KENO HILL SILVER DISTRICT OPERATIONS

FLAME AND MOTH DEVELOPMENT AND PRODUCTION PROGRAM

PROJECT PROPOSAL SUBMISSION TO YESAB

December 2013

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ACRONYMS

AANDC	Aboriginal Affairs and Northern Development Canada
ABA	Acid Base Accounting
AKHM	Alexco Keno Hill Mining Corp.
AMP	Adaptive Management Plan
ANFO	Ammonium Nitrate/ Fuel Oil
ARSA	Amended and Restated Subsidiary Agreement
CCME	Canadian Council of Ministers of the Environment
CF	Cut and Fill
DSTF	Dry Stack Tailings Facility
EMR	Energy, Mines and Resources
ERDC	Elsa Reclamation Development Company
EQS	Effluent Quality Standards
FNNND	First Nation of Na-cho Nyak Dun
GMMs	Ground Movement Monitors
ICP	Inductively Coupled Plasma
LHD	Load Haul Dump (Loader)
MLU	Mining Land Use (Approval)
MMER	Metal Mining Effluent Regulations
N-AML	Non-Acid Metal Leaching
NIA	Noise Impact Assessment
OCF	Overhand Cut and Fill
OH&S	Occupational Health and Safety
P-AML	Potential Acid Metal Leaching
QML	Quartz Mining Licence
RCP	Reclamation and Closure Plan
RTC	Registered Trapline Concession
SFE	Shake Flask Extraction
SWE	Snow Water Equivalent
UCF	Underhand Cut and Fill
UKHM	United Keno Hill Mines Ltd.
WRDA	(N-AML) Waste Rock Disposal Area
WRMP	Waste Rock Management Plan
WRSF	(P-AML) Waste Rock Storage Facility
WTP	Water Treatment Plant
WUL	Water Use Licence
YEC	Yukon Energy Corporation
YESAA	*Yukon Environmental and Socio-Economic Assessment Act*
YESAB	Yukon Environmental and Socio-Economic Assessment Board
YG	Yukon Government

EXECUTIVE SUMMARY

After nearly three years of successfully operating the Bellekeno Mine and Keno District Mill and recently permitting and licensing the Onek 990 and Lucky Queen Mines, Alexco Keno Hill Mining Corp. (AKHM) continues to systematically advance the development of newly discovered mineral resources in the Keno Hill Silver District through development and production at the Flame and Moth deposit. Timely development of Flame and Moth is critical to the long-term sustainability of the Keno Hill Silver District.

The purpose of the Project is to advance the Flame and Moth deposit towards development and mine production. This includes construction of a portal for underground access, development of a primary decline and ventilation/escape raise, construction of surface and underground infrastructure, underground definition drilling, development of ore accesses, mining and processing ore through the Keno District Mill, deposition of waste rock on surface, treatment and release of water and expansion of the Dry Stack Tailings Facility (DSTF).

Ore from the Flame and Moth deposit will either be comingled with ore from the Bellekeno, Lucky Queen and Onek mines or milled separately through the Keno District Mill. Development and operation sequencing of the Flame and Moth mine, as well as the other mines permitted in the Keno Hill Silver District, are largely driven by metal prices and other economic considerations. The project proposal presents the plan for development and operation of the Flame and Moth deposit as it is currently envisioned. The water encountered during the development and operation of the Flame and Moth underground workings will either be utilized in the milling process as makeup water or discharged. Discharged water will meet the current effluent quality standards for the Mill Pond as listed in Water Licence QZ12-053. Treated and released water will be managed using existing mill water management facilities along with necessary upgrades. Tailings produced will be deposited on the permitted and existing DSTF, as well as in an expanded area of the DSTF.

The Waste Rock Management Plan has been updated to incorporate waste rock generated from Flame and Moth. An increase in the licenced total tonnage of waste rock stored on surface will not be required. Waste rock generated from the Flame and Moth mine will be used for underground backfill, construction of laydown pads, access roads to the crusher, a toe abutment for the DSTF expansion, base layer for the DSTF expansion and for general construction purposes.

The Project will require the amendment of the existing Type A Water Use Licence QZ12-053 and Quartz Mining Licence QML-0009, which triggers an assessment under the Yukon Environmental and Socio-economic Assessment Act (YESAA) at the Designated Office level.

1 INTRODUCTION

Alexco Keno Hill Mining Corp. (AKHM) continues to develop the mineral resources of the Keno Hill Silver District. Alexco proposes to advance the newly discovered Flame and Moth deposit into development and operations in order to provide sustainable production in the Keno Hill Silver District mining operations, which includes the Bellekeno, Onek 990 and Lucky Queen Mines. The Flame and Moth deposit is located adjacent to the Keno District Mill. The development and operations program for the Flame and Moth deposit includes the development of underground primary and secondary ore access declines and drifts, construction of surface and underground support facilities, mining and milling ore in the Keno District Mill, depositing waste rock on surface and expanding the DSTF. Alexco plans to begin construction of surface facilities and underground access in the second quarter of 2014, upon procurement of the necessary regulatory authorizations and subject to economic considerations and other contractual considerations. Development work is anticipated to take 3 quarters to complete followed by mining and processing ore.

This submission is intended to meet the requirements for evaluation pursuant to the Yukon Environmental and Socio-economic Assessment Act (YESAA) by the Yukon Environmental and Socio-economic Assessment Board (YESAB) Mayo Designated Office.

Alexco's Health, Safety and Environmental Policy is attached in Appendix A.

1.1 PROPONENT INFORMATION

Alexco has been actively developing the Keno Hill Silver District since 2006 under a unique contractual arrangement with the Government of Canada whereby it can enter into production at historic and newly discovered deposits within the district while it undertakes reclamation activities to remediate historic environmental impacts.

AKHM is a wholly owned subsidiary of Alexco and has been incorporated for operation of mineral extraction and development in the Keno Hill Silver District. Alexco continues to advance the development and eventual implementation of the District Wide Closure Plan which addresses the historic environmental liabilities of the district from past mining activities.

1.1.1 Contact Information

Proponent	
ALEXCO KENO HILL MINING CORP. Suite 1150 – 200 Granville Street Vancouver, British Columbia V6C 1S4 Telephone: (604) 633-4888 Fax: (604) 633-4887	Contact: Kai Woloshyn, Environmental Manger Email: kwoloshyn@alexcoresource.com Phone:867-633-4881 ext. 233

1.2 PROJECT PURPOSE

The Bellekeno Mine was commissioned in January 2011 and is currently the only deposit supplying ore to the Keno District Mill. The Lucky Queen and Onek 990 Mines were permitted in 2013, but have not yet been brought into production. The Bellekeno Mine was recently put on temporary suspension of operations, due to a number of factors including a decline in commodity prices. The history of the Keno Hill Silver District is one of numerous high grade but narrow vein deposits being mined simultaneously to supply ore to a single mill. This same operational approach is being developed by Alexco, through the incorporation of multiple mines supplying feed to a centralized flotation mill (Keno Hill District Mill). Key to this approach however is the timely environmental assessment and permitting of deposits.

1.3 PROJECT LOCATION

The Keno Hill Silver District is located in central Yukon (63° 54' 32" N, 135° 19’ 18” W; NTS 105M/14 & 105M/13), 354 km due north of Whitehorse. Access to the property is via the Alaska, Klondike and Silver Trail Highways from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45 km); a total distance of 452 km.

The Keno Hill Silver District is located on and around Galena Hill, Keno Hill and Sourdough Hill and are collectively known as the Keno Hill Silver District. The property lies along the broad McQuesten River valley with three prominent hills to the south of the valley. The Flame and Moth portal will be located approximately 1 km southwest of Keno City (Figure 1-1, and Figure 1-2) and approximately 50 metres from the Keno District Mill.

Adit

Highway

Secondary

Contour (5 m interval)

Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13th and 14th 2006. Site hydrography and contours derived from 2006 aerial imagery obtained from Aero Geometrics, Calgary Alberta.

Datum: NAD 83; Projection: UTM Zone 8N

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AKHM

ACCESS

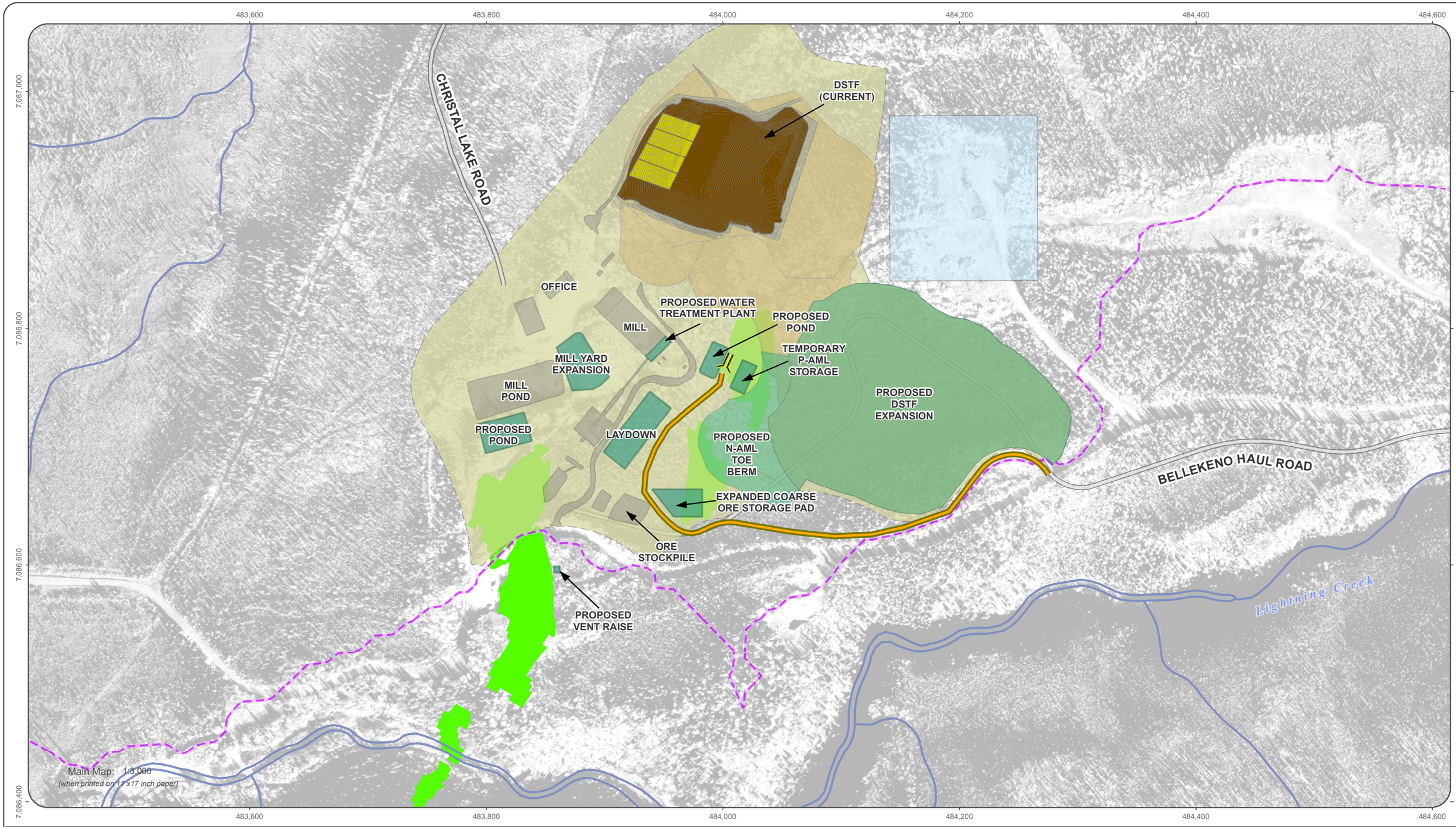
KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 1-1

OVERVIEW

DRAWN BY JP	NOVEMBER 2013	VERIFIED BY LH

I:\Keno_Area_Mines\ALL-SITES\Overview\01-Property Overview\Overview20131126.mxd
(*Last edited by: jpan;11/27/2013/11:08 AM*)



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Proposed Road
- Road
- Watercourse
- Proposed Features
- Watershed Boundaries
- District Mill Footprint
- DSTF 322,000 Tonnes Design
- Buildings/Structures
- As Built, DSTF, Sept 2013
- Land Disposition
- Flame and Moth Vein

AKHM
ACCESS

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 1-2

FLAME AND MOTH PROJECT OVERVIEW

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\Overview_20131127_ZOOM.mxd
(Last edited by: jpan;2013-11-28/15:13 PM)

1.4 ENVIRONMENTAL AND SOCIO-ECONOMIC CONTEXT

Table 1-1 summarizes existing environmental conditions in the Keno Hill project area. The Keno Hill Silver District lies within the Yukon Plateau – North Ecoregion, just south of the Wernecke Mountains. The terrain consists of concordant, rolling, upland areas separated by wide valleys. Alpine mountain peaks extend above the uplands locally. Many valleys include peatlands, palsas, fens and meadows of sedge tussocks. Upper slopes may be covered with scree material, with treeline occurring at 1,350 to 1,500 m. The area has been influenced by the latest glaciation but shows more subtle evidence of an earlier event as well.

Regional permafrost is irregularly distributed and its occurrence is dependent upon the elevation, hillside exposure, depth of overburden, soil types, amount of vegetative cover, and presence of flowing underground and surface water. At high elevations and on slopes with a northern exposure it is generally present. Geological conditions are presented in Appendix B.

The Keno Hill Silver District supports a variety of wildlife including ungulates, fur-bearers, small mammals, upland game birds and waterfowl. Moose are the most important subsistence animal in the area. Repeated survey work over the last 15 years indicates a healthy, stable moose population that has in recent years reached a maximum level of harvest (Lortie, 2009). Woodland caribou are not presently found in the immediate study area with the exception of the appearance, in summer, of fewer than 10-12 caribou scattered in very small groups in the Mt. Hinton and Bunker Hill areas. Sheep are not known to inhabit the Keno Hill area.

The Flame and Moth project site lies within the traditional territory of the First Nation of Na-cho Nyak Dun (FNNND) and near the communities of Keno City and Mayo. The area has been shaped by mineral development over the past hundred years. Silver and lead ore deposits were discovered on Keno Hill in the early 1900s and the area has since seen fluctuating levels of ongoing quartz and placer mining and exploration ever since. Today, the area supports not only mineral development, but also tourism, recreation, traditional pursuits, as well as the local people.

Keno City is a small community situated at the end of the Silver Trail Highway with a population of approximately 12 permanent residents. The community was originally established to support mining operations in the area and the community's population has fluctuated over the last hundred years in response to local mineral development activity. Today, Keno City is a small community with residences, a few small businesses, the Keno City Mining Museum, and the Keno City Alpine Interpretive Centre.

The community of Mayo is located approximately 50 km from the project site. Mayo has a population of approximately 450 people and serves as a distribution and service centre for the surrounding area, supporting mineral development, tourism and other activities. Mayo is also the administrative centre for the FNNND. In addition to being a tourist destination, the community is a base for wilderness and mining tourism, canoeing, hiking, big-game hunting and fly-in fishing.

Table 1-1 Keno Hill District Environmental Setting Summary

Drainage Region	Stewart River drainage region
Significant Watersheds	McQuesten River, Lightning Creek and Stewart River Watershed, Mayo River
Ecoregion	Yukon Plateau (North)
Study Area Elevation	900-1350 masl (Above Sea Level)
Vegetation Communities	Northern boreal forests occupy lower slopes and valley bottom; spruce, pine and alder; grasses and sedges, mosses occupy forest floor; heavy moss and lichen growth resident as ground cover understory of shrub willow; open and forest fringe areas of willow and scrub birch, and various flowering plant species.
Wildlife Species	Moose, grizzly and black bear, caribou, beaver, wolf, lynx, marten, wolverine, western tanager, magnolia warbler, white-throated sparrow, bald eagle, furbearers and small animals. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species include: Common Nighthawk (Threatened); Rusty Blackbird and Olive-Sided Flycatcher (Special Concern).
Fish Species	Bering and Beaufort Sea salmonids and freshwater species, including: Arctic grayling, Arctic char, lake trout, trout perch, lake whitefish, broad whitefish, burbot, inconnu, Arctic Cisco, Northern pike, slimy sculpin

Characterization and management of potential effects on environmental valued components have been incorporated into Sections 6, 8, 9 and 10, as appropriate. Potential impacts on fish, wildlife and vegetation have not been considered. The Project is not anticipated to affect these components, because Flame and Moth is situated immediately adjacent and entirely surrounded by previous and current disturbance and an active milling operation and minimal footprint extension is proposed. As described in Section 8, the Project is not expected to impact surface water.

Section 10 presents the socio-economic effects assessment and outlines mitigation and management measures.

1.5 ASSESSMENT AND REGULATORY CONTEXT

Alexco and its subsidiaries undertake a variety of activities at the Keno Hill Silver District, including care and maintenance, water treatment of historic adit drainages, site closure planning, mining exploration and development, ongoing environmental monitoring, and production of new deposits. These activities are authorized under a suite of project approvals. Table 1-2 lists the relevant existing approvals.

The proposed project will require the amendment of the existing mine production Water Use Licence QZ09-092 and Quartz Mining License, QML-0009.

Table 1-2 Relevant Keno Hill Silver District Assessment and Regulatory Approvals

Purpose	YESAA Approval	Quartz Mining Act Approval	Water Use Licence
Onek and Lucky Queen Mines Production	Project # 2011-0315 Decision Document	Amended Quartz Mining Licence (QML-0009, expires 2025)[a]	Type A Water Use Licence QZ09-092 amendment 1 – QZ12-053, expires 2020[b]
Bellekeno Mine Production	Project # 2009-0030 Decision Document	Quartz Mining Licence (QML-0009, expires 2025)[a]	Type A Water Use Licence QZ09-092, expires 2020[b]
Bellekeno Advanced Exploration	Project # 2008-0039 Decision Document	Class 4 Mining Land Use Approval (LQ00240, expires 2018)	Type B Water Use Licence QZ07-078/Amendment 1 QZ10-0606, expires 2018[b]
Care & Maintenance	Project #2012-0141 Project #2006-0293	N/A	Type B Water Use Licence QZ12-057 (renewal) expires 2018[b] Type B Water Use Licence QZ06-074/Amendment 1 QZ08-082[b]

Notes: [a] *www.emr.gov.yk.ca/mining/pdf/mml_bk_qml-0009.pdf*
[b] *www.yukonwaterboard.ca/waterline*

2 PROJECT DESCRIPTION

2.1 PROJECT AND ASSESSMENT SCOPE

The general scope of the project is outlined and provided in Table 2-1 and specific details are provided in the following subsections. Subsequently, activities related to the project but not included within the scope are described in Section 2.1.1.

The principal project activities include:

- Construction of surface infrastructure to support underground development and operations (shop trailers, fuel storage area, dry area, portal, ventilation fans, lay downs, settling pond and water treatment infrastructure);
- Construction of a ~175m by 9m haul road from the proposed Flame and Moth portal to the coarse ore stockpile. Realignment of ~325m of the existing Bellekeno haul road to accommodate the DSTF expansion.
- Construction of a surface portal, advancement of a primary decline, construction of a ventilation and secondary escape raise and ongoing construction of primary and secondary underground ore access drifts;
- Underground diamond drilling;
- Mining of ore and waste, milling of ore at the Keno District Mill;
- Use of N-AML waste rock (non acidic or metal leachate) for road building, laydown pad construction, DSTF toe abutment construction and general construction purposes;
- Temporary storage of P-AML waste rock on surface;
- Storage of tailings in an expanded DSTF;
- Use of explosives;
- Construction of water treatment infrastructure to support underground development and operations;
- Dewatering and water management activities and storage, treatment and discharge of water.

All of these activities described above and as part of the Flame and Moth project are similar or identical to activities already occurring in the Keno Hill District under current authorizations.

Table 2-1 Scope of the Assessment

	Flame and Moth	Project Proposal Section
Mine Operations	Daily mining rates up to 400 tpd, total ore mined over the life of the project of 1,000,000 tonnes	Sec. 3
Mining Development	New development of underground workings 3.7m wide by 3.7m tall Development of ventilation raise, safety bays, loadout bays and sumps Haulage to surface using 15 t trucks	Sec. 3
Maximum Approximate Waste Rock Tonnages to surface	12,000 t P-AML (included in currently Licence 500,000t of waste rock placed on surface) 125,000 t N-AML (included in currently Licence 500,000t of waste rock placed on surface)	Sec. 6
P-AML Waste Rock Storage	Temporary storage on surface until used as underground backfill	Sec. 6
N-AML Waste Rock Disposal	Construction of portal pad and laydown area, expanded coarse ore stockpile, mill yard expansion, new haul road to crusher and construction of the toe berm and base layer for DSTF expansion General construction Underground backfill	Sec. 6
Tailings management	Deposition of tailings on the licenced Dry Stack Tailings Facility is outside the scope of this assessment – refer to Section 2.1.1 Expansion of the DSTF to accommodate additional storage of tailings up to 585,000 tonnes Backfill of tailings to Flame and Moth mine	Sec. 5
Water use and management	Water use up to 140.1 m^3/d (112.1 m^3/d plus 25% contingency) from underground workings Contingency sources include: Mill well and Christal Creek (currently licenced). Onsite TSS management through a proposed primary and second storage/settling pond, plus contingency in the Mill Pond Dewatering of underground workings at a rate up to 2,450 m^3/day for a monthly average Discharge to Christal Creek via pond decant (KV-83) and water treatment (as required) to Licence Effluent Quality Standards outlined in QZ12-053	Sec. 8
Access/Ore Transport	No new roads are required to access the Flame and Moth Portal. A 175m haul road will be constructed between the Flame and Moth Portal and ore stock pad. ~325m of the Bellekeno haul road will need to be rerouted with the expansion of the DSTF	Sec. 7.6
Footprint extension	DSTF expansion (31,000m^2), F&M haul road (175m by 9m,1,575m^2) and rerouting Bellekeno haul road, 2,925m^2 (325m long by 9m wide)	Sec. 5.2 & 7.6
Personnel requirements	No additional staff required (as standalone operation)	Sec. 10
Power	Grid power	Sec. 7.1
Fuel Storage	Up to 30,100 L (two Envirotanks: 28,000 L main storage tank and 2,100 L day tank)	Sec. 7.9
Auxiliary facilities	Operation of portal facilities (plant services, miners' dry area, offices, trailers, portal, water treatment plant, settling ponds, fuel and explosives storage) Explosives storage and use Develop borrow source up to 15,000m^3 for DSTF expansion cover	Sec. 7

2.1.1 Activities outside the Assessment Scope

Because this project involves amendments to only certain portions of existing licences for the development activities, Table 2-2 describes proposed project activities that have been previously assessed as part of other Keno Hill District Development projects, and are therefore outside the scope of this assessment. Accompanying rationale and applicable authorizations are outlined for each activity.

In Alexco's interpretation, YESAA Section 42 (1) (b), the "existing project" clause, was meant to capture modifications to pre-existing projects that were never assessed under this legislation. We take the view that because the DSTF and mill have already been assessed under YESAA, and has since been licenced and made operational, this is not an "existing project" as defined in YESAA. We note that as we continue to develop the Keno Hill Silver District, it would become unwieldy over time to have to continually reassess key existing project components. Continual reassessment will hinder development in the Keno Hill Silver District.

Table 2-2 Activities Outside the Scope of the Assessment

Activity	Rationale	Applicable Authorization(s)
Current mining operations	The proposed project does not include any changes to mining operations at the Bellekeno, Onek or Lucky Queen deposits.	QML-0009
		QZ09-092
Operation of the mill	Flame and Moth ore will be milled at the licenced Keno District Mill, involving only minor operations adjustments. No changes to water use/ management are proposed for the purpose of milling	QML-0009: 15.6; Schedule B: Mill Development and Operations Plan; Noise Abatement Plan
		QZ09-092: 14(h-k)
Operation of the Dry Stack Tailings Facility	The total tonnage of tailings deposited on the already authorized DSTF will not change. Apart from any operational changes that may be implemented as a result of the monitoring and surveillance program, there are no planned changes to operation of the DSTF proposed as part of this project.	QML-0009: 15.10; 15.12; Schedule B – Dry Stack Tailings Facility Development and Operations Plan
		QZ09-092: 14l
Initial development of Flame and Moth Portal Pad	Flame and Moth portal bench is located directly adjacent to the District Mill. Surface development on titled land is permitted without an authorization under the *Quartz Mining Act*.	

2.1.2 Mine Site Liability

Responsibility for the historic environmental liabilities within the Keno Hill Silver District lies with the Government of Canada, as outlined in the Amended and Restated Subsidiary Agreement (ARSA) between Alexco/ERDC and Government of Canada. The ARSA contains a Production Unit provision that addresses the question of historic environmental liability if/when Alexco brings historic mines back into production and operation. A Production Unit is a surface area footprint that encompasses the required infrastructure and facilities included in a proposed mining production area. Under the ARSA, any historic terrestrial (i.e. waste dumps, roads, etc.) and water related liabilities that are within the Production Unit become the responsibility of Alexco.

A Baseline Environmental Assessment (BEA) will be completed prior to initiating development of the Flame and Moth deposit to establish the environmental baseline conditions associated with remnant liabilities.

2.2 EXISTING SITE CONDITIONS

The original Flame and Moth Mine was developed initially as shallow underground workings in the 1920s, which was followed up by a small open pit mining operation in the late 1980s to recover the crown pillar material left from the underground mining operation. The small remaining Flame and Moth Pit was subsequently backfilled in 2010 by AKHM as part of the preparation for the construction of the Keno District Mill.

The location of the Flame and Moth portal and facilities are surrounded on all sides by current mine operating activity and infrastructure including the mill, crusher, DSTF and haul road (Figure 1-2).

2.3 PROJECT SCHEDULE

Table 2-3 outlines the schedule for undertaking the key components of the Project.

Table 2-3 Project Timeline

Activity	2013	2014				2015-2020	2021-2025
	Q4	Q1	Q2	Q3	Q4	Q1-Q4	Q1-Q4
Construct Surface Facilities							
Develop Portal							
Underground Development							
Mining/Ore Processing							
Interim Reclamation							
Reclamation and Post-closure							

3 FLAME AND MOTH DEVELOPMENT AND OPERATIONS PLAN

3.1 INTRODUCTION

Subsequent to some early staking and surface workings in the 1920s, little or nothing appears to have happened on the property until the acquisition by United Keno Hill Mines (UKHM) just prior to 1950. A 27.4-metre inclined shaft was sunk to a vertical depth of 21.3 m along the footwall of what was likely the Moth vein. A crosscut, through the zone 13.7 m below surface and 42.7 m of drifting 22.9 m below surface, identified quartz-carbonate veins.

Between 1954 – 1984, various programs were carried out by UKHM including bulldozer trenching, soil sampling, ground geophysics and overburden drilling. In 1984, a small amount of vein material (368 tonnes at 699 gpt silver, 1.39% lead, 0.72% zinc) was open pit mined and sent to the Elsa mill, which may have come from vein material exposed during stripping of overburden in preparation for the open pit development.

Total production at the Flame and Moth property is listed as 1,440 tonnes grading 627 gpt silver, 1.1% lead, and 0.9% zinc (Cathro 2006). It is assumed most of these figures came from the underground work in the 1950s.

During 2006, Alexco embarked on an aggressive exploration program in the Keno Hill Silver District. Drilling by Alexco in the Flame and Moth resource area totalled 14 surface core boreholes (3,986.2 m) in 2010, 32 surface core boreholes (7,149.2 m) in 2011 and 43 surface core boreholes (8,753.1 m) in 2012. Recently completed drilling in 2013 totalled 2,809 m in 12 boreholes.

The surface exploration drilling completed by Alexco has resulted in the following mineral resources for the Flame and Moth deposit (Table 3-1).

Table 3-1 Mineral Resource Statement*, Flame and Moth Deposit, GeoStrat Consulting Services Inc., January 20, 2013

Zone	Class	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Au (gpt)
Christal	Indicated	450,000	545	1.74%	3.64%	0.48
	Inferred	57,000	320	1.08%	2.38%	0.28
Lightning	Indicated	829,000	496	1.73%	7.02%	0.40
	Inferred	50,000	302	0.61%	6.27%	0.26
Lightning V2	Indicated	99,000	548	1.61%	3.97%	0.27
	Inferred	1,000	614	1.73%	4.54%	0.12
Total	**Indicated**	**1,378,000**	**516**	**1.72%**	**5.70%**	**0.42**
	Inferred	**107,000**	**313**	**0.86%**	**4.21%**	**0.27**

* Reported at a NSR cut-off grade of C$185.00/t US$24.00/oz for Ag, US$ 0.85/lb for Pb, US$ 0.95/lb for Zn, and US$ 1,400/oz for Au; and recovery of 96% for Ag, 97% for Pb, 88% for Zn and 72% for Au. All numbers have been rounded to reflect the relative accuracy of the estimates. Mineral resources are not mineral reserves and have not demonstrated economic viability. Confidence in the estimate of Inferred mineral resources is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure.

3.2 LAYOUT AND PORTAL LOCATION

Given the close proximity of the Flame and Moth deposit and portal to the existing infrastructure at the Keno District Mill (Figure 1-2), a number of common facilities and infrastructure will be used which will improve the overall efficiency of the operation and reduce any potential environmental and socio-economic effects.

The Flame and Moth mine will require common surface support facilities including a dedicated mine office, dry/lunch room, maintenance shop, fuel storage tanks and laydown yard. A water management settling pond will also be constructed adjacent to the portal. The layout of the surface facilities for Flame and Moth is presented in Figure 1-2 while the preliminary portal location is shown below in Figure 3-1.

Figure 3-1 Flame and Moth Portal Location

After considering a number of alternatives, the preliminary portal location is planned at UTM 7,086,773N and 484,004E (Zone 8), approximately 50 m southeast of the mill building. At this location bedrock is at, or near surface, and where a portal face can be established into a steeper hill side. An overview of the Flame and Moth deposit is shown in Figure 3-1 and Figure 1-2.

In other locations considered for the portal, the overburden layer was modelled at up to 15 m thick which would have created additional geotechnical concerns and significantly higher material volumes. As such, the proposed portal location was selected.

Additional geotechnical investigation will be conducted prior to development of the Flame and Moth portal to confirm the bedrock conditions in that location. The final location of the portal will be adjusted based on the outcomes of this additional optimization work but the final location will be consistent with the design criteria which includes:

- Suitable bedrock at or near surface to minimize the overburden excavation required;
- Geotechnical stability to ensure the safety of employees and equipment;
- Location that allows development to occur in non-mineralized rock;
- Proximal location to the underground deposit to maximize project economics and minimize development metres;
- No long-term water emanating from the portal that would create a perpetual water management outcome (i.e. the portal will be above the ground water table).

Consistent with previous project approaches and licensing, the final location of the portal will be included in an update to the Development and Operations Plan under the Quartz Mining License. An adjustment to the portal location will not result in any changes to any potential effects on Keno City (e.g. noise and traffic).

In order to reach the mineralization of the Flame and Moth deposit, a new decline will be constructed and will serve as the primary ingress/egress and development/production haulage and transportation route. Approximately 750 m of primary decline will be required to reach the mineralization followed by ongoing primary development over the course of the project life. The primary decline is 3.7 m wide by 3.7 m high (for mechanized development and production mining) driven at a grade of approximately -15%. A multiplate portal collar similar to Bellekeno will be used for Flame and Moth (Figure 3-2.) The decline will include safety bays and remucks as required for decline development work. The preliminary portal is located at UTM 7,086,773N and 484,004E (zone 8).

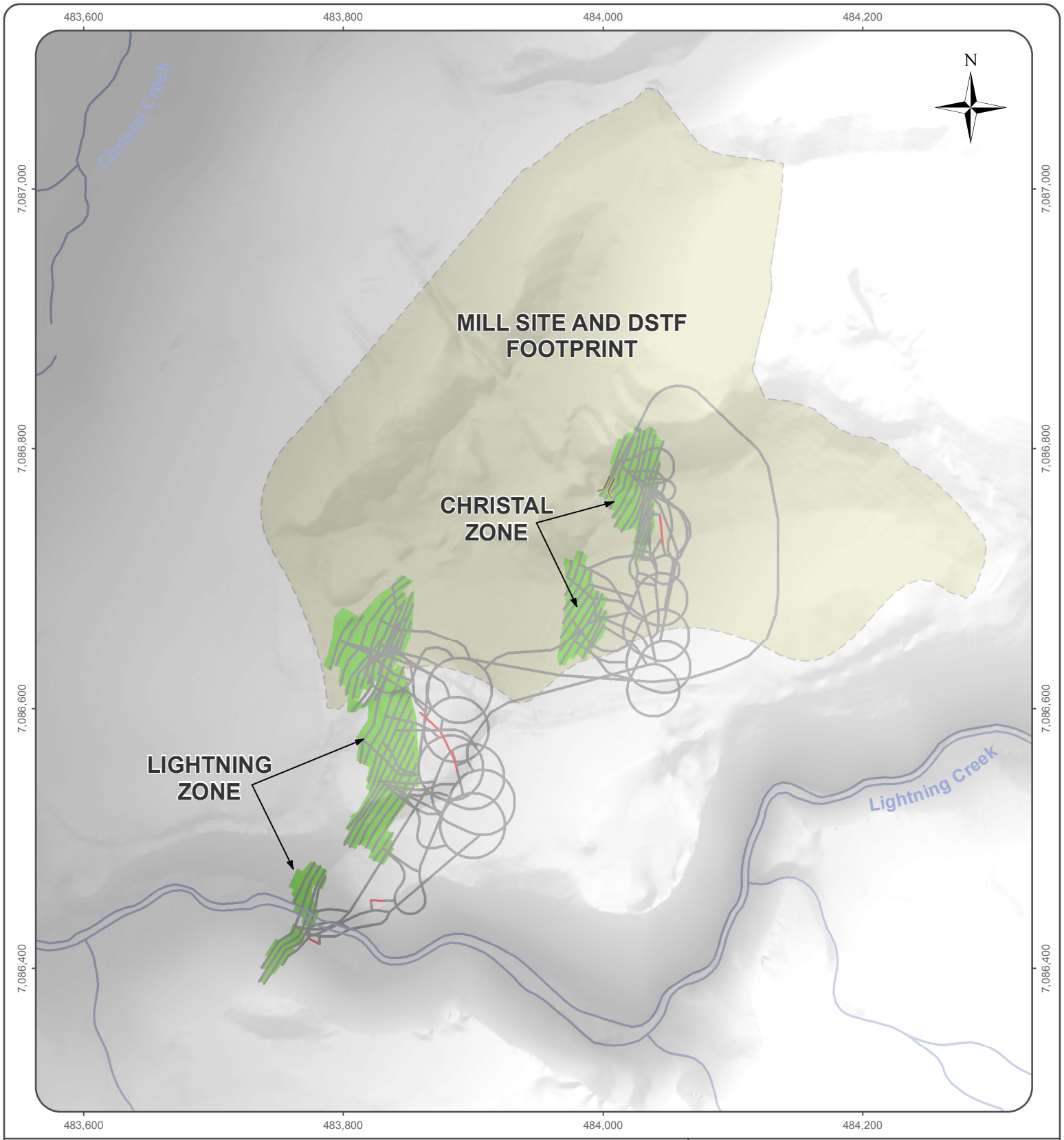
The decline will be driven using Alexco's owned mechanized equipment; specifically, rubber tire load-haul-dump scoops, 15 ton trucks, a jumbo and mechanized roof bolter. This fleet will be supported by a fleet of mechanized utility equipment.

Figure 3-2 Typical Example of Portal Multiplate Collar

3.3 MINE PLAN

Figure 3-3 shows a plan view of the Flame and Moth deposit; along with key features including the location of the mill and Lightning Creek. Figure 3-4 shows the 3D mine model of the Flame and Moth deposit. The view is from the hangingwall side of the deposit, looking northwest.

The mine model view shows only the centre lines of the planned ramps, crosscuts, and raises. The bedrock surface is based mainly on borehole information and it is observed to have some deep paleochannels where the overburden layer is 25 m thick and greater.



Watercourse
Workings
Shafts (Workings)
Mill Site Footprint
Flame and Moth Vein

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 3-3

FLAME AND MOTH DEPOSIT
PLAN VIEW

NOVEMBER 2013

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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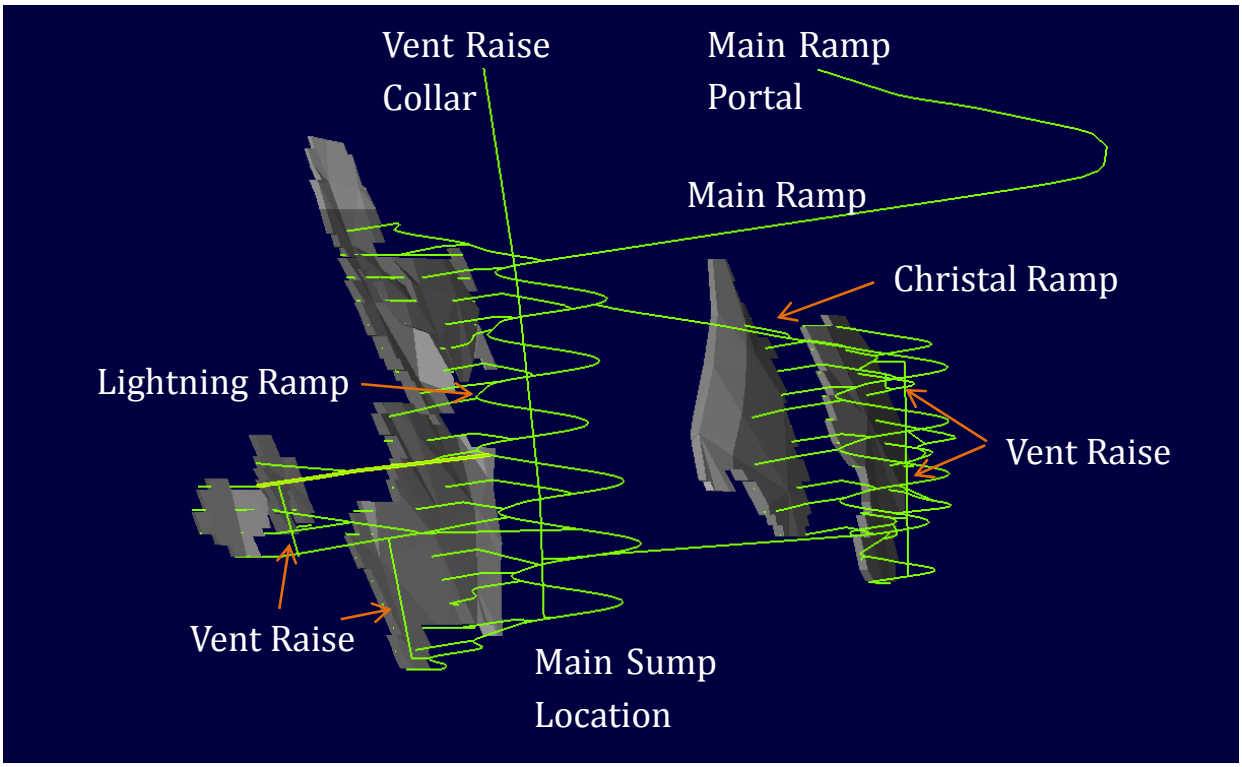


Figure 3-4 Flame and Moth Underground Mine Plan

3.4 MINING METHODS

The relevant characteristics of the deposit from a mining method selection perspective are:

- The deposit is offset by approximately 95 m of apparent right lateral movement along the west-northwest trending post-mineral Mill fault. The Mill fault dips approximately 66° to the southwest with the mineralization in the hangingwall section referred to as the Lightning zone and that in the footwall section referred to as the Christal zone;
- Most of the deposit area is covered by overburden that ranges in depth from 0 to 50 m;
- It is a vein-type deposit dipping at roughly 64°, comprised of two main veins – Lightning and Christal, plus a much smaller splay vein called Lightning vein 2;
- Vein widths vary from less than 1 to 10 m. The selected mineable portions of the veins are mainly in the range of 4 to 7 m wide;
- It is a high grade, high value deposit requiring good mining recovery;

- It is a shallow deposit with mining depths ranging from the crown pillar 30 m below bedrock surface to a current maximum depth of 270 m;
- Vein continuity is expected to be reasonably good with contacts that can be visually identified;
- Wall rock strength is good with the vein material being of fair to weak. Vein material strength is expected to be much improved when dewatered.

Planned mining methods are predominantly longhole and cut and fill, similar to the mining methods currently used at Bellekeno (Table 3-2).

Table 3-2 Mining Method Selection

Selected Mining Methods	Justification
Overhand Cut and Fill	Selected for less competent rock, less dilution, better ground control and optimized ore recovery
Long Hole	Selected for more competent rock and to extract the remaining pillars towards the end of the mine life

A brief description of each main mining method is given in the following pages.

Cut and Fill (CF) mining is a method of short hole mining used in a wide range of deposit geometries. There are two main methods of cut and fill (CF) mining; overhand cut and fill (OCF) and underhand cut and fill (UCF). In the case of Flame and Moth, only OCF is anticipated.

OCF typically uses uncemented fill and mining begins at the bottom of a mining block and advances in “slices” of “lifts” upwards. Stoping begins from an access ramp driven off the main level to the bottom of the mineralized zone to be accessed. Using development mining techniques, a drift is driven through the mineralized zone to the defined limit of mining. Upon completion, the drift (or "cut") is filled with cemented back-fill, which would consist of tailings or waste rock. Once the stope is filled the ore access off the main haulage ramp is driven down to access the next lift on top of filled cut. This process continues until the top of the stope is reached. See Figure 3-5 for a typical CF schematic. The majority of ore mined from the Bellekeno mine to date has been through OCF and cemented rock fill mining methods and is well demonstrated.

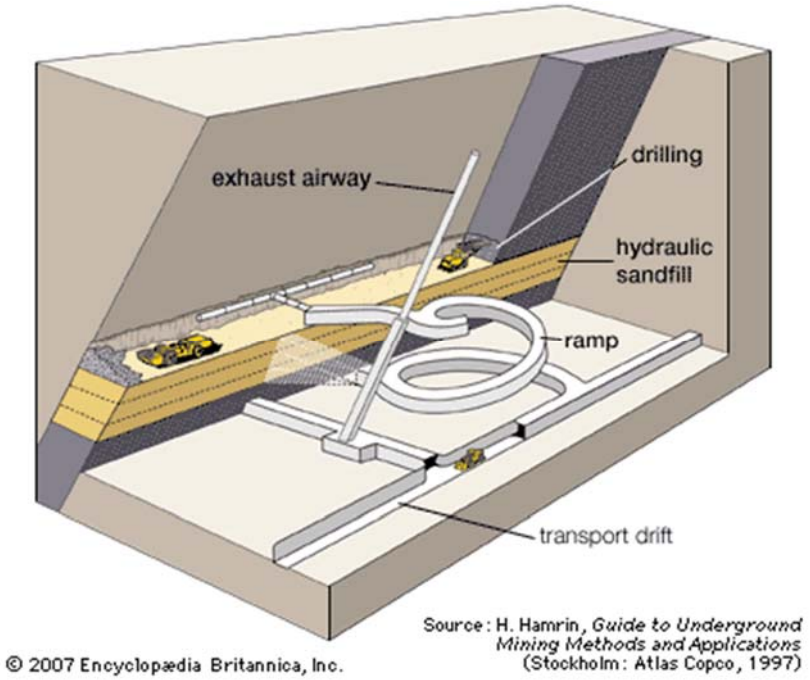


Figure 3-5 Overhand, Mechanized Cut & Fill Mining Methods (Source: Atlas Copco)

Long hole stoping ("LH") is normally used where large blocks of continuous mineralization can be identified and the surrounding rock is reasonably strong (Figure 3-6). Access to the top and bottom of the mineralized block is provided with drifts. A vertical opening (slot raise) is created within the stope block from the top of the block to the bottom. Long holes are drilled to blast vertical slabs off the mineralized block which is then scooped from a lower drawpoint by an LHD loader.

The depth on blast holes in the production sequence will be approximately 10-15 metres long. Blind raises or slot raises will be drilled with the LH drill unit, blasted and the stope block will be retreated out by drilling and blasting successive rings. Typically LH blocks will be pulled last unless they are in an area that would not conflict with ongoing operations. They could also be filled if they are located too close to mine infrastructure.

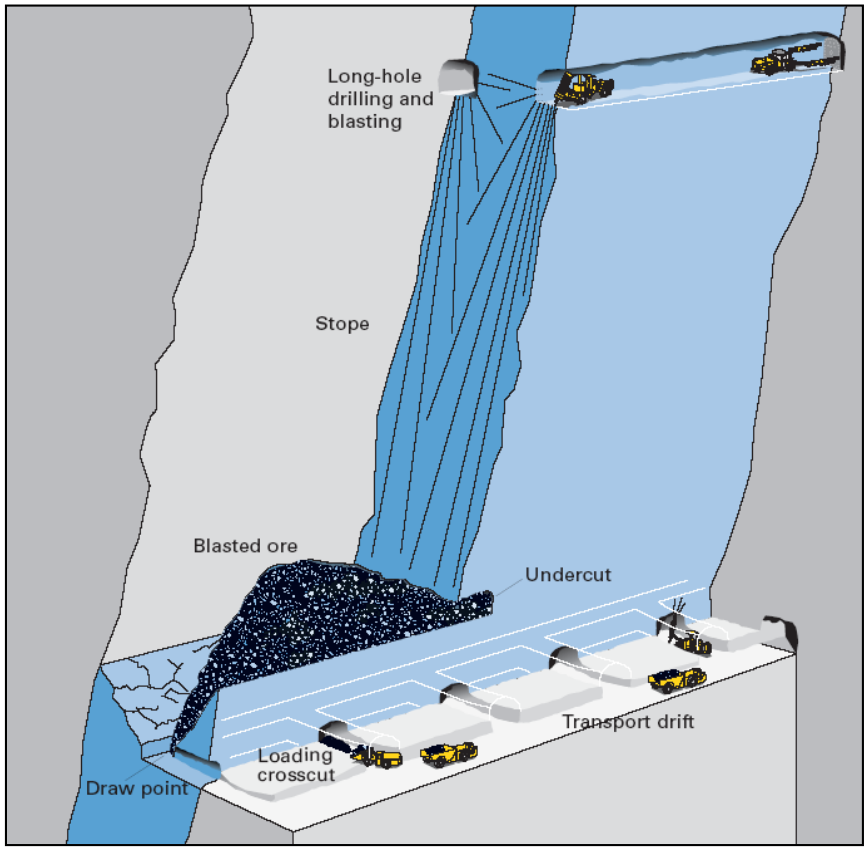


Figure 3-6 Long Hole Mining Method (Source: Atlas Copco)

3.4.1 Development and Production Schedules

A development and production schedule has been prepared for the Flame and Moth deposit (Table 3-3). The schedule tracks and reports development metres and vein production material. The schedule shown is based on various assumptions; including commodity prices, economic parameters, development costs and productivity constraints. This schedule is a snapshot of Flame and Moth based on these parameters. As these parameters change in the future, the various production rates and timing will vary as well.

The schedule assumes a development rate of 4 metres per day for the main ramp and the Lightning ramp system. The Christal spiral ramp system was scheduled at 3 m per day line advance.

The production schedule includes some time allowances for vein water drainage after the vein has been intersected by access crosscuts. One month or more has been allowed for drainage before mining in the vein begins. Another constraint is that production stoping is not scheduled to begin until a second route out of the mine has been established to that location.

The maximum stope production rates used in the schedule include:

- 1,600 to 2,100 tonnes/month for the longhole method;
- 1,000 to 2,100 tonnes/month for the cut and fill method.

These rates are long term averages that include the entire stope cycle including production and backfilling phases.

The sequence of underground development will entail shooting line and grade, marking up the face for jumbo drilling, drilling, loading holes for blasting, excavation and transportation of broken rock to pre-determined destinations, roof and rib bolting after the mucking sequence, assessment and sampling of the new face by a geologist and then repetition of the drill, blast, muck, bolt and assessment cycle. Utility piping, power cable and ventilation will be installed as the decline progresses.

Table 3-3 Flame and Moth Production Schedule

Category	2014	2015	2016	2017	2018	2019	2020
Metres Development	885	2690	995	678	887	784	750
Tonnes Ore Mined/Milled		58,312	133,868	121,797	115,403	115,321	115,000
Tonnes Waste Broken	38,711	151,826	23,274	40,832	30,733	31,086	31,000
Tonnes Concentrate Produced		5,065	11,215	9,414	7,754	6,716	6,700
Tonnes Tailings Generated		53,247	122,653	112,382	107,649	108,605	108,300

Although the Flame and Moth deposit is larger than Bellekeno in terms of average vein width, anticipated production rates and resource tonnage, the primary decline will be smaller than Bellekeno given its close proximity to the mill and crushing facility. Due to the close proximity, it is anticipated that the smaller underground haulage trucks (15 t) will come directly to surface and haul the relatively short distance (~ 175 m) to the coarse ore pad at the crusher. The main decline and associated development heading dimensions are provided below:

Decline	3.7 m W x 3.7 m H
Ore Access	3.7 m W x 3.7 m H
Ventilation Raise	3.0 m bored diameter above 720 elev., 2.4 m W x 2.4 m H below 720 elev.

3.4.1.1 Backfilling

Backfill materials consisting of development waste rock (N-AML and P-AML) and dry filtered tailings will be placed into empty stopes by Load Haul Dump (LHD) or 15-tonne trucks. The mix of these materials is flexible and will be varied to minimize the surface environmental impact while optimizing the most efficient and cost effective back filling sequence. For cut and fill stopes, the backfill will be pushed up tight to the back using an LHD equipped with a rammer jammer.

Cemented backfill at approximately 5% cement by weight will be used in longhole stopes. The cement, rock and water will be mixed by LHD bucket in a small sump-like cut out near the empty stope. Cement will be transported underground in bulk bags.

A waste rock and tailings materials balance for Flame and Moth is shown in Table 3-4. Waste rock will be brought to surface when immediate backfill locations are not available. Depending on backfill cycles, stockpiled waste on surface will be re-handled and brought back underground for use as backfill. The initial N-AML waste rock produced during the early development phase will be used for various construction projects including; the portal pad, laydown areas, haul road, coarse ore stockpile expansion, DSTF embankment and mill yard expansion. The amount of rehandle will be minimized as much as possible to reduce the surface stockpile as well as reducing operating costs from rehandling. Vein material and waste will be handled by 15-tonne capacity haulage trucks underground and on surface. Trucks will be loaded at remuck bays on the ramp systems and will haul directly to the coarse ore stockpile at the crusher or to the planned surface waste rock dump location, both surface locations being within ~175 m of the portal. A temporary surface stockpile will be required for storage of P-AML waste. The first priority for backfill material will be the P-AML waste stored on the surface stockpile. It is expected that 100% of all P-AML waste will be used as backfill underground.

Under the current mine plan, waste rock broken underground is estimated at 347,000 tonnes. Approximately 210,000 tonnes of this waste rock is needed for Flame and Moth backfill, along with 172,000 kt of dry filtered tailings. The amount of waste rock used for surface construction requirements is estimated to be up to 137,000 tonnes. Some will be used for the new haul road alignment next to the mill that will be required as the DSTF expands in future into the area of the currently used haul road from the Bellekeno Mine. Given the relatively small amount of waste that remains on surface for construction purposes, a dedicated waste rock storage area for Flame and Moth is not anticipated. All waste rock will be inspected and tested as per the updated Waste Rock Management Plan, which segregates all waste rock as either potentially acidic/metal leaching (P-AML) or not (N-AML).

Table 3-4 Waste Rock and Tailings Material Balance

Category	2014	2015	2016	2017	2018	2019	2020
Sources							
Tonnes Waste Rock Broken	38,711	151,826	23,274	40,832	30,733	31,086	31,000
Tonnes Tailings Generated	-	53,247	122,653	112,382	107,649	108,605	108,300
Tonnes Backfill Required	-	32,566	68,824	69,151	69,284	69,038	64,107
Destinations							
Waste Tonnes to Backfill		32,566	43,600	40,832	30,733	31,086	31,000
Tailings Tonnes to Backfill		8,956	25,224	28,319	38,551	37,952	33,107
Waste Tonnes to Construction	38,711	98,394	-	-	-	-	-

3.4.1.2 Mine Dewatering

A comprehensive hydrogeological investigation was completed at the Flame and Moth deposit to assess the hydrological conditions associated with development of the deposit. The details of the program are included as Appendix C. The hydrogeological investigation estimates that up to 35 lps of groundwater inflow could be expected and encountered during the operation of the Flame and Moth mine. Management of mine inflows at Flame and Moth is planned to be via underground sumps and pumps, similar to the water management program at the Bellekeno Mine.

A main dirty water sump is planned for the 660 m elevation near the fresh air raise and main ramp. A dirty water centrigual pump(s) are planned in two parallel banks of three pumps each in series, capable of up to 70 lps or twice the anticipated mine inflows. Two steel cased 150 mm diameter boreholes are planned to deliver dirty water from the main sump to surface.

Area sumps are planned as follows: two sumps at the lowest areas of Lightning and one at the lowest area of Christal. These sumps will be equipped with 45 kW dirty water submersible pumps to pump to the main sump at the 660 m elevation.

4 GEOTECHNICAL ASSESSMENT

4.1 ROCK MASS QUALITY

The Flame and Moth Vein is divided into the Lightning and Christal mining areas, separated by the Mill fault. The fault offsets the Christal area in a southeast direction by approximately 120 m and is primarily composed of very poor quality rock, with gouge and breccia materials. The fault thickness varies along strike, but near the proposed development locations the fault is approximately 2 to 4 m wide. Rock in the immediate hangingwall and footwall to the fault is considered to be of poor quality and exhibits conditions similar to those within the fault. The geotechnical assessment utilized borehole core photo reviews, re-logging of core photos, and detailed reviews of mining intersections to assist in understanding the distribution of likely ground conditions. Simplistic geotechnical domains were developed that reflect the quality of the rock mass relative to the mining methods proposed. Representative ground classes were developed that broadly correlate with the Poor, Fair, and Good domains.

The rock mass was separated into hangingwall, mineralized zone, and footwall zones, and then domained in terms of poor, fair, or good rock mass conditions. Planned mining areas without borehole coverage were assigned fair conditions.

At the Flame and Moth deposit, ground conditions within the footwall are less favourable for infrastructure placement based on well-developed weak schist packages. As such the location of the infrastructure will be within the hangingwall of the veins.

4.2 GROUND SUPPORT METHODS

4.2.1 Ground Classes

Based on the interpreted geotechnical conditions at Flame and Moth, as well as the experience gained at Bellekeno, a ground control management plan will be developed and appropriate ground control classes will be identified. These ground control classes will form the basis of the ground control management for development of the Flame and Moth decline and additional classes added or modified as required.

4.2.2 Shotcrete Requirements

Where required, shotcrete will be used to provide short and long term stability. In areas where shotcrete is required, it is important that shotcrete is applied as soon as possible following blasting and mucking to control the behaviour of the rock mass and prevent unravelling of the rock mass before final support is installed. In excavations expected to be open for the long-term, shotcrete can be used to prevent rock mass dilation and ravelling (e.g. where schist packages are intersected). In this situation, shotcrete can be applied as a flash-coat, with additional shotcrete thickness (50-75 mm) added following the installation of conventional support.

4.2.3 Ground Support Monitoring Instrumentation

Quality control / quality assurance of the ground support methods for Flame and Moth decline development will be monitored by the following programs;

- On-going field observations of ground support installations;
- Pull-tests to determine anchor strengths of various ground support anchors / rockbolts. *These tests will be performed on ground support installations that have been installed specifically for the purpose of doing the test. These installations will not be part of the active ground support;*
- Pull-tests will be performed on each type of anchor / rockbolts and in each type of ground condition;
- Test panels for shotcrete to determine compressive strengths.

As development and production advances, routine ground control and stability inspections will be completed. This will be performed by Alexco personnel in conjunction with external rock mechanics / ground control experts. Additionally, an annual audit and report will be completed in order to continuously review ground conditions and support methods.

In addition, any suspected ground concerns will be monitored by the appropriate instrumentation including field observations, ground movement monitors (GMMs), extensometers and/or other methods deemed appropriate. A dedicated ground control log book will be located at each mine and ground control concerns tracked and documented on an on-going basis. In addition, safety discussions are held with all personnel on a daily basis and this forum will be used to raise awareness of any ground control concerns and to discuss solutions.

5 ORE PROCESSING AND TAILING STORAGE MANAGEMENT

5.1 ORE PROCESSING

Ore from Flame and Moth will be processed in the already authorized Keno District Mill. A summary of the Keno District Mill is provided for continuity and ease of reference during review of the Project Proposal.

Figure 5-1 shows the general features of the Keno District Mill.

Figure 5-1 Keno District Mill

The Keno District Mill utilizes conventional differential flotation processes common throughout the mining industry. The process recovers valuable mineral sulfides through mechanical and chemical processes. The process flowsheet includes the following main components (Figure 5-2).

- primary and secondary crushing circuits with a belt conveyor to transport the crushed ore to the covered fine ore stockpile;
- fine ore reclaim system feeding crushed ore from the covered fine ore stockpile;
- primary ball milling in a closed circuit with a high frequency screen to produce a grinding product of 80% passing 174 µm;

- the ground high frequency screen underflow feeding to lead rougher scavenger flotation circuit to recover lead and silver minerals; the lead rougher flotation concentrate being upgraded in three stages of cleaner flotation;

- the zinc rougher flotation concentrate being upgraded in three stages of cleaner thickening and pressure filtration of the lead and zinc concentrates

- thickening and pressure filtration of tailings, disposed either as underground backfill or at surface on the DSTF.

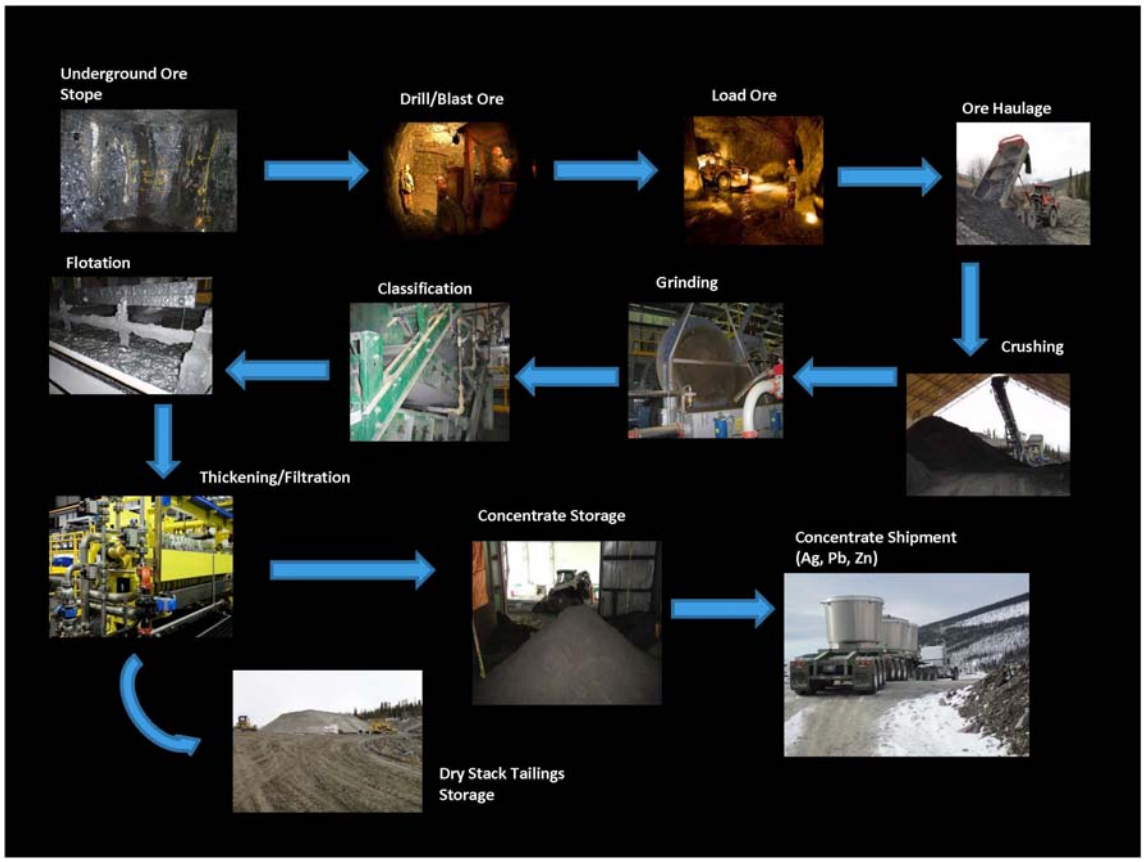


Figure 5-2 Simplified Process Flowsheet

5.2 TAILINGS MANAGEMENT

The Flame and Moth project will continue to utilize dry stack tailings technology for management and long-term storage of tailings produced from the processing of Flame and Moth ore. Depending on various operating and economic conditions, Flame and Moth will either be processed through the Keno District Mill as a standalone feed, or in combination with other permitted mines including Bellekeno, Lucky Queen and Onek.

Dry stack tailings technology has been successfully applied for management of Bellekeno tailings for nearly 3 years.

Dry-stacked tailings deposition has become a proven technology in recent years due to development of tailings dewatering technology and is a preferred method for tailings disposal in cold weather environments. Dry-stack tailings management and storage technology, although more expensive to construct and operate than conventional tailings disposal techniques, produces an engineered structure with superior geochemical and geotechnical stability.

Dry stack tailings management at the Keno District Mill involves the dewatering or filtering of tailings after the valuable minerals have been removed. Plate and frame filter presses inside the mill building remove the water from the tailings and produce a dry tailings product (<10% moisture). The filtered tailings from the filter press drop onto a conveyor belt and are transported outside the building onto a concrete slab for short-term storage. On a periodic basis (daily/weekly) the filtered tailings are loaded into a haul truck and transported to the DSTF. The tailings are deposited onto the DSTF in thin lifts (~300 mm) and compacted with a 10-t vibratory compactor. The chief advantages of progressive-construct and progressive-reclaim dry stack technology include:

- A smaller overall footprint of tailings deposit facility compared to conventional impoundments;
- Minimizes open area of tailings;
- Minimizes environmental disturbances (less clearing before immediate use, therefore less erosion/runoff);
- More stable structure, enhances long-term closure stability;
- Reduces water usage and makeup requirements from filtering;
- For cold climates, dry stacking prevents pipe freezes and frosting problems common with conventional impoundments; and,
- Enhances closure measure performance.

As the DSTF advances, progressive reclamation is undertaken through recountoring slopes to final angles and constructing a soil/revegetation cover. The cover system reduces pore water seepage through the tailings and promotes revegetation. A September 2013 photo of the DSTF demonstrating progressive reclamation is shown in Figure 5-3.

Figure 5-3 DSTF Progressive Reclamation – September 2013

5.3 DSTF EXPANSION

The current DSTF is permitted for a capacity of 322,000 tonnes. At the end of October 2013, the DSTF has approximately 178,000 tonnes placed with a remaining volume of 144,000 tonnes. This remaining capacity allows for < 2 years of design capacity remaining (assuming 400 tpd processing rate) before an expansion area is permitted and constructed. The remaining volume in the DSTF will be filled with a combination of tailings from Flame and Moth, Bellekeno, Lucky Queen and Onek.

The combination of future ore streams is a function of numerous operating and economic parameters. The expansion will be contiguous, and to the southeast of the current DSTF. Once the permitted volume of the current DSTF is exhausted, tailings disposal and management will transition into the expanded footprint. As discussed in Section 3.4.1 the materials balance for tailings at a 400 tpd ore processing rate is presented. For planning purposes, the materials balance assumes that all available waste rock is used as backfill first and then supplemented by tailings.

Alexco retained EBA Engineering Consultants Ltd. to complete a geotechnical investigation and preliminary design of the expansion of the DSTF. EBA completed the design of the current DSTF and conducts routine

independent monitoring of the DSTF performance. The DSTF Phase II Expansion Preliminary Design Report by EBA is attached in Appendix D. The EBA design does not include a liner below the compacted tailings. The previous YESAB assessment of the DSTF did not include a liner as an environmental protection measure but was subsequently added for MMER monitoring. Alexco is not proposing a liner in the DSTF expansion design as no seepage has been observed. Alexco will meet MMER requirements.

A site plan showing the proposed expansion footprint is presented in Figure 5-4. The proposed location of the expanded DSTF takes into consideration a number of design requirements and features including:

- The expansion design is consistent with the current design which has proven to be effective;
- Ground conditions in the expansion area are similar to the current area wherein frozen ice rich material has been encountered and appropriate design considerations have been incorporated with conservative factors of safety;
- The expansion area allows efficient placement of tailings given its logical expansion of the current facility;
- The footprint takes into account existing mine features including the proposed location of the Flame and Moth portal, mill building, crusher location and haul road access; and
- Operation of the DSTF is similar to operation of the current facility which has shown there is no impact from dust migration, noise or adverse environmental effects.

KENO CITY DUMP AREA

UPHILL RUN-OFF DIVERSION BERM

TOE RUN-OFF COLLECTION BERM

TOE RUN-OFF COLLECTION SUMP

EXISTING DSTF ULTIMATE FOOTPRINT

PHASE II EXPANSION ULTIMATE FOOTPRINT STORAGE VOLUME: 295,000 m³

ELEV = 940 m

ELEV = 936 m

ELEV = 920 m

TOE STRUCTURE

3H:1V

2H:1V

MILL BUILDING

SURFACE WATER COLLECTION POND

CONVEYOR

ORE BIN

CRUSHER

COARSE ORE STOCKPILE CEMENT PADS

EXISTING BELLEKENO HAUL ROAD

RE-ROUTED BELKENO HAUL ROAD

DUNCAN CREEK ROAD

BH16 BH17 (GTC) (MW) BH18 (GTC) BH19 BH20 BH21 BH22 BH23 (GTC) BH24 BH25 BH26 BH27 BH28 BH32 BH33 BH34 BH35 BH36 (SI)

KV-85S (MW) KV89 (MW)

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 TP20 TP21 TP23 TP24 TP25 TP26 TP27 TP28 TP29 TP30 TP31 TP32 TP33 TP34 TP35 TP36 TP37 TP38 TP39 TP40 TP41 TP42 TP43

LEGEND:

- TESTPIT LOCATION (PREVIOUSLY ADVANCED)
- BOREHOLE LOCATION (PREVIOUSLY ADVANCED)
- TESTPIT LOCATION (PHASE II EXPANSION)

0 100

Scale: 1 : 1750 (metres)

CLIENT

ALEXCO

DRY-STACKED TAILINGS FACILITY EXPANSION - PHASE II
KENO HILL DISTRICT MILL SITE, YUKON

SITE PLAN SHOWING PROPOSED EXPANSION FOOTPRINT

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
W1□103303-01	CB	JTP	0

OFFICE: EBA-WHSE

DATE: N□□□m□□r 1□, 2013

Figure 5-4

Q:\Whitehorse\Data\0201drawings\Keno\W14103122-01 Keno DSTSF Re-design\DSTF Expansion Options\W14103122-01 DSTF Expansion Option 5.dwg - [FIGURE 11] November 14, 2013 - 4:01:09 pm (BY: BUCHAN, CAMERON)

5.4 DSTF PERFORMANCE

Geotechnical and geochemical performance of the DSTF since inception (December 2010) demonstrates that actual field performance meets or exceeds original design considerations. The following general performance indicators are presented as support for the assessment of the expanded DSTF:

- The moisture content of the filtered and stacked tailings is lower than expected resulting in lower makeup water requirements and no discharge of mill water;
- The metals content of the pore water (i.e. Zn) is orders of magnitude lower than initially estimated (~ 2 mg/l vs. 20 mg/l);
- Humidity cell test results for actual Bellekeno tailings deposited in the DSTF demonstrate there is no concern for acid or metals generation;
- Progressive reclamation plans have been met with successful recontouring and revegetation of the western face of the DSTF completed;
- No measurable pore water has been measured or observed in the DSTF monitoring well installed within the DSTF;
- Compaction results have met design specifications;
- No surface subsidence has been observed;
- Ground temperature and slope indicator readings indicate no thawing of underlying permafrost or movement has occurred to date.

During ongoing technical updates and communication between Alexco and FNNND technical consultants and staff, concerns were raised surrounding the suitability and long-term stability of the current DSTF from ice rich permafrost in foundation soils. As part of Alexco's Comprehensive Cooperative Benefits Agreement with FNNND and as part of our normal course of business, Alexco commissioned SRK Consulting to assist in addressing these concerns through an objective risk based approach. A copy of the risk assessment report is included as Appendix E.

There were no high risks identified by FNNND or any of the technical consultants regarding the long-term stability of the DSTF.

5.5 METALLURGICAL TESTING

Inspectorate Exploration and Mining Services Ltd. was commissioned by Alexco to undertake a precious and base metal recovery study on samples originating from the Flame and Moth deposit during surface drilling programs completed in 2010/11. The purpose of this testing was to determine the recovery of silver, lead and zinc in the flotation circuits in the existing mill flowsheet, and to evaluate the environmental parameters of the residual tailings. Representative samples from drill core intervals were used to produce a composite sample of Flame and Moth for metallurgical testing.

The results of the metallurgical testwork indicate that Flame and Moth ore samples respond well to the current metallurgical flowsheet operating at the mill. Milling of Flame and Moth either as standalone mill feed or concurrently with ore from other deposits (Lucky Queen, Onek and/or Bellekeno) will result in acceptable metal recovery. The metallurgical results are not optimized lock cycle tests but demonstrate that the general metallurgical parameters are in line with historic performance and further optimization will improve the metallurgical response of Flame and Moth ore.

Table 5-1 to Table 5-6 summarizes the results of the metallurgical tests completed on Flame and Moth.

The head assay for the composite sample used in the metallurgical testing is shown in Table 5-1. The assay of the composite sample is consistent with the expected mill feed grades from Flame and Moth and is considered representative of the deposit. Table 5-2 summarizes the whole rock analysis of the composite sample.

Table 5-1 Flame and Moth Head Assays – Elements of Prime Interest

Element	Unit	Composite Analysis
Silver	g/t	658.2
Lead	%	2.05
Zinc	%	6.44
Iron	%	19.86
Sulphur	%	13.0

Table 5-2 Flame and Moth Head Assays – Whole Rock Analysis

Compound	Unit	Composite Analysis	Compound	Unit	Composite Analysis
Al2O3	%	1.74	MnO	%	4.08
BaO	%	0.01	Na2O	%	0.06
CaO	%	0.59	P2O5	%	0.02
Cr2O3	%	0.02	SiO2	%	32.91
Fe2O3	%	27.91	TiO2	%	0.14
K2O	%	0.22	LOI	%	17.39
MgO	%	0.53	Total	%	85.62

Table 5-3 presents the ICP metals analysis for the metallurgical composite sample used in the testwork.

Table 5-3 Flame and Moth Head Assays – Minor Elements ICP – AES

Element	Unit	Composite Analysis	Element	Unit	Composite Analysis
Aluminum	%	0.78	Molybdenum	ppm	4
Antimony	ppm	507	Nickel	ppm	11
Arsenic	%	1.36	Phosphorus	ppm	131
Barium	ppm	51	Potassium	%	0.15
Bismuth	ppm	95.0	Scandium	ppm	3
Cadmium	ppm	551.2	Sodium	%	0.03
Calcium	%	0.42	Strontium	ppm	5
Chromium	ppm	112	Thallium	ppm	<10
Cobalt	ppm	11.0	Titanium	%	0.02
Copper	ppm	1938.0	Tungsten	ppm	30
Lanthanum	ppm	<10	Vanadium	ppm	17
Magnesium	%	0.30	Zirconium	ppm	<5
Manganese	%	3.08			

Metallurgical testing involved 6 tests on the composite sample and investigated rougher kinetic flotation tests at three different primary grinds (F1-F3) and cleaner circuit tests (F4-F6) which also included regrind of zinc cleaner (F6) and modifications of weight pull and pH and addition of an additional cleaner stage in the zinc cleaner (F5). The results of these metallurgical tests are shown in Table 5-4 to Table 5-6.

Table 5-4 Flame and Moth Rougher Kinetic Test Results

Test	Product	Grind	Weight %	Assay			Recovery		
		P80		Ag	Pb	Zn	Ag	Pb	Zn
		(µm)		g/t	%	%	%	%	%
F 1	Pb Rougher Con 1	136	4.2	9,807	44.7	8.7	66.4	82.7	5.0
	Pb Rougher Con 1-2		6.9	7,420	29.7	10.0	82.6	90.3	9.6
	Pb Rougher Con 1-3		9.0	5,966	23.3	10.2	86.5	92.3	12.7
	Pb Rougher Con 1-4		11.7	4,689	18.1	10.1	88.2	93.4	16.3
F 2	Pb Rougher Con 1	123	6.9	7,241	29.9	9.7	83.5	90.2	9.5
	Pb Rougher Con 1-2		9.3	5,722	22.9	10.3	88.8	92.9	13.5
	Pb Rougher Con 1-3		11.1	4,868	19.4	10.3	90.3	93.9	16.2
	Pb Rougher Con 1-4		12.7	4,300	17.1	10.2	91.2	94.5	18.3
F 3	Pb Rougher Con 1	97	7.6	6,690	26.7	7.2	86.1	90.7	7.5
	Pb Rougher Con 1-2		10.7	4,914	19.4	8.1	89.5	93.0	12.0
	Pb Rougher Con 1-3		12.8	4,174	16.4	8.4	90.8	93.9	14.8
	Pb Rougher Con 1-4		14.8	3,657	14.3	8.5	91.6	94.6	17.3
F 1	Zn Rougher Con 1	136	16.4	218	0.2	27.8	5.8	1.7	62.8
	Zn Rougher Con 1-2		26.2	202	0.3	21.9	8.5	3.0	79.1
	Zn Rougher Con 1-3		29.5	190	0.3	19.9	9.0	3.4	80.8

Test	Product	Grind	Weight %	Assay			Recovery		
	Zn Rougher Con 1-4		35.2	169	0.3	17.0	9.6	4.1	82.2
F 2	Zn Rougher Con 1	123	22.1	170	0.2	25.0	6.3	2.3	78.0
	Zn Rougher Con 1-2		27.7	155	0.3	20.6	7.2	3.1	80.2
	Zn Rougher Con 1-3		29.6	149	0.3	19.3	7.4	3.3	80.5
	Zn Rougher Con 1-4		31.3	143	0.3	18.3	7.4	3.6	80.7
F 3	Zn Rougher Con 1	97	20.0	184	0.2	28.9	6.2	2.2	79.7
	Zn Rougher Con 1-2		23.9	171	0.3	24.7	6.9	2.7	81.3
	Zn Rougher Con 1-3		25.8	163	0.3	22.9	7.1	3.0	81.6
	Zn Rougher Con 1-4		27.3	156	0.3	21.7	7.2	3.3	81.8
F 1	Final Tailings			22.9	0.10	0.20	2.0	2.4	1.5
F 2	Final Tailings			14.1	0.08	0.13	1.3	1.9	1.0
F 3	Final Tailings			11.6	0.08	0.12	1.1	2.1	1.0

Table 5-5 Flame and Moth Lead Cleaner Test Results

Test	Product	Primary Grind	Weight	Assay			Recovery		
				Ag	Pb	Zn	Ag	Pb	Zn
		P80=(µm)	%	g/t	%	%	%	%	%
F 4	Pb 3rd Cleaner Conc		3.3	14,144	54.2	6.2	78.3	82.4	2.8
	Pb 2nd Cleaner Conc		4.2	11,670	44.3	7.6	82.8	86.1	4.5
	Pb 1st Cleaner Conc		5.6	9,176	34.7	9.0	87.0	90.1	7.1
	Pb Rougher Conc	112	11.0	4,860	18.4	10.4	90.1	93.3	15.9
F 5	Pb Rougher Conc	117	10.8	5,135	20.4	13.0	90.7	94.3	23.9
F 6	Pb Rougher Conc	114	11.3	4,899	18.6	12.0	91.3	94.1	18.7

Table 5-6 Flame and Moth Zinc Cleaner Test Results

Test	Product	Regrind	Weight	Assay			Recovery		
				Ag	Pb	Zn	Ag	Pb	Zn
		P80=(µm)	%	g/t	%	%	%	%	%
F 4	Zn 3rd Cleaner Conc	No RG	17.7	191.9	0.26	24.1	5.7	2.1	59.3
	Zn 2nd Cleaner Conc		20.9	188.8	0.26	23.6	6.6	2.5	68.8
	Zn 1st Cleaner Conc		24.3	183.4	0.27	22.7	7.5	3.0	77.2
	Zn Rougher Conc		32.2	156.3	0.30	18.5	8.5	4.4	83.0
	Zn Final Tailing			14.4	0.09	0.1	1.4	2.3	1.1
	Zn Circuit Feed			65.6	0.16	6.8			
F 5	Zn 4th Cleaner Conc	No RG	6.2	218.4	0.22	23.4	2.2	0.6	24.8

Test	Product	Regrind	Weight	Assay			Recovery		
				Ag	Pb	Zn	Ag	Pb	Zn
		P80=(µm)	%	g/t	%	%	%	%	%
	Zn 3rd Cleaner Conc		7.7	213.3	0.23	22.8	2.7	0.7	29.9
	Zn 2nd Cleaner Conc		11.3	210.8	0.23	22.6	3.9	1.1	43.3
	Zn 1st Cleaner Conc		18.1	201.3	0.24	21.3	5.9	1.8	65.6
	Zn Rougher Conc		23.5	180.7	0.26	18.2	6.9	2.6	72.7
	Zn Final Tailing			13.4	0.08	0.2	1.3	2.1	1.5
	Zn Circuit Feed			64.2	0.15	5.0			
F 6	Zn 4th Cleaner Conc	72	4.1	249.1	0.20	53.7	1.7	0.4	30.3
	Zn 3rd Cleaner Conc		5.9	237.6	0.20	46.3	2.3	0.5	37.9
	Zn 2nd Cleaner Conc		8.6	246.3	0.21	46.6	3.5	0.8	55.3
	Zn 1st Cleaner Conc		10.7	241.3	0.22	44.5	4.2	1.1	65.7
	Zn Rougher Conc		22.8	179.2	0.25	24.1	6.7	2.5	76.0
	Zn Final Tailing			9.7	0.09	0.2	0.9	2.4	1.3
	Zn Circuit Feed			59.6	0.15	6.6			

The level and detail of metallurgical testwork completed for Flame and Moth is sufficient to determine that the current mill operations will adequately process ore from these deposits as well as determine that the final mill tailings product is geochemically similar to other permitted Keno Hill District mines so that it can be stored in the currently permitted DSTF and an expanded DSTF. Additional metallurgical testing and reagent optimization is a secondary requirement for mill operations performance solely for operational requirements and not for determining the environmental performance and assessment of the tailings. Locked cycle tests were completed on Bellekeno samples to determine the design of the process flowsheet while open cycle tests on Flame and Moth can be used to determine the compatibility of these ores with the current mill flowsheet. Additional metallurgical testwork will be completed as part of normal mill operations and planning but is not necessary for assessment of environmental performance determination.

5.6 TAILINGS CHARACTERIZATION

Following metallurgical testing of Flame and Moth samples, standard ABA analysis was completed on the remaining tailings samples, similar to the approach for Bellekeno, Lucky Queen and Onek samples in the previous assessments. Most importantly, Alexco has nearly 3 years of actual field results and ongoing humidity cell results from Bellekeno on which to compare Flame and Moth tailings to real world performance.

Tailings samples from metallurgical testing (F4&F5) were combined into a composite sample submitted to ALS Chemex Labs for further static and kinetic testing. ABA testing was conducted using the Sobek method with siderite correction and combined ICP-MS and ICP-AES methods were used to measure ultra-trace metals composition. A standard 24 hour shake flask extraction test was performed on the sample, and was conducted using a 3:1 liquid to solid ratio using deionized water as the extracting fluid according to the procedure described in MEND, 2009. A humidity cell of the F4&F5 composite was established in July, 2013 by

ALS Chemex, and quantitative XRD diffraction was conducted by UBC Department of Earth, Ocean and Atmospheric Sciences.

Acid Base Accounting

A summary of ABA results for the Flame and Moth Tailings Characterization are presented in Table 5-7. The results shown are for the bulk tailings produced from the metallurgical flowsheet tested. As the results indicate, the tailings from Flame and Moth are well above a neutralization potential (NP) ratio of 2:1, above which acid generation is not expected, provided there are no errors in the estimation of effective NP and AP (MEND, 2009). One of the primary reasons for the high NP:MPA ratio is the significantly lower acid potential due to lower total sulphur and base metals (i.e. PbS) in Flame and Moth as compared to Bellekeno. NP was slightly lower in the Flame and Moth sample, but NNP was higher at 86 kg $CaCO_3$/tonne.

Table 5-7 Flame and Moth ABA Summary

Sample	Fizz Rating	pH	S_{total}	$S_{sulphide}$	S_{SO4}	C	CO_2	NP	MPA	NNP	Ratio (NP:MPA)
Unit	Unity	Unity	%	%	%	%	%	Kg $CaCO_3$/t			Unity
F4+F5 F&M Final Tailings	3	8	0.45	0.43	0.02	4.66	17.1	100	14.1	86	7.11
Bellekeno Tailings, Jan 2011-July 2013 Monthly Avg.	2.94	8.1	2.30	2.21	0.02	3.30	12.0	132	71.7	61	1.88

ICP Metals

A summary of ICP metals results for the Flame and Moth Tailings Characterization are presented in Table 5-8. The results shown in Table 5-8 are for the composite of tailings produced from the F4 and F5 tests. Table 5-8 shows that the content of a number of minor and trace metals and metalloids of main geoenvironmental interest (As, Cd, Pb, Zn, Se) were significantly lower in the F4+F5 composite analysis than the Bellekeno monthly tailings composite average from July 2012 to August 2013. Other parameters were slightly higher in the Flame and Moth composite, including Cu, Fe, Mn, Ni, and Mo. Calcium content, which is used within the district as a proxy for neutralizing potential, was lower in the Flame and Moth composite than the Bellekeno monthly composite, but from an ABA standpoint, this is more than offset by the lower acid potential within the Flame and Moth composite (Table 5-7).

Table 5-8 Flame and Moth ICP Metals Summary

Element	Unit	Flame and Moth F4+F5 Composite	Bellekeno Tailings Monthly Composite Jul 12 - Aug 13
Aluminum (Al)	%	0.2	0.2
Antimony (Sb)	ppm	41	120.6
Arsenic (As)	ppm	699	2147
Barium (Ba)	ppm	11.5	16.4
Beryllium (Be)	ppm	0.14	<0.2
Bismuth (Bi)	ppm	6.59	2.1
Cadmium (Cd)	ppm	7.19	165.8
Calcium (Ca)	%	0.59	1.52
Chromium (Cr)	ppm	185.5	5.5
Cobalt (Co)	ppm	2.7	9.9
Copper (Cu)	ppm	565	242.4
Iron (Fe)	%	16.25	10.09
Lead (Pb)	ppm	789	6359
Lithium (Li)	ppm	1.2	<5.0
Magnesium (Mg)	%	0.31	0.31
Manganese (Mn)	%	4.28	3.22
Mercury (Hg)	ppm	0.055	0.191
Molybdenum (Mo)	ppm	3.74	1.16
Nickel (Ni)	ppm	86.6	19.5
Phosphorus (P)	%	0.01	0.02
Potassium (K)	%	0.03	0.04
Selenium (Se)	ppm	0.1	0.52
Silver (Ag)	ppm	12.35	50.1
Sodium (Na)	%	0.006	0.014
Strontium (Sr)	ppm	4.81	24.0
Thallium (Tl)	ppm	0.652	0.129
Tin (Sn)	ppm	32.9	17.6
Titanium (Ti)	%	0.001	0.002
Uranium (U)	ppm	0.406	1.052
Vanadium (V)	ppm	9.4	5.18
Zinc (Zn)	ppm	1265	12623

Shake Flask Leachable Metals

A summary of SFE leachable metals results for the Flame and Moth Tailings Characterization (F4+F5 composite sample) are presented in Table 5-9 and shows that many leachable metals of geoenvironmental interest were leachable in the Flame and Moth composite sample at similar or lower concentrations than the Bellekeno composite, including As, Cd, Pb, and Se. Similar to the contained trace metal content measured by ICP, several elements showed higher leachable concentrations in the Flame and Moth composite compared with the Bellekeno monthly composite, including Cu, Ni, and Mn. Elements with elevated contained metal were generally reflected in the element's leachability, although the relationship was not necessarily directly proportional, e.g., contained zinc in the Bellekeno composite was an order of magnitude higher than the Flame and Moth composite, while leachable zinc was higher by a factor of approximately 3. Further discussion on the leachable metals is discussed below outlining the results of the Flame and Moth tailings humidity cell.

Table 5-9 Flame and Moth SFE Leachable Metals Summary

Leachable Metals	Unit	Flame and Moth F4+F5 Composite	Bellekeno Tailings Monthly Composite July 12 - Aug 13
Aluminum (Al)-Leachable	mg/L	0.0109	0.0282
Antimony (Sb)-Leachable	mg/L	0.0217	0.0387
Arsenic (As)-Leachable	mg/L	0.0061	0.0072
Barium (Ba)-Leachable	mg/L	0.0253	0.0234
Beryllium (Be)-Leachable	mg/L	<0.00050	<0.00050
Bismuth (Bi)-Leachable	mg/L	<0.00050	<0.00050
Boron (B)-Leachable	mg/L	0.0710	0.0942
Cadmium (Cd)-Leachable	mg/L	0.0024	0.00318
Calcium (Ca)-Leachable	mg/L	105	138
Chromium (Cr)-Leachable	mg/L	<0.00050	<0.00050
Cobalt (Co)-Leachable	mg/L	0.0004	0.00031
Copper (Cu)-Leachable	mg/L	0.0271	0.0096
Iron (Fe)-Leachable	mg/L	<0.030	<0.030
Lead (Pb)-Leachable	mg/L	0.0144	0.0593
Lithium (Li)-Leachable	mg/L	0.0071	0.0339
Magnesium (Mg)-Leachable	mg/L	6.90	6.01
Manganese (Mn)-Leachable	mg/L	1.95	0.797
Mercury (Hg)-Leachable	mg/L	0.0001	<0.000050
Molybdenum (Mo)-Leachable	mg/L	0.0024	0.0108
Nickel (Ni)-Leachable	mg/L	0.0012	0.0009
Phosphorus (P)-Leachable	mg/L	<0.30	<0.30
Potassium (K)-Leachable	mg/L	2.04	10.6
Selenium (Se)-Leachable	mg/L	0.0009	0.00106
Silicon (Si)-Leachable	mg/L	1.55	3.4
Silver (Ag)-Leachable	mg/L	0.0009	0.0018
Sodium (Na)-Leachable	mg/L	2.36	24.1
Strontium (Sr)-Leachable	mg/L	0.380	0.515
Thallium (Tl)-Leachable	mg/L	0.0001	0.0002
Tin (Sn)-Leachable	mg/L	<0.00050	<0.00050
Titanium (Ti)-Leachable	mg/L	0.0100	0.012
Uranium (U)-Leachable	mg/L	0.0000	0.00162
Vanadium (V)-Leachable	mg/L	<0.0010	<0.0010
Zinc (Zn)-Leachable	mg/L	0.156	0.051

Humidity cell

Humidity cell testing on Flame and Moth tailings was initiated in July 2013 using a composite sample comprised of F4 and F5 tailings and are currently ongoing. The initial 20 cycles (weeks 0 – 19) through November 20, 2013 are summarized in this section. Raw data for weeks 0-19 are presented in Table 5-10. Selected plots showing the F4+F5 composite data are shown in Figure 5-5 and Figure 5-6. Data from the Bellekeno composite (weeks 0-19) are also included on these figures where applicable.

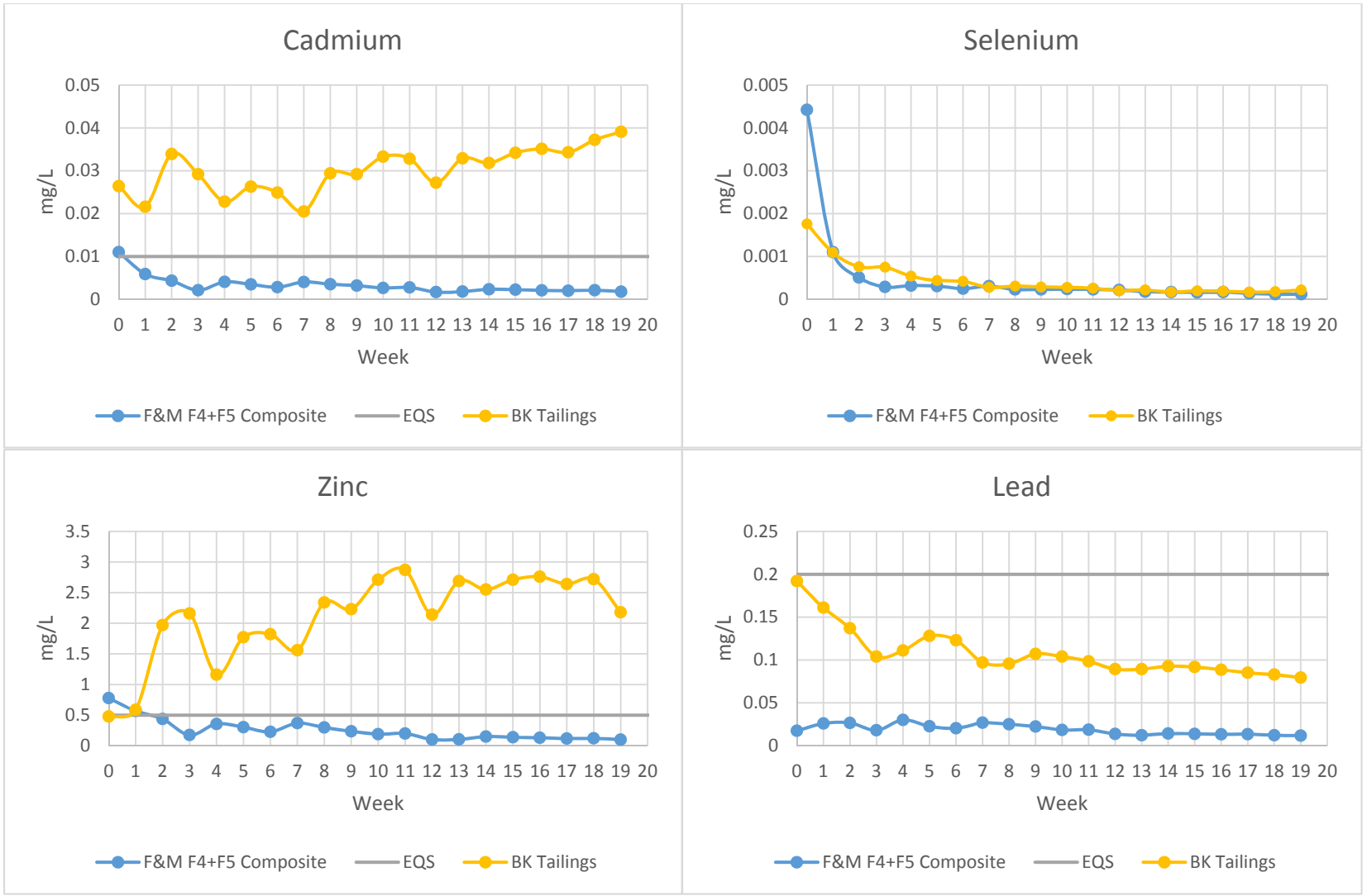


Figure 5-5. Selected Humidity Cell Metals Plots

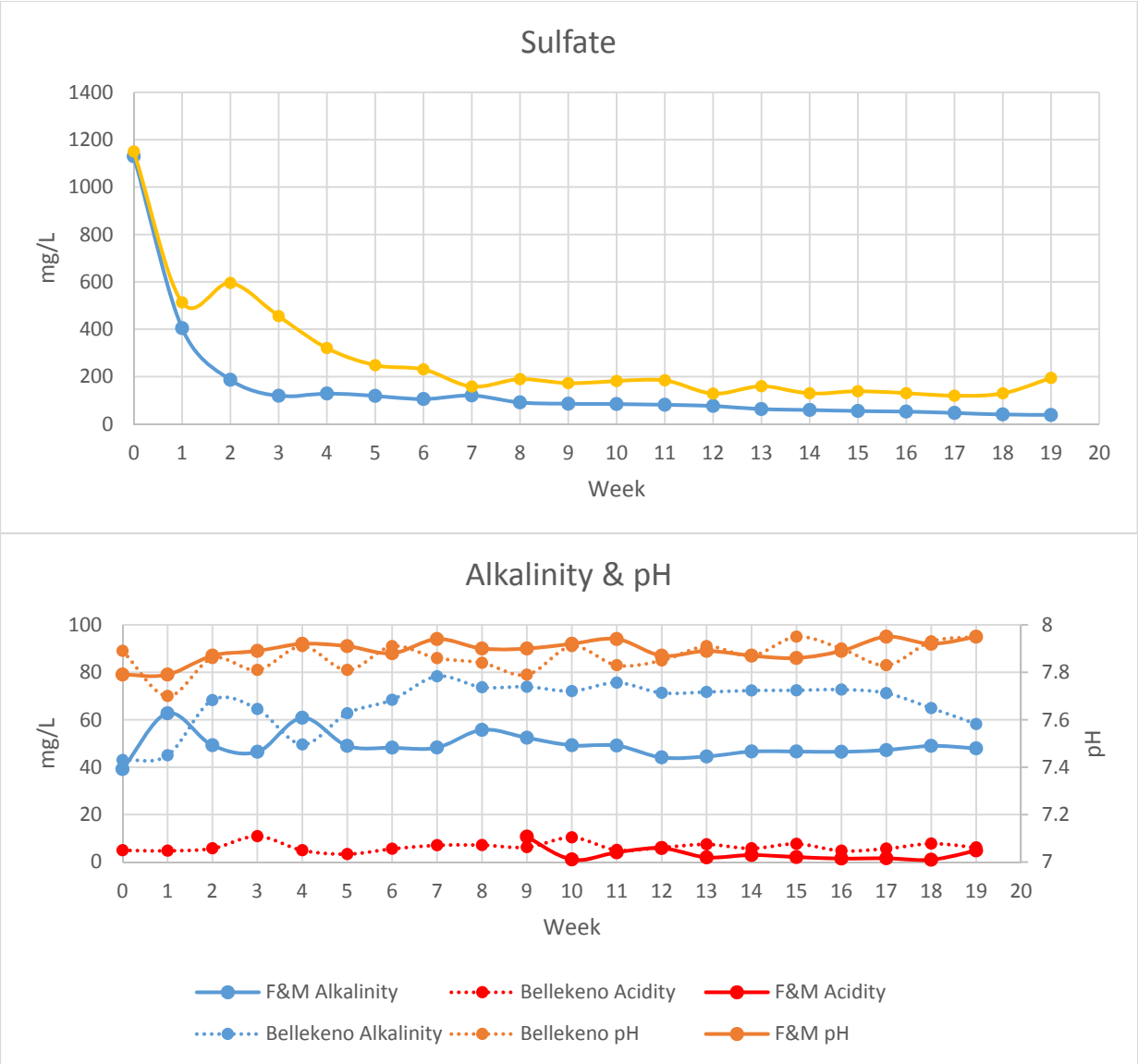


Figure 5-6. Selected Humidity Cell Parameter Plots

Table 5-10. Flame & Moth Humidity Cell Results (Weeks 0-19)

Date Sampled	10-Jul-13	17-Jul-13	24-Jul-13	31-JUL-13	7-Aug-13	14-AUG-13	21-Aug-13	28-Aug-13	4-Sep-13	11-Sep-13	18-Sep-13	25-Sep-13	2-Oct-13	9-Oct-13	16-Oct-13	23-Oct-13	30-Oct-13	6-Nov-13	13-NOV-13	20-NOV-13
Cycle (Week)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Sample Preparation																				
Total Volume In	750	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Total Volume Out	510	470	470	450	475	465	475	450	445	470	470	475	450	445	445	440	475	440	450	450
Physical Tests																				
Conductivity	1880	878	506	347	380	364	329	368	310	290	282	282	266	236	235	225	220	207	200	191
Hardness (as CaCO3)	1140	486	254	173	184	188	158	186	149	143	137	139	129	118	114	114	110	95.6	95.9	91.3
pH	7.79	7.79	7.87	7.89	7.92	7.91	7.88	7.94	7.9	7.9	7.92	7.94	7.87	7.89	7.87	7.86	7.89	7.95	7.92	7.95
Anions and Nutrients																				
Acidity (as CaCO3)										10.7	1.1	4.1	5.9	2	3	2.1	1.5	1.6	1.0	4.9
Alkalinity, Total (as CaCO3)	39.2	62.7	49.2	46.5	60.8	49.0	48.2	48.3	55.7	52.4	49.2	49.1	44.1	44.5	46.6	46.6	46.5	47.2	49.0	47.9
Bromide (Br)	<0.50	<0.50	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	<5.0	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	0.64	0.77	0.95
Fluoride (F)	0.56	0.48	0.285	0.261	0.241	0.193	0.162	0.12	0.126	0.107	0.083	0.087	0.065	0.065	0.045	0.053	0.052	0.044	0.040	0.041
Nitrate (as N)	0.178	<0.050	0.0072	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	<0.010	<0.010	<0.0010	<0.0010	0.0023	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0036	<0.0010
Sulfate (SO4)	1130	404	186	119	128	118	105	120	90.5	85.3	83.8	80.8	75.5	62.7	58.9	54.6	52.1	46.2	39.9	37.9
Anion Sum	24.4	9.69	4.88	3.42	3.89	3.45	317%	3.47	3	2.83	2.73	2.67	2.46	2.2	2.16	2.07	2.03	1.93	1.83	1.77
Cation Sum	23.7	10	5.25	3.56	3.79	3.88	3.24	3.82	3.07	2.93	2.81	2.85	2.62	2.41	2.34	2.32	2.26	1.96	1.97	1.87
Cation - Anion Balance	-1.3	1.8	3.7	2.0	-1.3	5.8	1.1	4.8	1.1	1.7	1.5	3.2	3.2	4.6	4	5.8	5.3	0.9	3.4	2.6
Dissolved Metals																				
Aluminum (Al)-Dissolved	0.0094	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Antimony (Sb)-Dissolved	0.0226	0.022	0.0236	0.0240	0.0303	0.0236	0.0269	0.0276	0.028	0.027	0.0272	0.0275	0.0274	0.029	0.0276	0.0277	0.029	0.0294	0.0307	0.0304
Arsenic (As)-Dissolved	0.0058	0.00697	0.00803	0.00609	0.00666	0.00586	0.00569	0.007	0.00756	0.00723	0.00687	0.00748	0.00751	0.00745	0.00842	0.00799	0.00856	0.00952	0.0119	0.00913
Barium (Ba)-Dissolved	0.0735	0.0291	0.0244	0.0207	0.0247	0.0236	0.0201	0.0244	0.0195	0.0186	0.017	0.0174	0.0149	0.0134	0.0144	0.0131	0.0123	0.0114	0.0114	0.0101
Beryllium (Be)-Dissolved	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bismuth (Bi)-Dissolved	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron (B)-Dissolved	0.168	0.145	0.097	0.059	0.055	0.032	0.028	0.029	0.022	0.02	0.018	0.018	0.016	0.015	0.014	0.012	0.014	0.012	0.012	0.013
Cadmium (Cd)-Dissolved	0.011	0.0059	0.00434	0.00214	0.00407	0.00350	0.00285	0.00405	0.00353	0.00321	0.00266	0.00278	0.00169	0.00181	0.00236	0.00226	0.00211	0.00202	0.00213	0.00179
Calcium (Ca)-Dissolved	402	181	95.8	66.2	70.8	73.5	61.6	72.8	58.7	56.1	53.9	54.5	50.4	46.3	44.5	44.4	42.9	37.1	37.1	35.3
Chromium (Cr)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt (Co)-Dissolved	0.0022	0.00112	0.00089	0.00050	0.00083	0.00075	0.00063	0.00092	0.00073	0.0006	0.00053	0.00055	0.00035	0.00034	0.00042	0.00039	0.00039	0.00034	0.00034	0.00030
Copper (Cu)-Dissolved	0.0441	0.0564	0.0516	0.0273	0.0421	0.0371	0.0295	0.0398	0.0362	0.0318	0.0258	0.0274	0.0181	0.0165	0.0215	0.0213	0.021	0.0188	0.0196	0.0162
Iron (Fe)-Dissolved	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Lead (Pb)-Dissolved	0.0174	0.0259	0.0266	0.0180	0.0301	0.0227	0.0204	0.0268	0.025	0.0224	0.0184	0.0186	0.0137	0.0122	0.0142	0.0138	0.0133	0.0135	0.0122	0.0118
Lithium (Li)-Dissolved	0.0219	0.0135	0.0082	0.00442	0.00422	0.00253	0.00194	0.00271	0.00174	0.00185	0.00163	0.00184	0.00179	0.00162	0.00128	0.00131	0.00148	0.00149	0.00136	0.00133
Magnesium (Mg)-Dissolved	31.8	8.13	3.63	1.87	1.62	1.17	0.904	0.918	0.696	0.658	0.65	0.677	0.631	0.642	0.708	0.699	0.755	0.726	0.788	0.768
Manganese (Mn)-Dissolved	8.74	3.76	2.61	1.70	2.13	2.07	1.67	2.19	1.62	1.39	1.42	1.35	1.07	0.983	1.15	1.01	1.04	0.944	1.00	0.846
Mercury (Hg)-Dissolved	0.00006	0.000043	0.000092	0.000022	0.000019	0.000025	0.000016	0.000017	0.000025	0.000026	0.000022	0.000035	0.00003	0.000027	0.000024	0.000022	0.000025	0.000019	0.000016	0.000017
Molybdenum (Mo)-Dissolved	0.00251	0.00274	0.00213	0.00204	0.00207	0.00159	0.00177	0.00155	0.00172	0.00162	0.00148	0.00147	0.00146	0.00138	0.00136	0.00127	0.00131	0.00116	0.00122	0.00115
Nickel (Ni)-Dissolved	0.0089	0.00312	0.00227	0.00111	0.0018	0.00160	0.00129	0.00182	0.00142	0.00116	0.00103	0.00103	0.00063	0.00057	0.00076	0.00073	0.00069	0.00057	0.00056	0.00050
Phosphorus (P)-Dissolved	0.75	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Potassium (K)-Dissolved	8.46	2.67	1.34	0.955	0.873	0.721	0.618	0.6	0.488	0.451	0.408	0.389	0.391	0.355	0.348	0.297	0.312	0.299	0.325	0.277
Selenium (Se)-Dissolved	0.00442	0.0011	0.00051	0.00029	0.00032	0.00031	0.00025	0.00031	0.00023	0.00023	0.00024	0.00023	0.00022	0.00018	0.00017	0.00016	0.00017	0.00014	0.00012	0.00012
Silicon (Si)-Dissolved	2.02	1.75	1.63	1.35	1.42	1.32	1.14	1.23	1.14	1.12	0.948	1.05	0.943	0.944	0.907	0.881	0.922	0.861	0.803	0.804
Silver (Ag)-Dissolved	0.000454	0.00029	0.000977	0.000374	0.000328	0.000380	0.000475	0.000474	0.000653	0.000972	0.000929	0.00128	0.00154	0.00178	0.00149	0.00154	0.00228	0.00196	0.000942	0.00170
Sodium (Na)-Dissolved	11.3	2.18	0.701	0.266	0.196	0.147	0.106	0.1	0.076	0.069	0.056	0.063	0.06	<0.050	0.06	0.05	0.05	0.051	0.05	0.057
Strontium (Sr)-Dissolved	1.46	0.645	0.325	0.180	0.186	0.112	0.0975	0.0999	0.0783	0.0642	0.0592	0.0559	0.0485	0.0413	0.0411	0.0377	0.0384	0.0341	0.0343	0.0308
Sulfur (S)-Dissolved	367	155	74.5	43.0	49.3	46.3	40.1	46.4	34.3	32.5	33.2	32.4	31.4	26.2	24.9	24.2	21	19	16.7	16.0
Thallium (Tl)-Dissolved	0.000399	0.00024	0.000122	0.000091	0.000119	0.000084	0.000084	0.000096	0.000088	0.000082	0.000075	0.000075	0.000072	0.000069	0.000082	0.000069	0.00007	0.000068	0.000067	0.000063
Tin (Sn)-Dissolved	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	0.000815	0.000173	0.000042	0.000011	0.000017	0.000011	0.00001	0.000013	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Vanadium (V)-Dissolved	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Zinc (Zn)-Dissolved	0.777	0.568	0.436	0.174	0.355	0.303	0.227	0.369	0.298	0.236	0.189	0.199	0.102	0.103	0.149	0.139	0.13	0.117	0.120	0.0989

The initial 20 weeks (weeks 0-19) of Flame & Moth humidity cell data as shown in Figure 5-5 show that compared with the Bellekeno composite, lower initial metal content results in lower leaching rates for key parameters including zinc, lead and cadmium. Importantly, metal leaching rates for these key parameters in the Flame & Moth F4+F5 composite sample are below water licence EQS except for the initial flush (weeks 0-1 for Zn, week 0 for Cd).

Acidity, Alkalinity and pH as shown in Figure 5-6 are generally similar to those observed in the Bellekeno humidity cell with high alkalinity, low acidity, and stable pH between 7.7 and 8. This evidence corroborates the assertion that the Flame & Moth tailings will have very low potential for net acid generation.

Humidity cell data for the Flame & Moth F4+F5 composite will continue to be gathered for at least 40 weeks or until weekly rates become relatively stable (MEND, 2009).

Mineralogy

A summary of quantitative XRD mineralogy results for the Flame and Moth Tailings Characterization (F4+F5 composite sample) are presented in Table 5-11 and shows a number of similarities and differences between the primary minerals which form the Flame and Moth composite sample compared with the Bellekeno Tailings Monthly composite. Siderite is significantly higher in the Flame and Moth composite as compared with the Bellekeno composite, while most other component tailings minerals are lower, including quartz, muscovite, calcite, and pyrite. Notably the main base metal sulphides sphalerite and galena were below the detection limit in the Flame and Moth composite sample, which is typically greater than 1% for most quantitative XRD methods for mixed materials. Two minerals not present within the Bellekeno tailings composite samples were identified by the UBC lab include dravite ($NaMg_3Al_6(BO_3)3Si_6O_{18}(OH)_4$) and cassiterite ($SnO_2$). However, the contained metals results showing 32.9 ppm Sn within the Flame and Moth composite sample suggest that the identification of cassiterite is likely in error. The mineralogy results otherwise corroborate and explain the ABA and ICP metals results, showing that within the Flame and Moth composite, the lower NP is due to lower calcite content, the lower AP is due to lower pyrite content, and the lower base metals (Pb and Zn) are due to lower galena and sphalerite content. The overall balance of contained minerals is primarily due to higher siderite content in the Flame and Moth composite, which is reflected in the higher manganese shown in the ICP metals results.

Table 5-11 Flame and Moth Tailings XRD Summary

Mineral	Flame and Moth F4 + F5 Composite	Bellekeno Tailings Monthly Composite July 12 - Aug 13
Quartz	45.20	52.62
Siderite	45.30	29.81
Muscovite	2.50	6.56
Calcite	1.20	3.20
Sphalerite	0	2.42
Pyrite	0.70	2.27
Galena	0	0.58
Plagioclase	0	0.81
Ankerite	0	0.41
Gahnite	0	0.17
Chalcopyrite	0	0.08
Clinochlore	1.30	0.35
Rutile	0	0.31
Wurtzite	0	0.16
K-Feldspar	0	0.26
Dravite	3.2	0
Cassiterite	0.5	0
Total	100	100

Discussion

The final tailings deposited in the DSTF or underground as composite paste backfill at Flame and Moth will either be standalone Flame and Moth tailings or a combination of ores originating from the mines currently permitted in the Keno Hill District. Given the performance of the Bellekeno tailings (as presented in the QZ09-092 Annual Reports) the ABA testwork completed on the bulk tailings stored on the DSTF are not a concern from an acid generating potential perspective. The Flame and Moth tailings are shown to be geochemically and mineralogically similar to, or better than, Bellekeno and therefore the storage of the Flame and Moth tailings in the DSTF is appropriate. The performance of the Flame and Moth humidity cells and ABA testwork supports the design consideration that no liner is required for environmental protection from tailings on the DSTF expansion.

The metal leaching concentrations from the Lucky Queen tailings SFE test are similar or less than those observed in the Bellekeno tailings porewater samples and the Bellekeno humidity cell.

Humidity cells have been established for the geological materials at the Flame and Moth deposit and the first 20 weeks show that the acid potential of the tailings will become depleted before the neutralizing potential and that metal leaching rates are indicated to be very low. The Flame and Moth tailings are low sulphide (<0.2%) (Table 5-7); therefore, they are not anticipated to be acid-generating or significantly metal leaching. The following factors are relevant to characterizing the potential effects of deposition of Flame and Moth tailings:

- tailings placed as backfill into the underground workings will be cemented backfill which includes a cement binder that will effectively reduce the leachability and permeability of the backfilled tailings;
- during the operations phase of the mine, the DSTF seepage is collected and routed to the Mill Pond for use in the processing circuit. To date, there has been no seepage observed at the DSTF and this is expected to continue at the current DSTF and the expanded DSTF;
- any discharges from the Mill Pond requires treatment to meet the EQS under QZ09-092; and
- at closure the DSTF will have a soil cover installed to reduce infiltration in addition to a bioreactor if necessary to provide ongoing long-term water treatment during the post-closure period.

6 WASTE ROCK CHARACTERIZATION AND MANAGEMENT

The geology and mineralization at Flame & Moth share a number of similarities with other assessed and permitted deposits within the district such as Bellekeno, Onek, and Lucky Queen. Common features between these deposits include occurrence within the same major lithologic unit, similarity in general age and mineralization. As such, the geochemical characteristics of the rocks are similar.

Geochemical characterization using the results of a suite of static (acid base accounting (ABA), shake flask extraction (SFE) testing and trace element assay by ICP) and preliminary kinetic (composite humidity cell test, weeks 0-19) testing using exploration drill core was undertaken in order to assess the applicability of the Waste Rock Management Plan currently in place for the management of waste rock at Bellekeno is suitable at Flame & Moth. Additionally, the study was completed to characterize and identify which rock units will be encountered and permanently excavated during development of the Flame & Moth mine. The geochemical characterization study for Flame & Moth is attached as Appendix K.

6.1 GEOENVIRONMENTAL CHARACTERIZATION OF FLAME & MOTH WASTE ROCK

The geoenvironmental rock characterization for the Flame & Moth deposit focused on the planned area of underground development where the mine development schedule would require permanent excavation (during the initial 2 years of operation). This initial development excavation facilitates access to the mineralized areas of the mine but has been designed to be away from the mineralized vein faults. It was found in the geochemical characterization study for Flame & Moth, (Appendix K) that this planned development which will be permanently excavated to surface and used primarily for construction purposes, contains generally low contained and leachable metals, and has generally favorable (non-potential acid generating) ABA characteristics. Initial results of kinetic testing (humidity cell, weeks 0-19) of the Flame & Moth waste rock composite sample (as reported in Appendix K) also showed low leachable metals and no potential for net acid generation.

These data were used in conjunction with Alexco's growing body of experience operating in the Keno Hill District in order to propose slightly modified waste management criteria with waste rock to be permanently excavated to surface that is > 5m of the mineralized vein faults. Material from Flame & Moth within 5 m of the mineralized vein which is to be permanently excavated will be subjected to the standard waste rock management criteria. The Waste Rock Management Plan has been updated to reflect these changes and will be protective when applied the Flame & Moth deposit. The updated Waste Rock Management Plan (Revision 4) is included as Appendix L.

6.2 HISTORY AND PERFORMANCE OF THE WASTE ROCK MANAGEMENT PLAN

The Waste Rock Management Plan (WRMP) was established in 2008 for the management of excavated waste rock during advanced underground exploration and development activities prior to mine licensing and production at the Bellekeno Mine. These activities were licenced and carried out under Mining Land Use approval LQ00240 and Type B Water Use Licence (WUL) QZ07-078. The WRMP was determined to be effective and adopted for the Bellekeno Mine operations and production, which was licenced under QML-0009 and WUL QZ09-092 and commenced at the end of 2010. QZ09-092 was amended on May 15, 2013 as (application QZ12-053) to include water use and waste deposition associated with the Lucky Queen and Onek Mines.

No N-AML waste rock dumps have been created since the Bellekeno mine was licenced in 2010. N-AML waste rock has been either placed underground or used for construction/upgrade/maintenance of the Bellekeno Haul Road/Lightning Creek Bypass Road. N-AML waste associated with initial development at Lucky Queen and Onek has been used for road construction material. Seeps from the road building materials have not been identified; therefore, N-AML waste rock seepage quality data do not exist.

Clause 69 of QZ09-092 Amendment 1 pertains to inspections and monitoring waste rock dumps:

> *69. Monthly, between May and October of each year, the Licensee shall inspect all Waste Rock locations including all pre-existing Bellekeno Waste Rock dumps described in the Application, and any new dumps or Waste Rock locations created after the effective date of this licence.*

Additionally, the Keno Hill Silver District Mining Operations Adaptive Management Plan (AMP) stipulates measures to be taken in the case of identified waste rock seepage. The AMP will be further developed during the Water Use Licence amendment process to incorporate Flame & Moth.

Feedback and demonstration of the effectiveness of the WRMP is provided primarily through periodic review of routine geochemical testing of excavated materials as a check of the field screening criteria. Longer term geochemical stability and water quality prediction information is provided through the Mine Wall Testing Plan, Hydrogeology Study Plan, Groundwater Monitoring Plan and Monitoring and Surveillance Plan, which also form parts of the major mine licences (QML-0009 and QZ09-092). The results and synthesis of annual WRMP activity are summarized and presented each year as part of the annual reports which are requirements of the major mine licences.

Results of geochemical confirmation testing will be compiled and interpreted as part of the annual reporting requirements of the Quartz Mining Licence and Type A Water Use Licences (due annually by March 31), which will help refine the effectiveness and accuracy of the waste rock determination. It should be noted that very little waste rock excavated (P-AML and N-AML) was brought to surface during 2013. The reason for this was the current mining cycle at Bellekeno requires that all of the new development rock be used for backfill.

Part of the purpose of the annual report and review is to identify and suggest improvements and streamlining of the WRMP within the annual reports, the WRMP has been effective overall in the identification, segregation, operational management and geochemical verification of excavated materials at the Bellekeno Onek, and Lucky Queen mines. The robust feedback mechanisms featured within the WRMP and in the other related plans will help ensure the efficacy of waste rock management activities at Flame & Moth, and other mines within the district.

The annual reports which contain complete WRMP summaries are available online at Yukon Government (YG) Energy Mines and Resources website:

http://www.emr.gov.yk.ca/mining/bellekeno.html

The annual reports for Water Use Licences QZ07-078 and QZ09-092 which also contain WRMP summaries are available in hard copy at the Yukon Water Board's office and online at the Waterline website.

6.3 ROCK MANAGEMENT CATEGORIES

The rock at the Flame & Moth deposits can be categorized as follows: Non-Acid Metal Leaching waste rock (N-AML), potentially-acid metal leaching (P-AML) waste rock, mineralized rock, and ore. Waste rock and ore excavated from the Flame & Moth mine will be categorized and managed according to the existing Waste Rock Management Plan:

- Non-Acid Metal Leaching Waste Rock (N-AML): Rock of non-economic grade with no significant potential for the generation of net acidity or metal leaching. Rock field-classified as N-AML will be used for general construction purposes as required or backfilled underground.
- Potentially-Acid Metal Leaching (P-AML) Waste Rock and Mineralized Waste Rock of no Economic Interest: Rocks field-classified as P-AML that is brought to surface will be temporarily stored in designated lined P-AML waste rock storage facilities prior to be backfilled underground. In addition to P-AML wall rocks, some material especially along the margins of zoned veins contain mostly gangue minerals such as siderite, pyrite and quartz, but do not contain economic amounts of silver (Ag), zinc (Zn), or lead (Pb) minerals and therefore are of no economic interest. Due to their increased likelihood for acidic or metal leaching, all such mineralized non-economic rock is considered to be P-AML and will be stored in the temporary P-AML Waste Rock Storage Facility (WRSF) until used as rock backfill.
- Mineralized Rock and Ore: Ore and vein material which contains significant Ag, Zn or Pb minerals may be temporarily stockpiled at the surface at the mine site before being transported to the mill. Confirmatory assay will determine whether this rock is milled, or is sent to the temporary P-AML WRSF or hauled back underground to be incorporated in the cemented rock backfill material.

The ultimate fate and use of these rock types are summarized in Table 6-1.

Table 6-1. Summary of Management Protocols for Rock Types

Rock Management Category	Management Procedures
N-AML Waste Rock	Use for general construction purposes Used as underground rock backfill as required
P-AML Waste Rock	Stored in temporary P-AML WRSFs Used as underground rock backfill
Mineralized Rock and Ore	Milled for mineral recovery if deemed of economic grade If deemed uneconomic grade: Stored in temporary P-AML WRSFs Used as underground rock backfill

6.4 ESTIMATED ROCK QUANTITIES

A total of 137,000 t of waste rock are anticipated to be brought to surface at Flame & Moth over its currently known mine life. Waste rock volumes and tonnages for each respective deposit, including a breakdown by the major lithologic units and the relative proportion of N-AML and P-AML waste are shown in Table 6-2.

Table 6-2. Flame & Moth Rock Excavation Estimate

Flame & Moth	Greenstone (GNST)	Quartzite (QZT), Calcareous Quartzite (CQZT), Thin Bedded Quartzite (TQZT)	Sericite Schist	Graphitic Schist/Interbedded Carbonaceous Quartzite and Schist (GSCH/ICQS)	Total
Cubic Metres	1,172	35,726	7,953	4,755	52,733
Tonnes	3,048	92,888	20,679	20,490	137,105
% of Total Excavation	2%	68%	15%	15%	100%
% N-AML	100%	96%	100%	60%	91.3%
% P-AML	0%	4%	0%	40%	8.7%

6.4.1 Estimation Methodology

The estimated tonnages by lithology presented in Table 6-2 were derived by superimposing the planned underground workings with the 3D geologic model created with Mintec's MineSite® software, which was constructed using data obtained and interpreted by Alexco geologists from all available exploration diamond drill core from the Flame & Moth area (drilled between 2010-2013). Estimations of N-AML and P-AML are based on sampling of diamond drill core selected from the area where permanent excavation of waste rock is planned as part of the development, and is described in the geochemical characterization report for Flame and Moth, which is included as Appendix K.

6.5 WASTE ROCK MANAGEMENT

A summary of waste rock management for Flame & Moth over the life of mine for each deposit is shown in Table 6-3. The waste rock materials balance for the project (Table 3-4) indicates that the major permanent excavation to surface will be split approximately evenly during the initial two years of the development (2014, and 2015) for a total permanent excavation tonnage of up to 137,000 tonnes to be used for construction. A temporary P-AML storage facility will be located near the portal entrance (shown on Figure 1-2) which will be used during the initial development (137,000 tonnes) after which the development schedule will enable all P-AML development rock to remain underground, and the P-AML rock stored within the temporary facility to be moved back underground as backfill.

Table 6-3. Flame and Moth Waste Rock Management

Lithology	Total estimated tonnage	Tonnage P-AML	Tonnage N-AML	P-AML Rock Management	N-AML Rock Management
Quartzite	92,888	3,716	89,172	Underground backfill utilizing temporary storage on surface or permanent storage on surface in approved EBA generic design	Toe berm and base drainage layer for DSTF expansion, construction/ upgrade material; road upgrade and maintenance and general construction, underground backfill
Graphitic Schist	20,490	8,196	12,294		
Greenstone	3,048	0	3,048		
Sericite Schist	20,679	0	20,679		
Project Proposal Total	137,105	11,912	125,193		

Appendix L presents the revised Waste Rock Management Plan which includes provisions and updates for management of Flame & Moth waste rock.

Upon P-AML or N-AML determination as per the WRMP, directions will be given to the surface crew for hauling and disposal of the waste rock as described in the previous sections. These management protocols will mitigate potential effects associated with improper waste rock disposal, such as soil and surface/groundwater contamination. During operations, all waste rock will be immediately classified and moved to the appropriate disposal area or storage facility depending on type, thereby negating the need for a temporary waste rock classification area.

The temporary P-AML WRSF facilities will not be located within 30 m of a waterbody/watercourse. Water management structures (e.g. ditching) will be installed around the facility to ensure runoff and leachate are appropriately managed. Temporary storage of P-AML waste rock will be within the drainage of the mill area that currently reports to the mill pond. EBA's Construction Specifications require that an engineer approve the site. Design criteria/specifications for additional P-AML Waste Rock Storage Facilities are provided in the approved Typical Waste Containment Facility Design – Construction Specifications (EBA, 2008[1]).

EBA's Construction Specifications account for physical stability of the facility. The facilities are lined and seepage is collected and treated as required during operations. At closure, all P-AML material in the temporary facility will be removed and the P-AML will be decommissioned.

1 Available from the EMR website http://www.emr.gov.yk.ca/mining/pdf/mml_bellekeno_mine_development__and_operations_plan__waste_rock_storage_facility.pdf

7 ASSOCIATED MINE SERVICES AND INFRASTRUCTURE

7.1 POWER

Power for the Keno Hill Silver District is supplied by Yukon Energy Corporation (YEC). The Mayo hydro facility was recently upgraded with a new penstock and turbine plant providing additional capacity (Mayo B). Currently the power for the Keno Hill Silver District is supplied by a 69 kV overhead line from Mayo and is then stepped down at the Onek transformer to 6.9 kV for further distribution to the Bellekeno mine. A new 69 kV spur line was constructed in 2010 to supply power to the Keno District Mill. A 69 kV – 600 V transformer is located at the mill to supply power and will be used to supply electrical power for the Flame and Moth project. There is ample power available in the transformer to run both the mill and Flame and Moth Mine.

Power requirements for the Flame and Moth development project are estimated at 300 kW (6,570 MWh/yr).

The power requirements for the Flame and Moth mine will be primarily for the Jumbo, support equipment (fans, compressed air) and surface facilities. Power will be supplied from the mill MCC located approximately 150 metres from the Flame and Moth portal. Surface teck cable will be run from the mill MCC to the Flame and Moth portal area where additional transformers and switch gear will be located and then distributed either underground or to surface facilities.

7.2 COMMUNICATIONS

The Keno Hill Silver District is not within the Yukon grid for cell phone communication therefore a dedicated on site radio communication system has been installed for the Keno Hill Silver District and radio communication is available across the district. The system in place functions for the Flame and Moth project. A leaky feeder system will be installed at Flame and Moth which allows surface radio communication to extend to underground operations.

7.3 COMPRESSED AIR

The Flame and Moth mine will be initially supplied with compressed air via a Gardner Denver 800 cfm diesel compressor or alternatively will utilize the mill electric air compressor. A 6-inch Victaulic airline will provide air from the air compressor to the advancing decline face.

7.4 VENTILATION

A main ventilation raise from surface is planned next to the Lightning spiral ramp. It will deliver fresh air and will be equipped with a manway to provide a second exit from the mine. The raise collar on surface is planned across Duncan Creek road in an area where bedrock is exposed.

The planned ventilation flow for Flame and Moth is 78 cms, equivalent to 165,000 cfm based on a ventilation model. Heated fresh air will be delivered centrally to the mine through a 3-metre diameter bored raise equipped with a manway. Two fans operating in parallel on the fresh air raise will operate at an estimated

total pressure of 1.8 kPa and will have a combined power draw of 190 kW (255 hp). Bedrock is exposed on surface at the planned raise collar location.

Exhaust air will be through the main Lightning ramp system that extends from the mine bottom to surface.

From the bottom of the fresh air raise, fresh air will be distributed by lateral development and ventilation raises to the lower extremities of the Lightning and Christal zones. In both cases, fresh air will be distributed upwards through the zones by a combination of ventilation raises and spiral ramps. Exhaust will be removed from the upper extremities of the Lightning and Christal zones through the ramp systems that connect them to the main Lightning ramp.

7.5 SUPPORT FACILITIES

Most of the mobile equipment maintenance will be performed in a planned surface shop, to be constructed near the Flame and Moth portal. The mine area is relatively small and it will not be difficult to bring underground equipment to the surface shop. An additional small maintenance shop will be set up underground to handle small repairs and routine servicing.

The maintenance department will have a fuel/lube truck, a mechanic's service truck, a tractor, and access to a scissor lift and a boom truck.

In addition to the mobile equipment, the mine maintenance department will be responsible for the stationary equipment consisting of air compressors, main ventilation fans, propane air heaters, underground electrical distribution system, and main dewatering pumps.

There will be several laydowns on the portal bench for ground support materials. The majority of the mining gear will be stored at the shop and office location as shown in Figure 1-2.

7.6 SITE ACCESS AND TRANSPORT

Although the road through Keno City is a public highway, over the course of operations at Bellekeno, the vast majority of traffic including light and heavy service vehicles have been routed away from Keno City and diverted onto newly constructed access and haul roads.

Mine traffic associated with the Flame & Moth mine will use the Christal Lake Road and a short haul road (~175m) to be constructed between the portal and the crusher pad, as shown in Figure 1-2. The Bellekeno Project Bypass Road North will be re-routed to allow development of the DSTF expansion. As the mine operations at Flame & Moth begin, traffic from other deposits is expected to decrease, and the net level of traffic for the district should remain the same. A decrease in traffic along the Bellekeno Bypass Road is expected during Flame & Moth operations as Bellekeno mine operations are expected to cease during the active operations period at Flame and Moth. There will be no additional traffic through Keno City for the Flame and Moth Mine.

Table 7-1 summarizes the volume of traffic in the Keno City area for the mine development phase at Flame & Moth. These estimates are for traffic in/out of the Christal Lake Road since this is the only access road envisioned for the Flame and Moth Mine.

Table 7-1 Estimated Traffic During Development – Flame & Moth

Vehicle Type	Average Traffic Volume (roundtrips/week)
Light Truck	50
Water truck	2
Sewage truck	2
Semi trailer loads (mining equipment, building supplies, construction equipment, etc)	7
Grader	1
Total	**62**

During mine production, all heavy and light truck traffic will be routed along the Christal Lake Road. Table7-2 presents traffic volumes during operations on the Christal Lake Road and the Flame & Moth haul road.

Table 7-2 Estimated Daily Traffic Count – Operations Phase Flame & Moth

		Shift Change	Day Shift	Shift Change	Night Shift
Vehicle Type – One way traffic count	**Travel Direction**	**6 am – 8 am**	**7 am – 7 pm**	**4 pm- 6 pm**	**7 am – 7 pm**
Light Trucks (< 1 ton) and Autos	Elsa to Mine/Mill	4	8	4	6
Buses	Elsa to Mine/Mill	2		2	
Heavy Trucks (>5 tonne) bulk materials	Elsa to Mine/Mill		3		
Ore Trucks (>20 tonne) hauling ore	Mine to Crusher		14		
Ore Trucks (>20 tonne) hauling tailings or empty	Crusher to Mine		14		
Total round trips per day		**6**	**44**	**6**	**6**

Notes:

1) Warehouse receiving and shopping normally confined to hours between 8 am and 4 pm. This will minimize heavy traffic during shift changes. Normally no heavy truck deliveries on night shift.
2) Bulk materials include fuel, reagents, materials, supplies and concentrate haulage.
3) Above values are considered typical of daily traffic anticipated during operations. Variations up to 50% are possible on any given day.
4) Based on 408 t/d production rate which results in highest ore haulage traffic count.

7.6.1 Road Development and Traffic Management Measures

The Traffic Management Plan, developed and approved under QML-0009, has been updated to incorporate Flame and Moth mine traffic (Appendix F).

Potential socio-economic effects associated with project traffic are addressed in Section 10.

7.7 WORKER HEALTH & SAFETY

Operations at the Keno Hill Silver District fall under the jurisdiction of the Occupational Health & Safety Act and Regulations administered by the Yukon Workers' Compensation Health & Safety Board. Alexco has in place a Health & Safety Policy (Appendix A) and both will continue to be adhered to during the course of

operations at Flame and Moth. The safety record at the Keno Hill Silver District is exemplary with over 250,000 manhours worked without a lost time accident.

All personnel and Contractors will meet the standards outlined in the Occupational Health and Safety Legislation, Mine Safety Rules, and Regulations of the Worker's Compensation Board.

The Emergency Response Plan is included in Appendix G.

Alexco has an established program for achieving and maintaining a healthy and safe workplace. In the Keno Hill Silver District there are currently emergency first aid responders providing 24-hour service. There are multiple first aid rooms and an ambulance on the site as well.

Alexco policy requires that all employees (including contractors' employees) have pre-employment medical examinations including a drug and alcohol test. All employees will be fully equipped with the proper personal protective equipment standard for working underground, taking into consideration hazards caused by noise level, air born particulates and confined work space.

All new employees will have a site wide and safety orientation and another orientation of the underground work site prior to commencing work. Regular safety meetings with supervisors, safety officer and employees are mandated. Any changes in procedures, equipment, or hazards require immediate notification to employees.

Underground contractors, Alexco personnel and others will have to comply with the Yukon OH&S regulations in addition to Alexco and contractors in-house standards.

A Safety Coordinator/Officer specific for the underground operation will ensure all workers are orientated to all aspects of the work site including hazard identification, protective equipment requirements and that medical and health requirements are followed according to legislation. That position is also charged with ensuring continued training and skill development for all personnel.

7.8 WASTE MANAGEMENT

Project waste will be managed according to a revised Waste Management Plan in place under the QML-0009 (Appendix H).

7.9 FUEL AND HAZARDOUS MATERIALS MANAGEMENT

Fuel and petroleum products required for Flame and Moth development will be managed appropriately. A 28,000 L Envirotank will be used for fuel containment at Flame and Moth. Alexco's existing and approved Spill Contingency plan and Hazardous Materials Management Plan have been updated for the Flame and Moth Mine and are presented in Appendices I and J, respectively.

7.9.1 Explosives

Explosives will be used to develop the decline and ongoing waste development and ore production. Explosives will be trucked to the site and stored in an approved magazine in accordance with YWCHSB (mine

regulations) and onsite manufacturing will not be required. Explosives use, transport, handling, storage and disposal is governed by the Yukon Occupational Health and Safety Act Blasting Regulations and Occupational Health & Safety Regulations, and the Transport of Dangerous Goods Act and Regulations. Figure 1-1 shows the location for the explosive magazine. The explosive magazines will be located at appropriate distances away from the portals and other buildings as dictated by regulations. Explosives and detonators will be conveyed to the working headings on as need basis transported via approved day boxes. Excess explosives will be returned to the magazine at the end of the shift. A log book will be maintained in the magazine as required by regulations.

Blasting reagent consumption is expected to be comprised of approximately two thirds ANFO (ammonium nitrate and fuel oil), and one third explosives in stick form. Estimated consumption for ANFO and stick product is 1.15 kg/t (2.3 lb/ton). Both products contain nitrogen compounds (0.33 kg N per kg ANFO and similar composition for stick product); the stick product is a less soluble formulation and is typically used under wetter conditions.

Detonators will be non-electric and tied in with detonator cord.

7.10 GENERAL GROUND PROTECTION MEASURES

During development certain activities could affect ground stability. In general, ground disturbance will be minimized and only minimal new footprint development will be required. Geotechnical engineers will inspect sites proposed for N-AML and P-AML storage and construction and other major surface facilities prior to development. Appropriate water management infrastructure (e.g. diversions, berms) will be established to ensure site runoff is managed and erosion/ground instability is avoided.

While the broad region in which the Keno Hill Silver District is located is generally characterized by discontinuous permafrost, Alexco has not encountered significant permafrost during development anywhere in the District. As much of the surface development is proposed for existing disturbed areas, the likelihood to encounter permafrost at surface is relatively low. The preliminary design of the expanded DSTF has taken into account the ground conditions within the expansion area through a geotechnical field investigation and the findings are presented in Appendix D.

The proposed location of the Flame and Moth portal is within broader disturbed areas already constructed as part of the Keno Hill District Mill facilities and as such no permafrost is expected.

Permafrost may be encountered underground. Alexco will engage geotechnical engineering consultants to inspect areas where permafrost is encountered that could pose significant geotechnical issues. The geotechnical engineers will advise Alexco as to any modifications to design or operations to ensure mitigation of slumps or failures relating to the presence of permafrost.

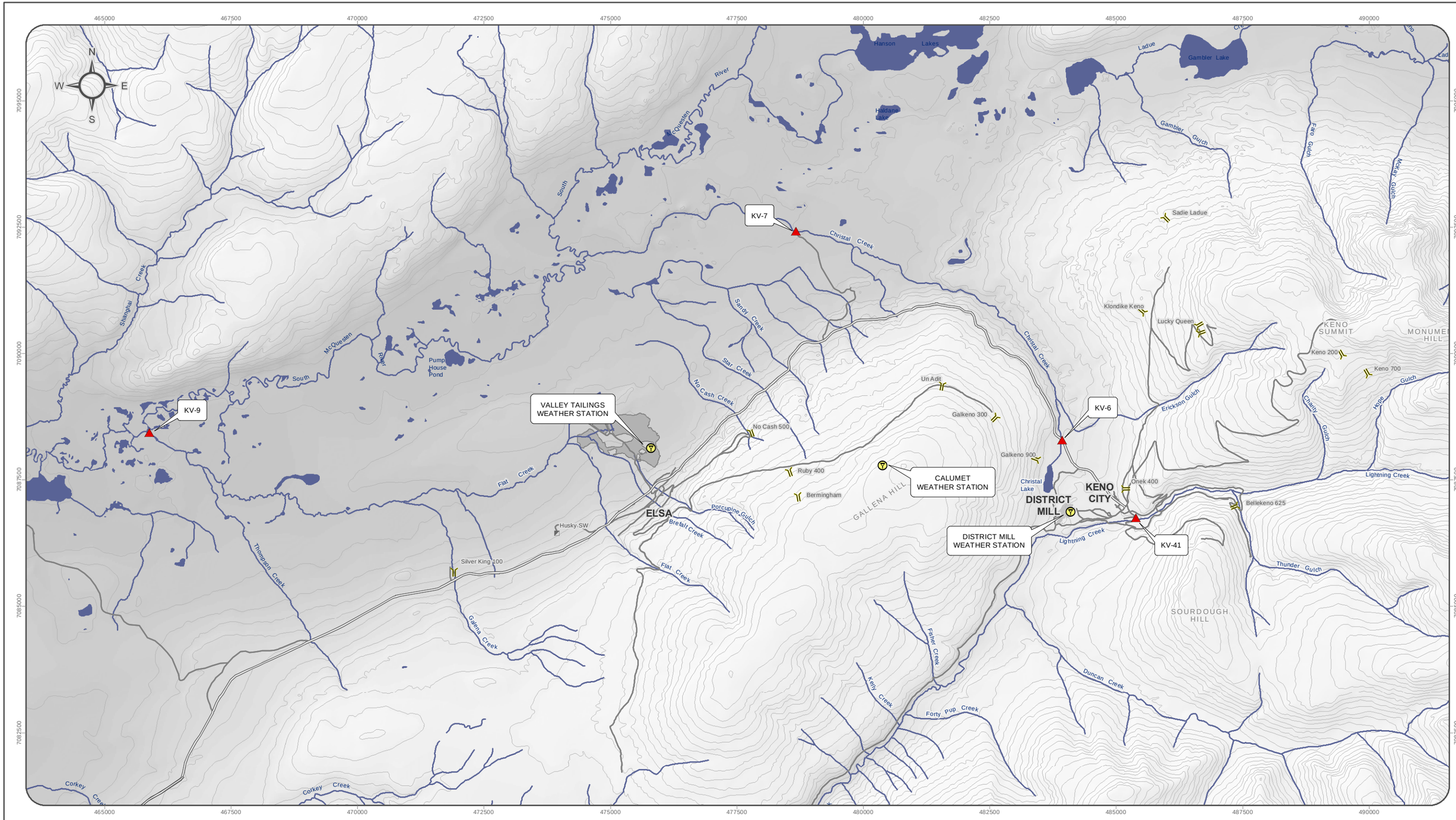
8 WATER

8.1 METEOROLOGY

A Campbell Scientific meteorological station located adjacent to the District Mill and DSTF (at an elevation of 935 masl) was installed in June 2011. The sensors on this station include air temperature, relative humidity, rainfall, pyranometer, and wind speed and direction. Table 8-1 summarizes data collected to date at the District Mill. The location of the District Mill meteorological station is shown on Figure 8-1.

An automated meteorological station (Calumet Weather Station) was installed on Galena Hill above the Hector adit at 1,380 masl in June 2007. A second HOBO weather station was installed at the valley tailings facility in 2012. The Calumet and Valley tailings stations measure air temperature, relative humidity, barometric pressure, rainfall, wind speed and direction, solar radiation, and soil temperature. Table 8-2 and Table 8-3 summarizes total rainfall and average temperatures recorded at the stations to date. The locations of the Calumet and Valley tailings meteorological stations are shown on Figure 8-1. Further discussion and presentation of the meteorological data is presented in Appendix M.

Alexco also collected manual snow surveys in 2011, 2012 and 2013 at ten monitoring stations in order to adequately represent the varying snow conditions as a function of aspect, elevation, etc. Snow water equivalent (SWE) results are presented in Table 8-4 below and the snow survey stations locations are shown of Figure 8-2.



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Quartz claim boundaries current as of February 24th, 2011. Ownership data current as of December 20th, 2010. Data source: http://geomaticsyukon.ca.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:70,000 (when printed on 11 x17 inch paper)

0 1 2 3 Kilometers

- Water Quality Monitoring Station
- Weather Station
- Adit
- Shaft
- Highway
- Secondary Road
- Contours (100 ft)
- Watercourse
- Waterbody

ALEXCO ACCESS

FIGURE 8-1

KENO HILL SILVER DISTRICT WEATHER STATION LOCATIONS

NOVEMBER 2013

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(Last edited by: mducharme; 15/11/2013/08:31 AM)

Table 8-1 Monthly Statistics for the District Mill Meteorological Station

Month	Extreme Maximum Temperature (ºC)	Average Maximum Temperature (ºC)	Average Temperature (ºC)	Average Minimum Temperature (ºC)	Extreme Minimum Temperature (ºC)	Average Relative Humidity (%)	Total Rain (mm)	Average Wind Speed (m/s) [1]	Extreme Maximum Wind Speed (m/s) [1]	Average Solar Radiation (W/m²)	Total Evapo-transpiration (mm)
Jun -11[2]	24.72	18.59	11.96	6.30	-2.56	n/a	n/a	1.35	9.14	n/a	n/a
Jul-11	25.67	18.50	12.91	8.00	5.09	n/a	n/a	1.15	8.02	n/a	n/a
Aug-11	22.32	15.58	9.78	5.37	1.93	n/a	n/a	1.18	9.15	n/a	n/a
Sep-11	17.97	11.29	6.07	1.85	-2.47	n/a	n/a	1.43	11.36	n/a	n/a
Oct-11	7.20	0.20	-2.74	-5.41	-9.84	n/a	*2.60*[3]	0.94	13.12	n/a	n/a
Nov-11	-4.23	-16.79	-19.54	-22.47	-34.99	n/a	0.00	0.58	12.05	n/a	n/a
Jan-12	-0.96	-19.10	-23.13	-26.79	-37.32	n/a	0.00	*0.59*	*9.51*	n/a	n/a
Feb-12	2.77	-6.77	-10.00	-13.07	-26.78	n/a	0.10 [4]	*1.38*	*15.62*	n/a	n/a
Mar-12	5.33	-7.69	-13.37	-18.00	-27.80	n/a	0.00	*0.97*	*9.24*	n/a	n/a
Apr-12	9.69	6.13	0.96	-3.87	-15.92	n/a	0.60 [4]	1.37	10.27	n/a	n/a
May-12	17.78	10.73	6.31	1.91	-3.47	*51.81* [5]	18.30	1.78	10.60	n/a	n/a
Jun-12	27.62	18.41	13.46	8.29	4.42	56.35	21.70	1.44	10.26	n/a	n/a
Jul-12	25.14	18.07	12.75	7.73	1.64	69.26	85.80	1.36	12.99	n/a	n/a
Aug-12	21.72	16.31	11.25	6.56	-0.89	67.79	47.00	1.62	9.41	n/a	n/a
Sep-12	20.24	10.33	5.90	2.08	-5.22	69.51	36.40	1.84	14.27	n/a	n/a
Oct-12	7.60	-3.95	-7.35	-10.32	-20.62	79.54	7.60	1.13	10.37	n/a	n/a
Nov-12	-8.98	-19.55	-21.90	-24.32	-33.36	81.43	0.00	0.94	9.36	n/a	n/a
Dec-12	-3.36	-21.30	-23.44	-25.58	-36.32	81.34	0.00	*0.26*	*5.93*	*1.01* [6]	*0.05* [7]
Jan-13	-1.59	-17.06	-20.01	-23.08	-41.48	82.92	0.00	*0.76*	*14.48*	1.06	0.81
Feb-13	1.54	-9.10	-12.52	-15.46	-23.74	88.36	0.30 [4]	*0.85*	*12.25*	10.26	1.27
Mar-13	3.26	-7.52	-13.16	-17.99	-29.96	64.08	3.90	*1.59*	*12.47*	95.82	6.33

Month	Extreme Maximum Temperature (ºC)	Average Maximum Temperature (ºC)	Average Temperature (ºC)	Average Minimum Temperature (ºC)	Extreme Minimum Temperature (ºC)	Average Relative Humidity (%)	Total Rain (mm)	Average Wind Speed (m/s) [1]	Extreme Maximum Wind Speed (m/s) [1]	Average Solar Radiation (W/m²)	Total Evapo-transpiration (mm)
Apr-13	6.07	-2.76	-7.94	-13.69	-25.07	54.50	8.20	2.44	12.93	190.02	14.48
May-13	23.31	10.20	5.27	0.23	-9.46	61.83	39.60	1.77	11.76	215.44	21.70
Jun-13	30.51	19.97	14.27	8.30	1.84	58.72	57.30	1.82	12.87	234.69	29.79
Jul-13	24.93	19.40	14.01	8.60	2.25	62.67	46.90	1.75	16.14	211.00	27.10
Aug-13	27.34	18.54	12.98	8.01	-0.38	66.30	51.90	1.49	11.05	156.25	21.38
Sep-13	16.11	9.69	5.81	2.26	-3.74	77.52	59.70	1.54	10.99	79.69	10.88
Oct-13	8.25	1.61	-1.32	-4.21	-10.10	86.75	44.60	1.11	11.62	35.75	4.26

Notes: *Values in grey italics indicate a partial month*

[1] January 2012 has 25 days of complete wind data
February 2012 has 28 days of complete wind data
March 2012 has 30 days of complete wind data
December 2012 has 15 days of complete wind data

[2] June 2011 has 29 days of complete data (station commissioned on June 2)
[3] 16 days of complete rain data
[4] Rainfall recorded at temperatures below zero may be due to snowmelt
[5] 25 days of complete RH data
[6] 18 days of complete solar radiation data
[7] 7 days of complete evapotranspiration data

Table 8-2 Average Temperature and Rainfall Collected at Calumet Station

	Average Temperature (°C)							Total Rainfall (mm)						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
January	-	-17.18	-18.84	-14.08	-16.78[3]	-18.71[4]	-16.90	-	-	-	-	-	-	-
February	-	-16.99	-16.95	-9.09	-15.88[3]	-9.94[4]	-10.81	-	-	-	-	1.8[3]	[9]	-
March	-	-11.04	-16.39	-9.21	-12.92[3]	-12.92[4]	-14.45	-	-	-	-	0.5[3]	[9]	0.6
April	-	-4.93	-4.75	-2.01	-3.77[3]	-1.88[4]	-12.32	-	1	-	1.3[3]	2.8[3]	[9]	0.2
May	-	3.31	3.66	5.35	4.41[3]	1.61[4]	n/a	-	25.4	21.8	32.3[3]	15.5[3]	[9]	n/a
June	*11.25*[1]	8.70	9.58	8.68	8.82[3]	7.76[4]	11.59	*55.2*[1]	44.6	*11.8*[7]	56.7[3]	121.8[3]	[9]	45.2
July	11.80	8.17	12.45	10.50	3.80[3]	7.84[4]	11.11	108.8	108.4	*22.8*[8]	137.7[3]	135.9[3]	*27.8*[10]	39.2
August	9.63	5.54	7.47	9.61	[2]	8.33[5]	10.58	54.8	110.2	89.4	140.0[3]	[9]	45.0	35.6
September	1.12	2.27	3.58	2.40	[2]	3.39	3.33	57.6	61.4	50.4	78.0[3]	[9]	17.4	64.6
October	-6.53	-7.20	-4.73	-4.86	[2]	-8.16	-2.52	-	12.6	-	16.0[3]	[9]	1.6	14.6
November	-9.41	-10.17	-11.94	-11.19	-17.39[4]	-18.44	[6]	-	-	-	-	-	0.2	[6]
December	-16.19	-18.34	-11.16	-17.72	-11.78[4]	-18.83		-	-	-	-	-	0	

Notes:

Values in grey italics indicate a partial month

[1] Station commissioned June 15, 2007

[2] Temperature probe malfunction – no proxy data available

[3] Calculated from MAYO A data

[4] Sensor occasionally offline but most data complete

[5] Sensor replaced August 7th

Notes:

[6] Last download on November 2, 2013.

[7] Rainfall gauge malfunction on June 11; total rainfall provided for June 1-11

[8] Rainfall gauge back online; total rainfall provided for July 7-31

[9] Tipping bucket malfunction – no proxy data available

[10] Tipping bucket repaired July 4th; total rainfall provided for July 4-31

Table 8-3 Temperature and Rainfall at Valley Tailings Area Station

Month	Extreme Minimum Temp.(°C)	Average Minimum Temp. (°C)	Average Temp. (°C)	Average Maximum Temp. (°C)	Extreme Maximum Temp. (°C)	Average Relative Humidity (%)	Maximum Relative Humidity (%)	Minimum Relative Humidity (%)	Total Rain (mm)[2]	Average Wind Speed (m/s)[3]	Average Maximum Wind Speed (m/s)[3]	Extreme Maximum Wind Speed (m/s)[3]	Average Barometric Pressure (mbar)	Average Solar Radiation (W/m²)	Soil Average Water Content (%)[4]
Oct-2012[1]	*-23.84*	*-20.12*	*-15.71*	*-9.71*	*-4.05*	*81.92*	*89.16*	*70.76*	n/a	*0.51*	*1.39*	*7.81*	*939.06*	*34.14*	n/a
Nov-2012	-40.71	-27.24	-23.77	-20.42	-8.07	82.04	90.97	69.24	n/a	*0.59*	*1.66*	*7.81*	932.15	7.72	n/a
Dec-2012	-44.20	-29.97	-26.29	-22.98	-3.99	82.75	97.20	71.67	n/a	*0.52*	*1.75*	*6.04*	926.06	1.48	n/a
Jan-2013	-45.56	-25.98	-21.58	-17.72	0.74	84.73	94.43	72.60	n/a	*0.94*	*2.10*	*14.61*	929.62	4.78	n/a
Feb-2013	-24.88	-16.72	-12.96	-8.80	2.40	90.08	96.67	81.42	n/a	*0.90*	*2.09*	*10.83*	919.93	23.70	n/a
Mar-2013	-33.45	-21.40	-13.93	-5.74	5.57	68.05	92.35	53.08	n/a	*0.84*	*2.00*	*13.85*	931.80	93.31	n/a
Apr-2013	-25.05	-14.66	-7.17	-0.87	8.37	53.23	81.57	39.58	n/a	*2.01*	*4.10*	*16.62*	930.07	171.18	n/a
May-2013	-8.36	0.10	6.08	11.66	23.35	62.90	95.00	40.13	*4.80*	*1.42*	*3.26*	*11.84*	928.76	186.87	12.3
Jun-2013	1.64	8.20	15.63	22.00	32.82	58.66	84.24	42.04	46.20	1.50	3.45	22.66	930.76	215.51	8.0
Jul-2013	1.59	8.95	15.68	21.90	29.32	60.65	87.50	38.38	25.40	1.39	3.22	16.12	931.69	194.18	6.9
Aug-2013	-1.90	6.94	13.85	20.49	29.49	68.65	95.18	44.98	43.00	*0.93*	*2.45*	*13.60*	926.92	144.34	9.6
Sep-2013	-2.45	2.00	6.39	10.85	18.06	80.70	98.19	60.89	64.80	*1.19*	*2.83*	*17.38*	921.41	71.21	14.4
Oct-2013	-11.22	-5.32	-1.54	2.56	9.11	91.89	99.04	68.02	49.40	*0.61*	*1.86*	*11.58*	927.19	32.16	12.2

Notes: *Values in grey italics indicate a partial month*

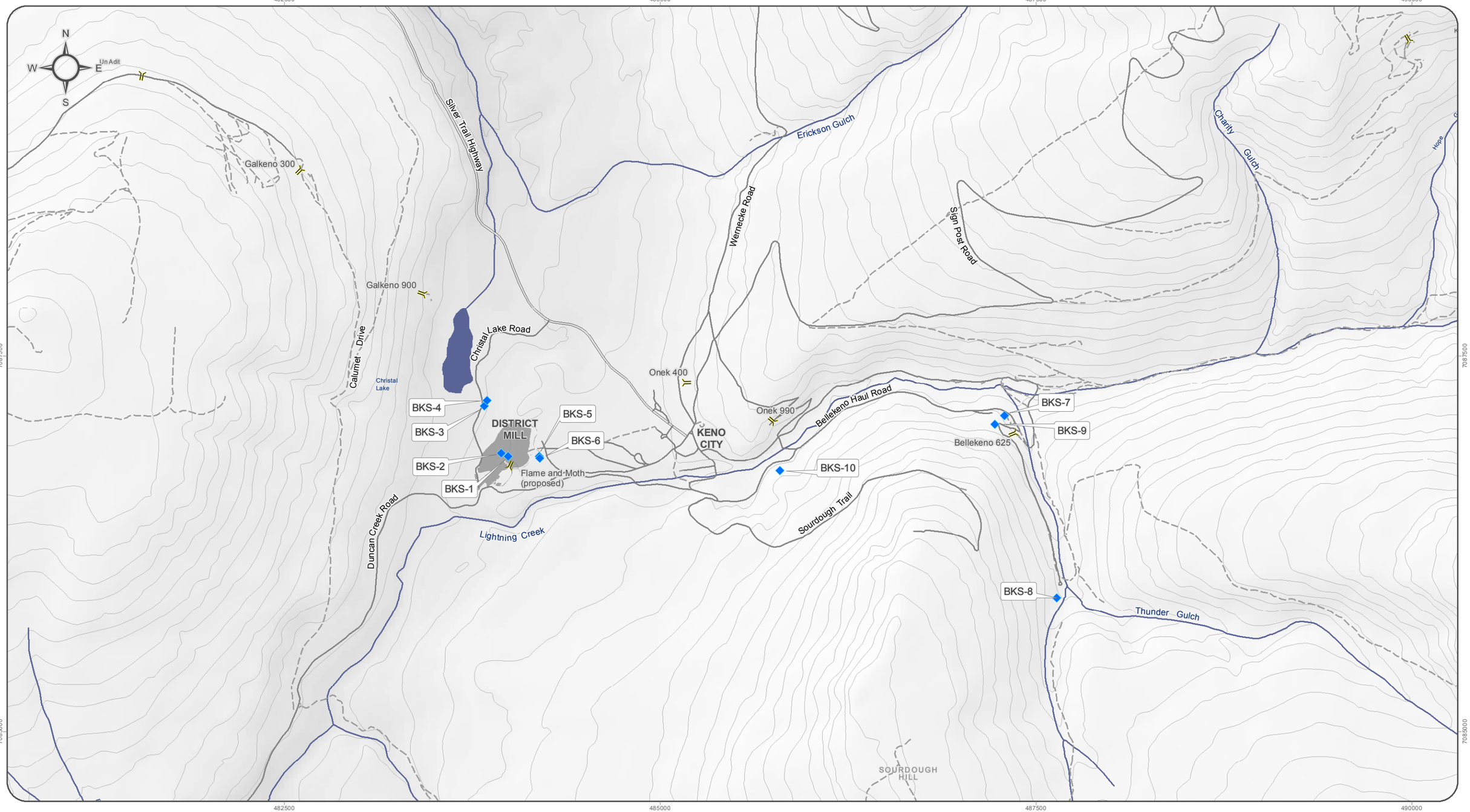
[1] Station was commissioned on October 19 so October 2012 has 12 days of complete data

[2] May2013 has 14 days of compete rain data

[3] October 2012 has 2 days of complete and 11 days of partial wind data
November 2012 has 5 days of complete and 24 days of partial wind data
December 2012 has 2 days of complete and 16 days of partial wind data and
January 2013 has 5 days of complete and 16 days of partial wind data
February 2013 has 2 days of complete and 26 days of partial wind data
March 2013 has 4 days of complete and 27 days of partial wind data
April 2013 has 14 days of complete and 16 days of partial wind data
May 2013 has 15 days of complete and 16 days of partial wind data
June 2013 has 29 days of complete and 1 day of partial wind data
August 2013 has 29 days of complete and 2 days of partial wind data

Table 8-4 Keno Hill Manual Snow Survey Data

Station	Description	Jan 2011 SWE (cm)	Feb 2011 SWE (cm)	Mar 2011 SWE (cm)	Jan 2012 SWE (cm)	Feb 2012 SWE (cm)	Mar 2012 SWE (cm)	April 2012 SWE (cm)	Jan 2013 SWE (cm)	Feb 2013 SWE (cm)	Mar 2013 SWE (cm)	April 2013 SWE (cm)
BKS-1	tall spruce up hill near dry stack	7.6	7.6	5.1	6.	16.1	18.7	8.7	7.3	11.3	13.0	15.0
BKS-2	log pile near dry stack	7.6	7.6	7.6	12.2	13.6	9.3	20.8	9.3	10.7	11.7	13.8
BKS-3	Between 1 and 2 marker on CLR road	7.6	10.2	7.6	9.6	12.5	4.4	7.7	7.3	10.0	14.3	14.7
BKS-4	down road from BKS 3, closer to #2 CLR marker	7.6	7.6	7.6	8.5	17.6	12.3	8.8	9.3	11.7	18.3	14.3
BKS-5.0	Keno dump area. Near scrub trees	5.1	7.6	5.1	13.7							
BKS-5.1	Keno dump area. Near scrub trees	-	-	-		11.3	12.2	9.6	6.7	9.7	13.3	13.0
BKS-6	Keno dump area. On sloping hillside	2.5	2.5	0	11.2	12.6	14.8	19.8	6.7	9.2	12.0	11.3
BKS-7	Uphill from Bellekeno treatment pond	7.6	10.2	7.6	12.5	13.6	4.8	8.5	6.7	11.0	10.3	13.7
BKS-8	Far end of Bellekeno East. Nr explosive storage shed	7.6	7.6	5.1	9.9	13.8	17.6	19.5	8.0	10.0	18.5	19.7
BKS-9	At BKR 16 marker. Slightly up on hillside	7.6	10.2	10.2	12.4	13.3	17.1	0.00	7.3	10.0	15.0	14.0
BKS-10	Near BKR 8 pull out. Up on hillside	10.1	7.6	5.1	13.3	16.5	27.7	10.7	9.3	10.0	12.3	14.3
Mean	-	7.112	7.874	6.096	10.93	14.09	13.87	11.43	7.79	10.36	13.87	14.38



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Quartz claim boundaries current as of February 24th, 2011. Ownership data current as of December 20th, 2010. Data source: http://geomaticsyukon.ca.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:24,000 (when printed on 11 x17 inch paper)

0 500 1,000 1,500 2,000 Meters

- Snow Monitoring Station
- Adit
- Highway
- Secondary Road
- Track
- Contours (100 ft)
- Watercourse
- Waterbody

ALEXCO ACCESS

FIGURE 8-2
KENO SNOW SURVEY STATIONS

NOVEMBER 2013

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8.1.1 Surface Water Hydrology and Water Quality

8.1.1.1 Christal Creek Catchment

Christal Creek flows northwest from Christal Lake for approximately 22 km before it flows into the South McQuesten River. Water chemistry and aquatic resources in the creek have been influenced by previous mine and milling operations including tailings deposition and adit discharge. Christal Creek receives input water from Galkeno 900 adit, Galkeno 300 adit, and seepages (surface and groundwater) from workings on the west face of Keno Hill. Christal Lake has been a receptor for effluent from various mines for several decades including Galkeno 900 and the Mackeno Mill area and Mackeno tailings, contributing to metal loading in Christal Creek.

Within the Christal Creek catchment there are 11 active licenced monitoring sites (Figure 8-3, Table 8-5) and the results up to August 2013 are presented in Appendix 0. Monitoring in this watershed begins at Christal Creek before its confluence with Hinton Creek (KV-50) and ends at the mouth of Christal Creek where it enters the South McQuesten River (KV-8). There are no significant tributaries to Christal Creek upstream of Hinton Creek; however, it is unknown to what degree mine-related discharges may have an influence on the drainage above KV-50 as there are known to be historical workings upstream of this sampling location. It is reasonable to assume that water quality at KV-50 reflects some degree of historical mine-related contamination as a result of its proximity to historical mining areas, but could also reflect naturally mineralized seep areas. A summary of the hydrological conditions in the Christal Creek watershed are provided in Appendix N for stations KV-6 and KV-7.

KV-6, monitoring the outflow from Christal Lake, shows a slight increase in total arsenic to August 2013 with a median concentration of 0.005 mg/L, which is equal to the CCME PAL guideline, as compared to the 2004 to 2008 results that had a median concentration of 0.004 mg/L (average total arsenic has remained the same). A decrease in median total cadmium and zinc is reported at KV-6 as observed in Figures 8-4 and 8-5. The median total cadmium and zinc concentrations decrease by about 40% since 2008 from 0.00173 mg/L to 0.00105 mg/L and 0.229 mg/L to 0.144 mg/L, respectively. As a result of Care and Maintenance activities taken over by ERDC in 2007, treated discharge from Galkeno 900 and Galkeno 300 flows into Christal Creek, decreasing the overall concentrations of cadmium and zinc, improving water quality. The District Mill and associated Dry Stack Tailings Facility have not discharged any effluent since their construction and therefore no additional load has been attributed in Christal Creek from these facilities. The Christal Creek mass load models presented in the Water Licence Application for the Bellekeno Mine predicted maximum concentrations for total cadmium and zinc of 0.00332 mg/L and 0.320 mg/L, respectively. The total cadmium and zinc concentrations from 2010 to August 2013 have all been below the predicted values with the exception of the July 2010 and May 2012 sampling events as shown on Figures 8-4 and 8-5.

KV-7 demonstrates there is a decreasing trend for total cadmium and zinc as shown in Figures 8-4, and 8-5. Median total cadmium has decreased by 50% at KV-7 and 38% at KV-8, while median total zinc has decreased by about 60% at KV-7 and KV-8. Treated discharge entering the Christal Creek watershed has contributed to a decreased cadmium and zinc loading. The trends in the Lower Christal Creek stations (KV-7 and KV-8) are similar to those observed at the outlet of Christal Lake (KV-6).

Table 8-5 Christal Creek Catchment Surface Water Monitoring Stations

SITE	SITE DESCRIPTION	MONITORING FREQUENCY
KV-6	Christal Creek at Keno Highway	Monthly
KV-7	Christal Creek at Hanson Road	Monthly
KV-8	Christal Creek at mouth	Monthly
KV-48	Hinton Creek u/s Calumet Drive	Quarterly
KV-49	Hinton Creek u/s Christal Creek	Quarterly
KV-50	Christal Creek u/s Hinton Creek	Quarterly
KV-51	Christal Creek d/s Hinton Creek	Quarterly
KV-52	Natural spring to Christal Lake at Old Mackeno pumphouse	Monthly
KV-54	Erickson Gulch at Road to Lucky Queen	Quarterly
KV-79	Christal Creek d/s of Mackeno Tailings	Quarterly
KV-80	Christal Creek u/s of Mackeno Tailings	Quarterly

8.1.1.2 Lightning Creek Catchment

Lightning Creek is situated within a narrow valley with a steep gradient flowing from the north side of Sourdough Hill into Duncan Creek, which drains into the Mayo River. Hope and Thunder Gulches flow into Lightning Creek within the bounds of the KHSD. Lightning Creek has also been the site of extensive placer mining upstream of Keno City both historically and at present time. The Lightning Creek drainage has also been affected by localized quartz mining activities including the Bellekeno Mine which was re-opened by Alexco in 2011. Mine adit drainages from Bellekeno 625 (north side of Sourdough Hill) and Keno 700 (south side of Keno Hill) eventually report to the Lightning Creek drainage.

Lightning Creek is notable as it is the only large watershed in the KHSD not connected to the South McQuesten River. There are nine regularly monitored sites within the Lightning Creek drainage under Water Licence QZ09-092; eight sites between the background baseline station at KV-37, to the station at the Lightning Creek Bridge near Keno (KV-41), and a recently added site downstream, station KV-81, southwest of the Keno District mill site (Table 8-6, Figure 8-3, and Appendix O). A summary of the hydrological conditions in the Lightning Creek watershed for station KV-41 are provided in Appendix N.

Background data on Lightning Creek is collected at station KV-37. Two creeks, Hope Gulch and Charity Gulch, flow from the south side of Keno Hill into Lightning Creek upstream of Thunder Gulch and the Bellekeno 625 adit flow. These creeks are sampled upstream of the confluence with Lightning Creek (stations KV-39 and KV-40 respectively). A water quality sampling site on Thunder Gulch upstream of all current mining activities (KV-77) also provides baseline information on the quality of water flowing into Lightning Creek. Another water quality monitoring site on Lightning Creek (KV-38) is located downstream of Hope Gulch and Charity Gulch but upstream of Thunder Gulch and a placer operation on Lightning Creek. A third station on Lightning Creek (KV-41) downstream of the Bellekeno 625 adit flow (KV-42 and KV-43), Thunder Gulch and the placer operation gives an indication of the combined influence of these inputs and activities. A fourth station on Lightning Creek, KV-81 was added to the monitoring program in 2010 to track water quality downstream of the District mill.

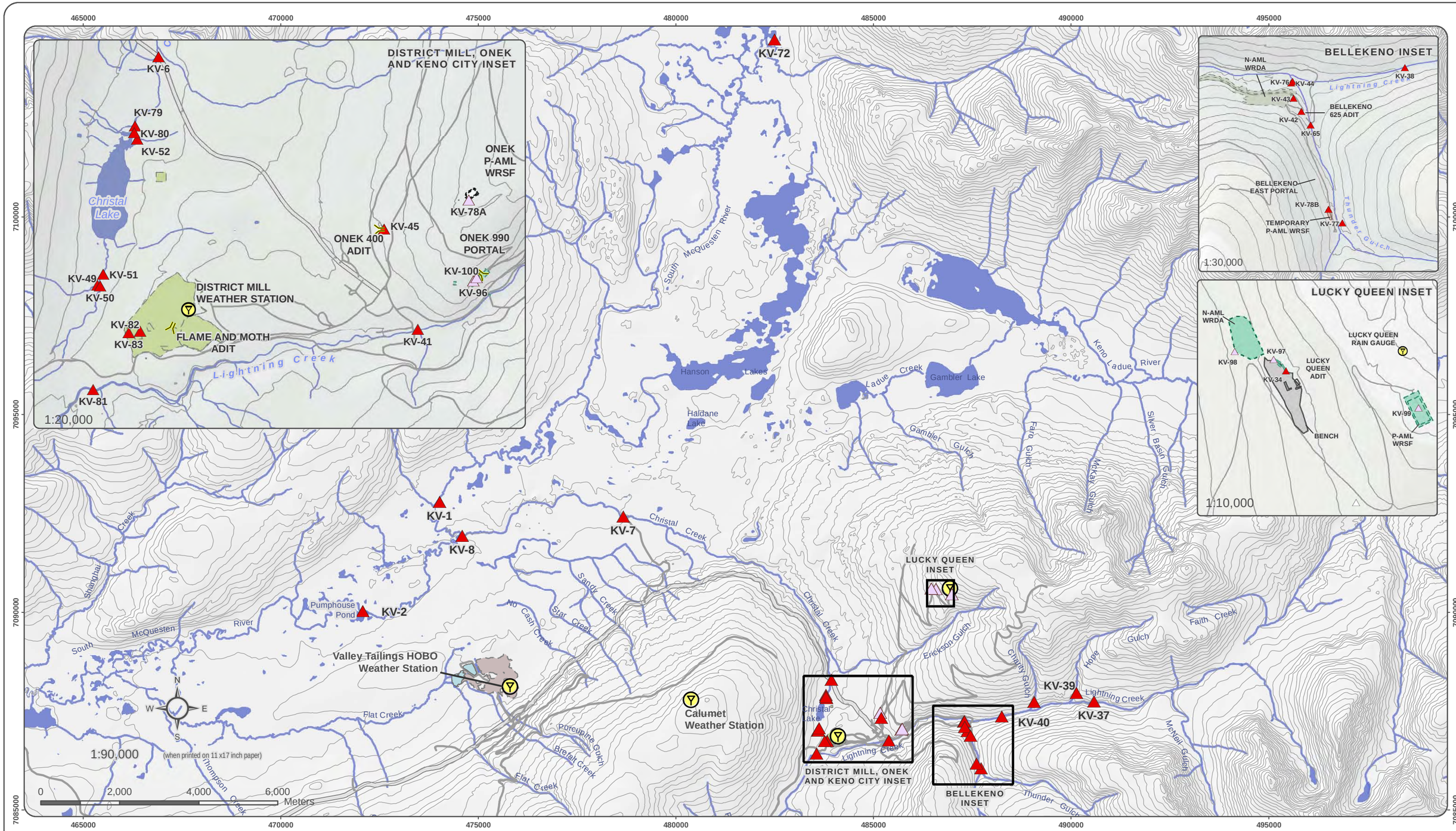
The total cadmium and zinc concentrations for lower Lightning Creek between 2004 and 2013 are plotted on Figures 8-6, and 8-7. The lower Lightning Creek stations generally show a pattern of elevated concentrations of total metals in the spring and summer months, with a decreasing trend in the fall to winter period. As outlined in the above section on Thunder Gulch, the Lightning Creek watershed is impacted by placer mining on Thunder Gulch. For example the July 2013 elevated concentrations for total arsenic, cadmium and zinc for KV-41 and KV-81 were associated with TSS concentrations of 203 mg/L and 75.4 mg/L, respectively. The associated dissolved concentrations were typically an order of magnitude lower than the total concentrations. The dissolved arsenic concentration for lower Lightning Creek (KV-41) shows a slight decrease between 2004 and August 2013 with a median arsenic concentration of 0.0018 mg/L for 2004 to 2008, and 0.0011 mg/L for 2009 to August 2013. The dissolved cadmium concentrations for KV-41 also shows a decreasing trend for the period of 2004 to 2008 (median: 0.000125 mg/L) and 2009 to August 2013 (median: 0.000065 mg/L). The dissolved zinc concentration for lower Lightning Creek (KV-41) shows a decreasing trend between 2004 and August 2013 with a median zinc concentration of 0.018 mg/L for 2004 to 2008 period, and 0.008 mg/L for the 2009 to 2013 period. At KV-81 total arsenic meets the CCME PAL guideline except in July of each year, while total cadmium is 100% in exceedance and total zinc also experiences periodic exceedances during the spring and summer (May – July).

During the water licencing process in 2010 Alexco predicted zinc and cadmium concentrations through a mass load model at KV-41 ranging from 0.024 to 0.034 mg/L and 0.00021 to 0.00038 mg/L, respectively. In November 2012 the GoldSim model was used to calculate similar operations and post closure maximum concentrations with the additions for the Onek 990 mine at KV-41 for total zinc and cadmium at 0.041 mg/L and 0.00037 mg/L respectively.

A number of other parameters are seen to exceed the CCME PAL guidelines at KV-41 and KV-81 on a regular basis (i.e. greater than or equal to 15% of the time): aluminum, chromium, copper, iron, lead, selenium and silver.

Table 8-6 Lightning Creek Catchment Surface Water Monitoring Locations

SITE	SITE DESCRIPTION	MONITORING FREQUENCY
KV-37	Lightning Creek upstream Hope Gulch	Quarterly
KV-38	Lightning Creek upstream Thunder Gulch	Quarterly
KV-39	Hope Gulch upstream Lightning Creek	Quarterly
KV-40	Charity Gulch upstream Lightning Creek	Quarterly
KV-41	Lightning Creek upstream bridge at Keno City	Monthly
KV-65	Thunder Gulch upstream of Bellekeno	Monthly
KV-76	Thunder Gulch downstream of Bellekeno 625 Adit	Quarterly*
KV-77	Thunder Gulch upstream of Bellekeno East	Quarterly
KV-81	Lightning Creek Southwest of Mill Site	Quarterly



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- Weather Station
- Monitored
- Pending
- Discontinued
- Valley Tailings Pond
- Valley Tailings
- Keno District Mill Site
- Waterbody
- Highway
- Secondary Road
- Watercourse
- Contour (100 feet)

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KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 8-3

KENO HILL SURFACE WATER QUALITY STATION LOCATIONS LICENCE QZ09-092

DECEMBER 2013

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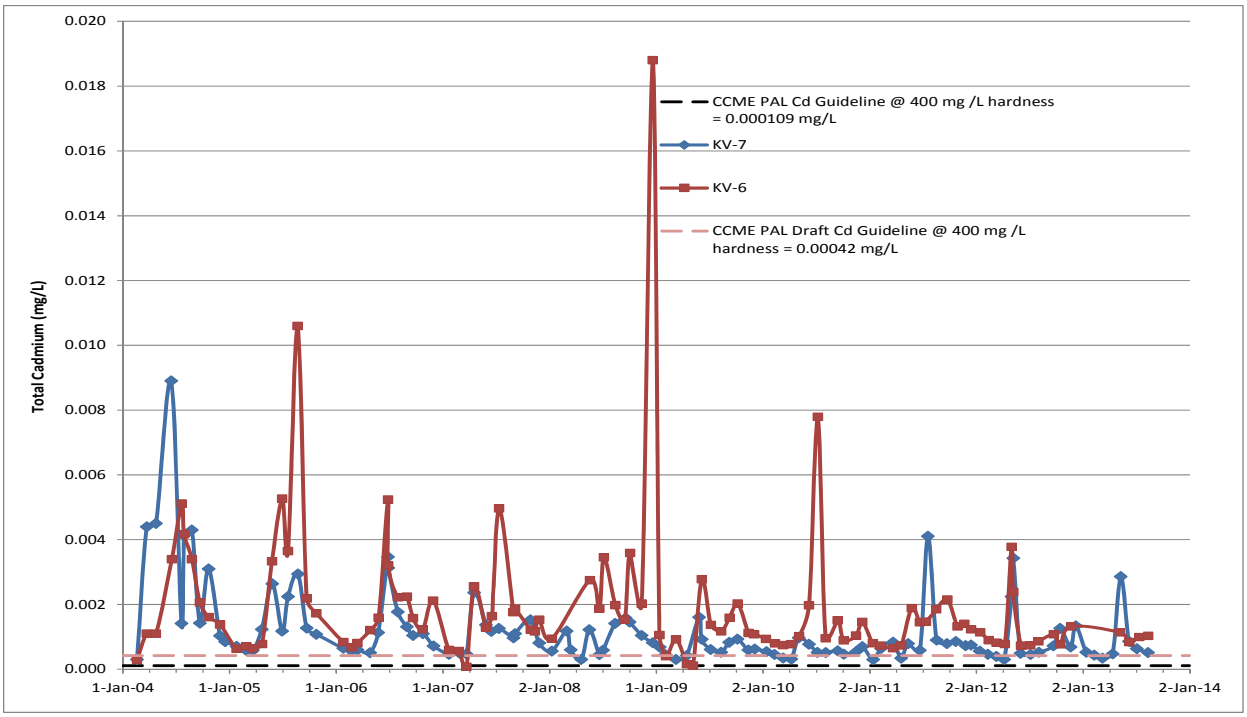


Figure 8-4 Christal Creek, Cadmium

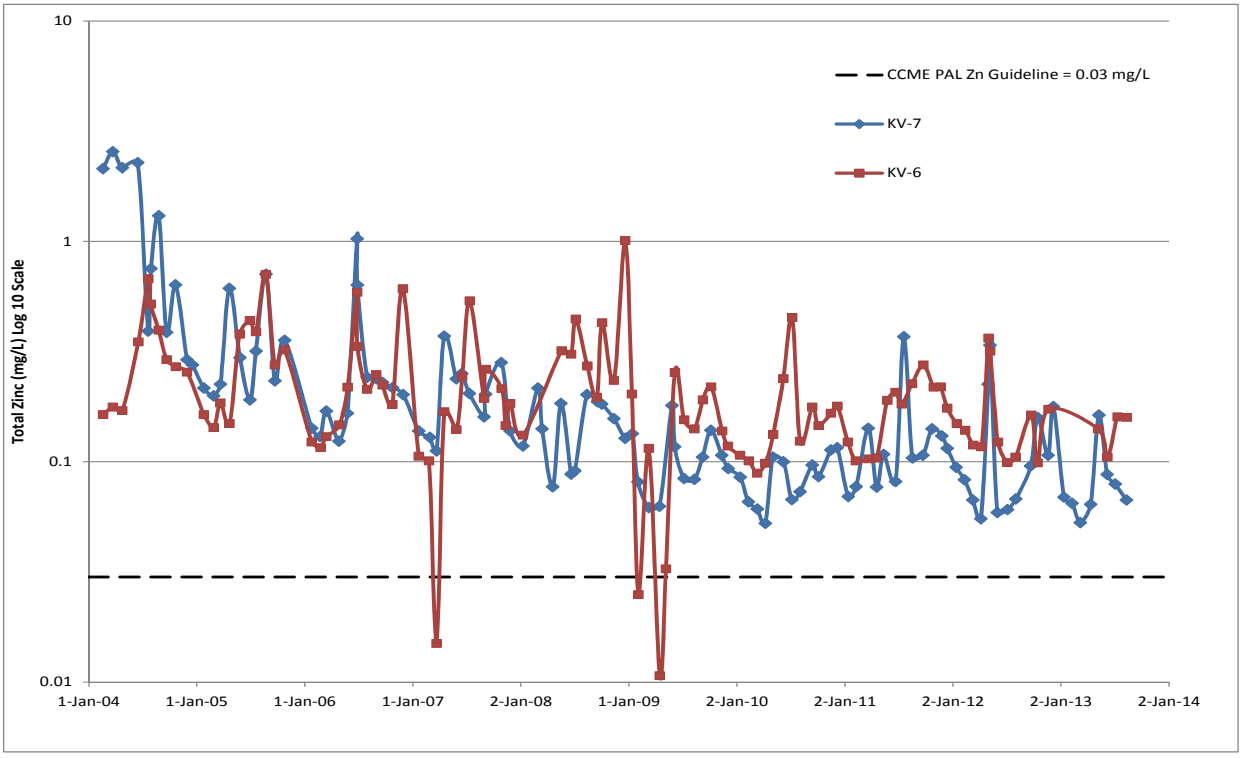


Figure 8-5 Christal Creek, Zinc

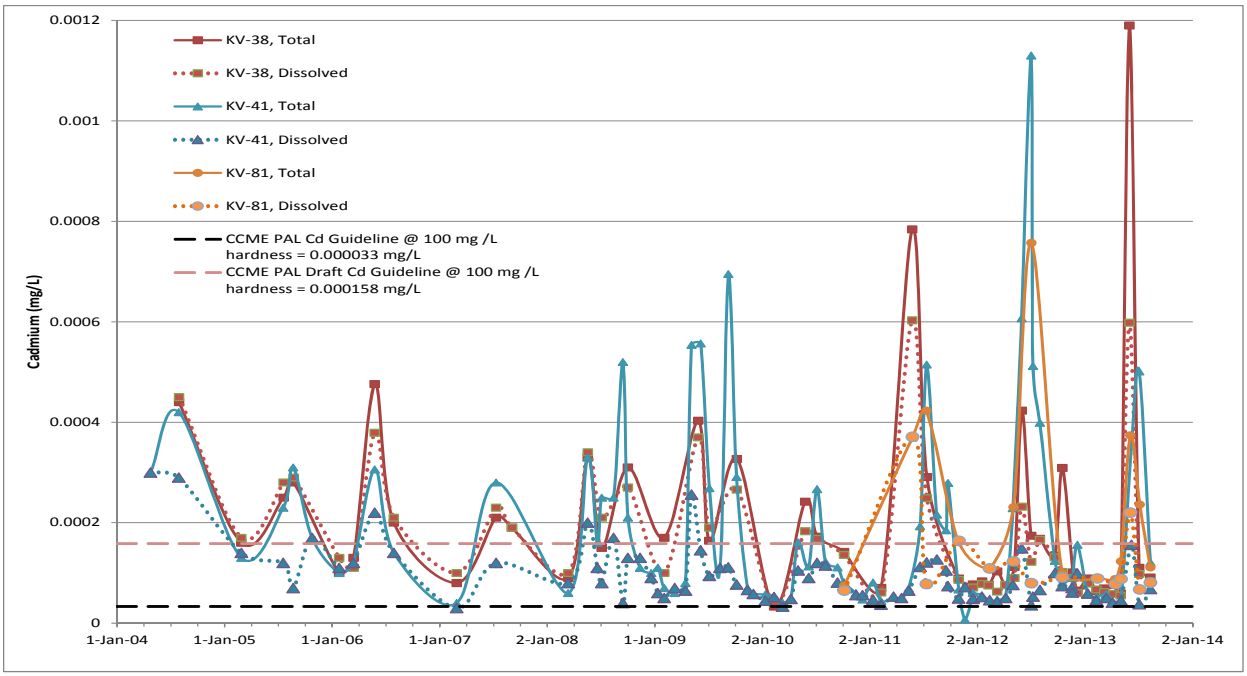


Figure 8-6 Lower Lightning Creek, Cadmium

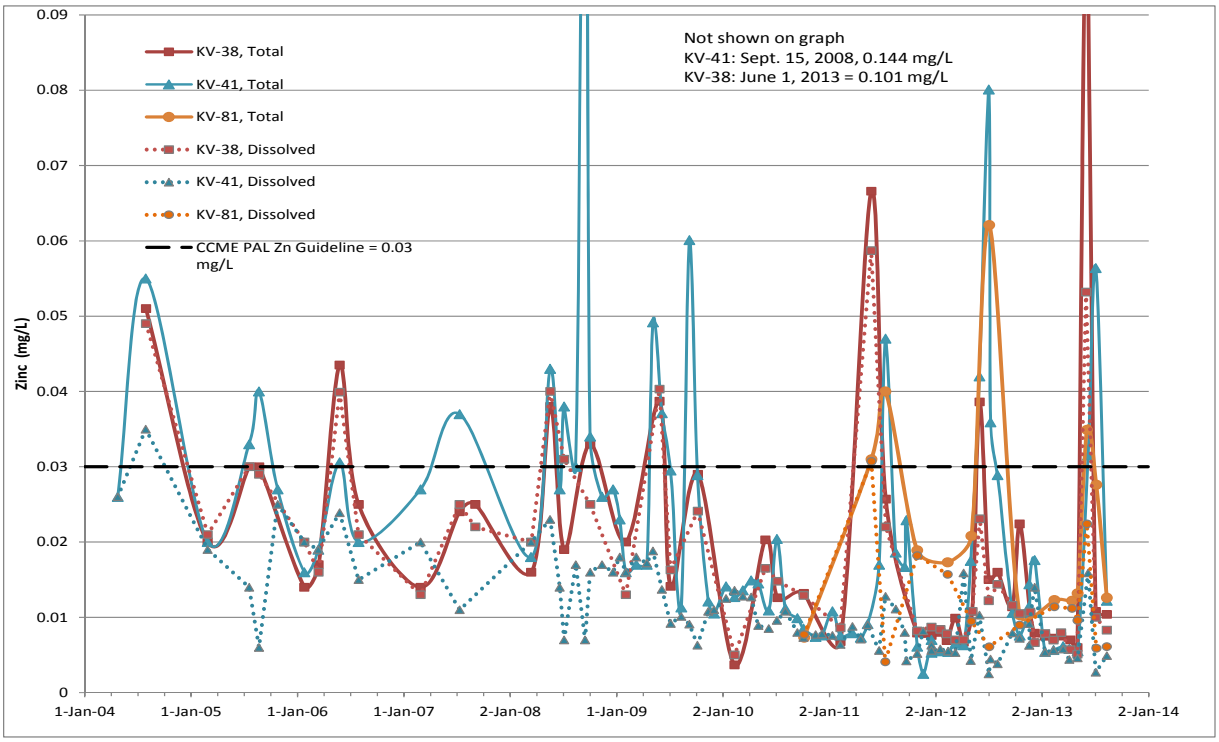


Figure 8-7 Lower Lightning Creek, Zinc

8.1.2 Groundwater

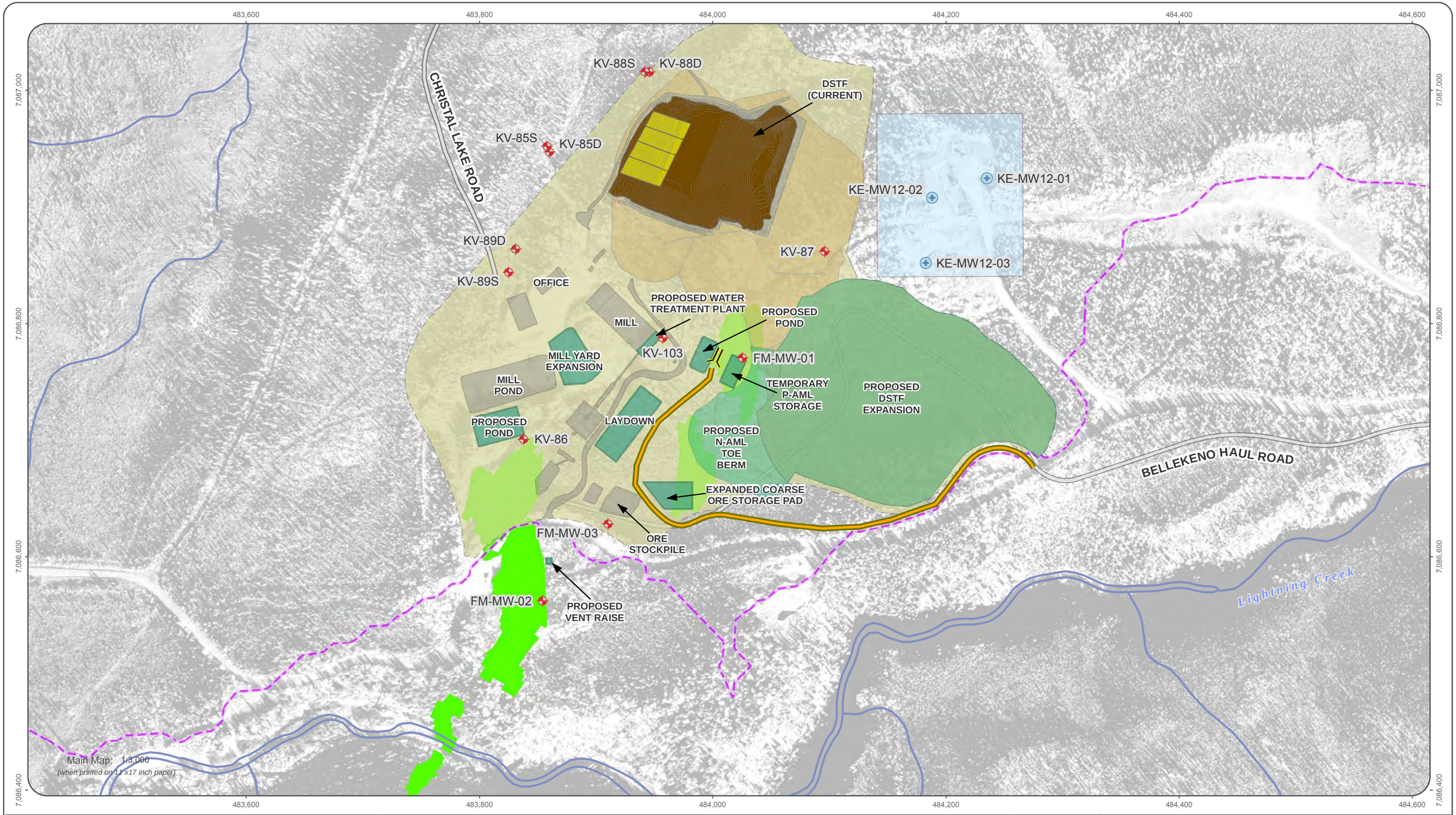
Groundwater has been monitored in the Flame and Moth mine area since the development of the District Mill and DSTF. Through Water Licence QZ09-092, nine groundwater monitoring stations are currently monitored on a quarterly basis and are listed in Table 8-7. Three deep groundwater wells were drilled in 2013 (FM-MW-1, FM-MW-2, and FM-MW-3). The locations of the wells in the District Mill area are shown on Figure 8-8.

Table 8-7 District Mill Groundwater Monitoring Locations

SITE	SITE DESCRIPTION	Screened Interval
KV-85S	Located downgradient from DSTF	Overburden
KV-85D	Located downgradient from DSTF	Bedrock
KV-86	Located adjacent to Mill Pond	Overburden
KV-87	Located upgradient from DSTF	Bedrock
KV-88S	Located downgradient from DSTF	Overburden
KV-88D	Located downgradient from DSTF	Bedrock
KV-89S	Located downgradient from Mill	Overburden
KV-89D	Located downgradient from Mill	Bedrock
KV-103	Mill Supply Well	Bedrock
FM-MW-1	Christal Zone	Bedrock
FM-MW-2	Lightning Zone	Bedrock
FM-MW-3	Mill fault	Bedrock

8.1.3 Groundwater Flow Direction

Interralogic has prepared a groundwater flow directional map for Keno City and the District Mill area which is presented in Figure 8-9. These groundwater contours were created using water level measurements taken on the October 17, 2013 (Appendix C). Generally groundwater flows from Keno City to the North West towards Christal Lake or west towards Christal Creek. The groundwater flow direction for the Flame and Moth Mine is towards the North West in the direction of Christal Lake.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Monitoring Well
- Pending Monitoring Well
- Decommissioned Monitoring Well
- Private Drilled Well
- Public Drilled Well
- Water Supply Well
- Manual Drive Point
- Decommissioned Manual Drive Point
- Proposed Road
- Road
- Watercourse
- Watershed Boundaries
- District Mill Footprint
- Flame and Moth Vein
- DSTF Cover and Revegetation Phase I
- DSTF 322,000 Tonnes Design
- Buildings/Structures
- As Built, DSTF, Sept 2013
- Land Disposition
- Proposed Features

AKHM
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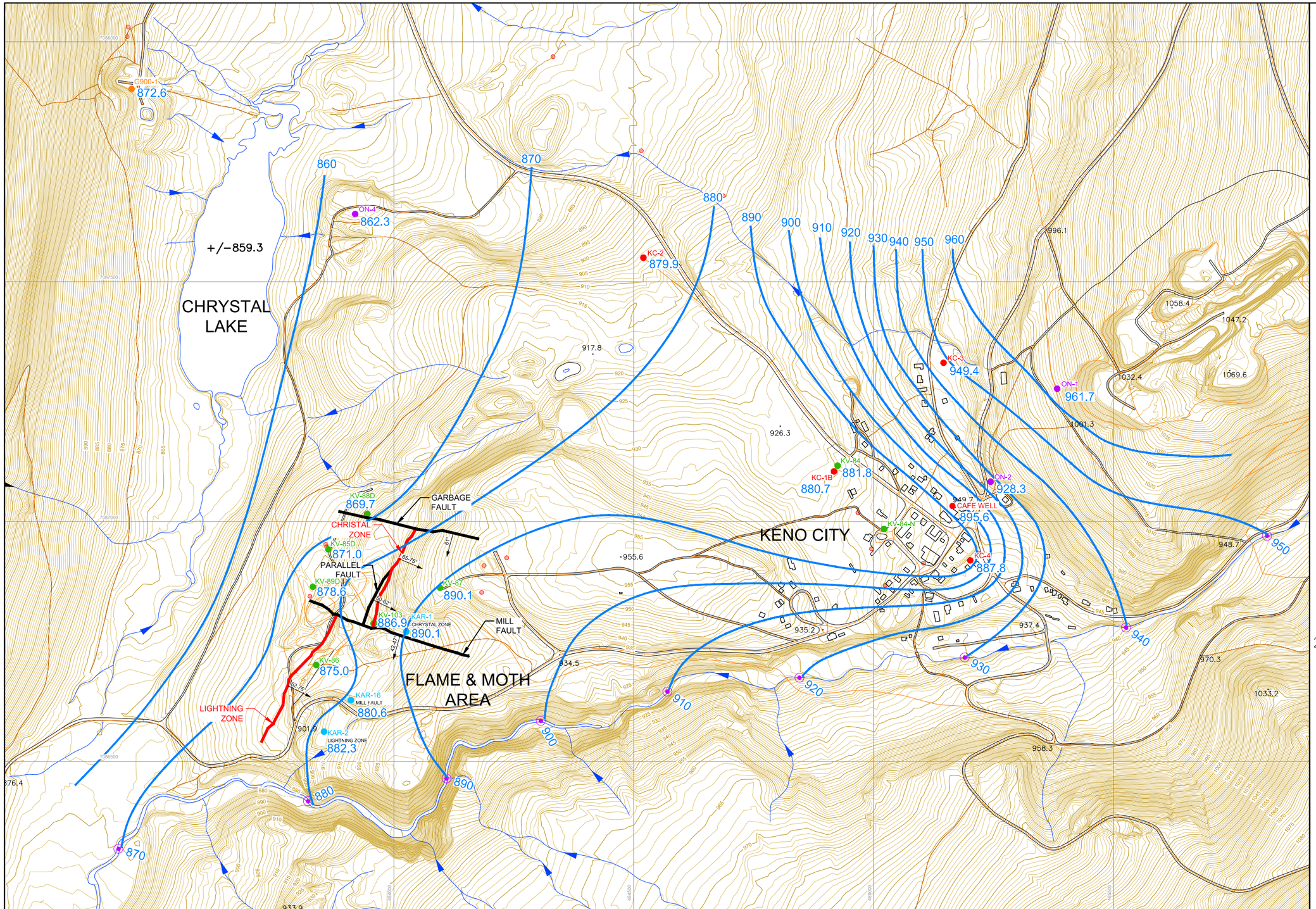
KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 8-8

FLAME AND MOTH GROUNDWATER MONITORING LOCATIONS

DECEMBER 2013

I:\Keno_Area_Mines\FM\Map\01_Overview\WQ_Stations\Groundwater_Monitoring_20131128_ZOOM.mxd
(*Last edited by: jpan;2013-12-05/14:40 PM*)



LEGEND:

- KV-3 920 — REGULATORY WELL w/ WATER LEVEL ELEVATION (m MSL)
- KC-3 920 — KENO CITY WELL w/ WATER LEVEL ELEVATION (m MSL)
- KAR-3 920 — FLAME & MOTH TEST HOLE w/ WATER LEVEL ELEVATION (m MSL)
- ON-2 920 — ONEK WELL w/ WATER LEVEL ELEVATION (m MSL)
- G900-1 920 — ADIT AREA w/ WATER LEVEL ELEVATION (m MSL)
- 920 — PERENNIAL STREAM WATER LEVEL ELEVATION (m MSL)
- 880 — GROUND WATER LEVEL CONTOUR (m MSL)

200 0 200

(meters)

REV	DESCRIPTION	ENG	DATE
0	ISSUE		

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DRAWING REFERENCE(S):
EXISTING TOPOGRAPHY PROVIDED BY ALEXICO RESOURCE CORP.
RECEIVED, OCTOBER 2013.

DATUM:
AMSL

CAD FILE:
MONITORING WELLS 2013-10-17

DESIGNED BY		
DRAWN BY	STEVEN C.	10-17-2013
CHECKED BY	FRED M.	
APPROVED BY		
PROJECT MANAGER		
CLIENT APPROVAL		

PROJECT LOCATION
KENO CITY, YUKON, CANADA

PROJECT
KENO - FLAME AND MOTH OPERATIONAL SUPPORT

TITLE
WATER LEVEL CONTOUR MAP

INTERRA
4715 Innovation Dr., Suite 110
Fort Collins, Co 80525
970.225.8222

PROJECT NO: 102006
REVISION 0
SCALE: 1 cm = 60 m
DRAWING NAME FIG. 8-9
SHEET NUMBER 1 OF 1

DRAWING FILENAME: [L:\Projects\102000 - Keno\102004 - Keno Operational Support\04 - Flame and Moth\AUTOCAD\Exhibits\MONITORING WELLS 2013-10-17.dwg] LAYOUT NAME: [FIGURE 1] DATE: [Nov 27, 2013 - 10:08am] CAD OPERATOR: [jmcnell]
LIST OF XREFS: [None EDIT] [Metn_Master_Plots] [Roads_DS_Master] [EXHIBIT TITLE]

8.1.4 Groundwater Quantity from Mine Dewatering

Interralogic Inc. has summarised the results from the drilling and associated air lift testing from the three deep monitoring wells (FM-MW-1, FM-MW-2 and FM-MW-3) completed in August and September 2013. Additionally, Interralogic has summarised an air lift pump test conducted on well FM-MW-1 for 72 consecutive hours to calculate the potential mine inflows for the Flame and Moth Mine. The maximum predicted flow rate for the Flame and Moth mine has been conservatively calculated to be 35 L/s. Interralogic's report outlining the calculation of the potential Flame and Moth Mine inflows has been included as Appendix C.

The Interralogic report presented in Appendix C concludes that Flame and Moth Mine dewatering will not have a significant impact on surface water flows in Lightning Creek and it is highly unlikely that mine dewatering will have an effect on groundwater levels and the availability of water supply in the Keno City area.

8.1.5 Groundwater Quality

Appendix P presents the groundwater quality data collected for the bedrock screened wells listed in Table 8-7. Groundwater samples in the Keno District are generally collected following the purging of a minimum of three well volumes.

Figure 8-9 presents the water level elevations for the bedrock wells in the District Mill area. The water elevations around the District Mill have been recorded to be between ~865 to 900 masl. Generally this equates to being ~20m below ground surface. The ground water elevation for the proposed portal location has been estimated to be 888 masl from Figure 8-9, compared to the surface elevation of the portal at 910masl (a difference of 22m).

Groundwater monitoring locations (KV-85d,s, KV-86, KV-87, KV-88d,s, and KV-89d,s) for the Mill area were monitored monthly for the first year and then transitioned to a quarterly frequency under Water Licence QZ12-053. Monitoring of wells KV-103, FM-MW-1, FM-MW-2, FM-MW-3 and ON-MW-03 was initiated in 2013. Figure 8-10 presents the groundwater elevations measured for the wells in the mill area. Figure 8-11 to Figure 8-14 presents the dissolved arsenic, cadmium, lead and zinc concentrations, respectively, for the bedrock wells in the District Mill area.

Wells FM-MW-1, FM-MW-2 and FM-MW-3 were drilled in August and September 2013 to evaluate groundwater quantity in the proposed Flame and Moth mine; as well as to understand the groundwater quality expected to be encountered at depth. FM-MW-1 was drilled to a depth of 182.3 mbgs into the Christal zone. FM-MW-2 was drilled to a depth of 244.4 mbgs. FM-MW-3 was drilled to a depth of 195.7mbgs As the wells were drilled in late August and September only one set of water quality data is available at this time. The deep groundwater quality measured in FM-MW-1, FM-MW-2 and FM-MW-3 for arsenic, cadmium, lead and zinc concentrations are all generally lower than those measured in the shallower groundwater wells around the Mill. The dissolved zinc concentrations in the deep groundwater wells ranged from 0.007 mg/L to 0.0107mg/L, all below the CCME guideline (0.03 mg/L). The dissolved arsenic concentrations ranged from 0.00359 to 0.0695 mg/L and the dissolved cadmium concentrations were below the detection limit (<0.000010 to <0.000020). The dissolved lead concentrations were below the detection limit for two of the

three wells and the third well having a concentration of 0.000205 mg/L, well below the CCME guideline. It is therefore anticipated that groundwater encountered during the development of the Flame and Moth will not contain significant metals concentrations.

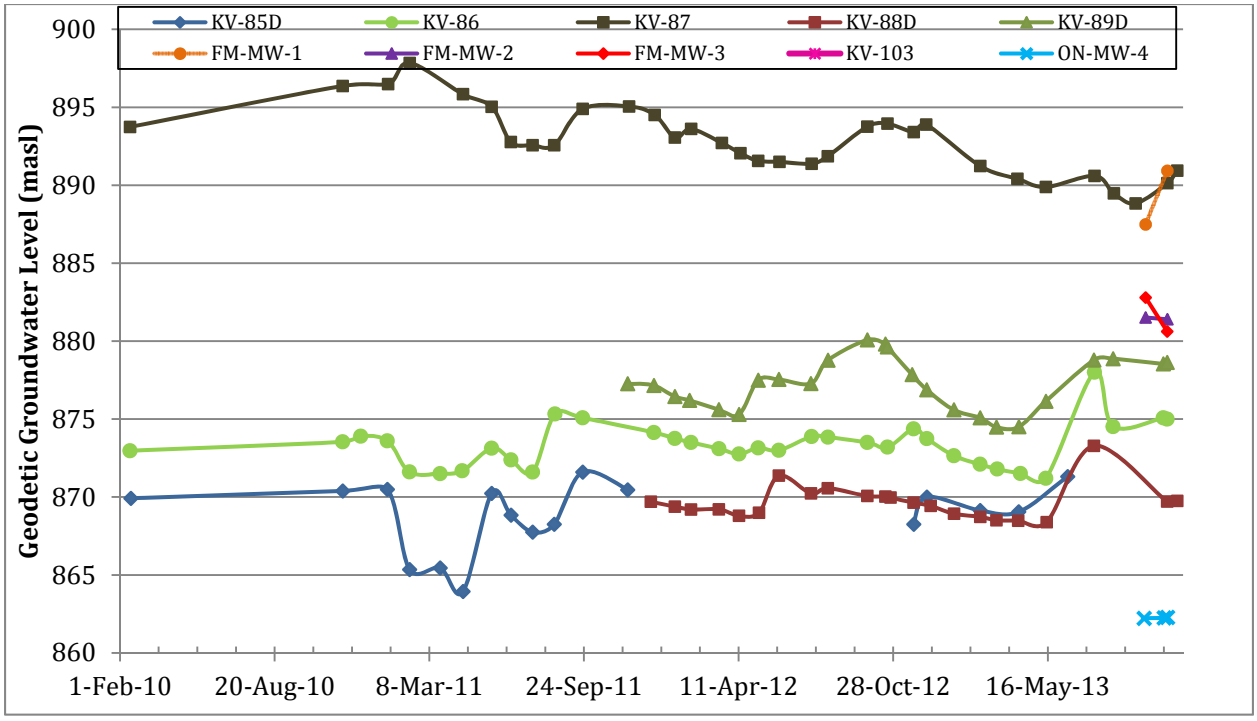


Figure 8-10 District Mill Area Groundwater Water Levels

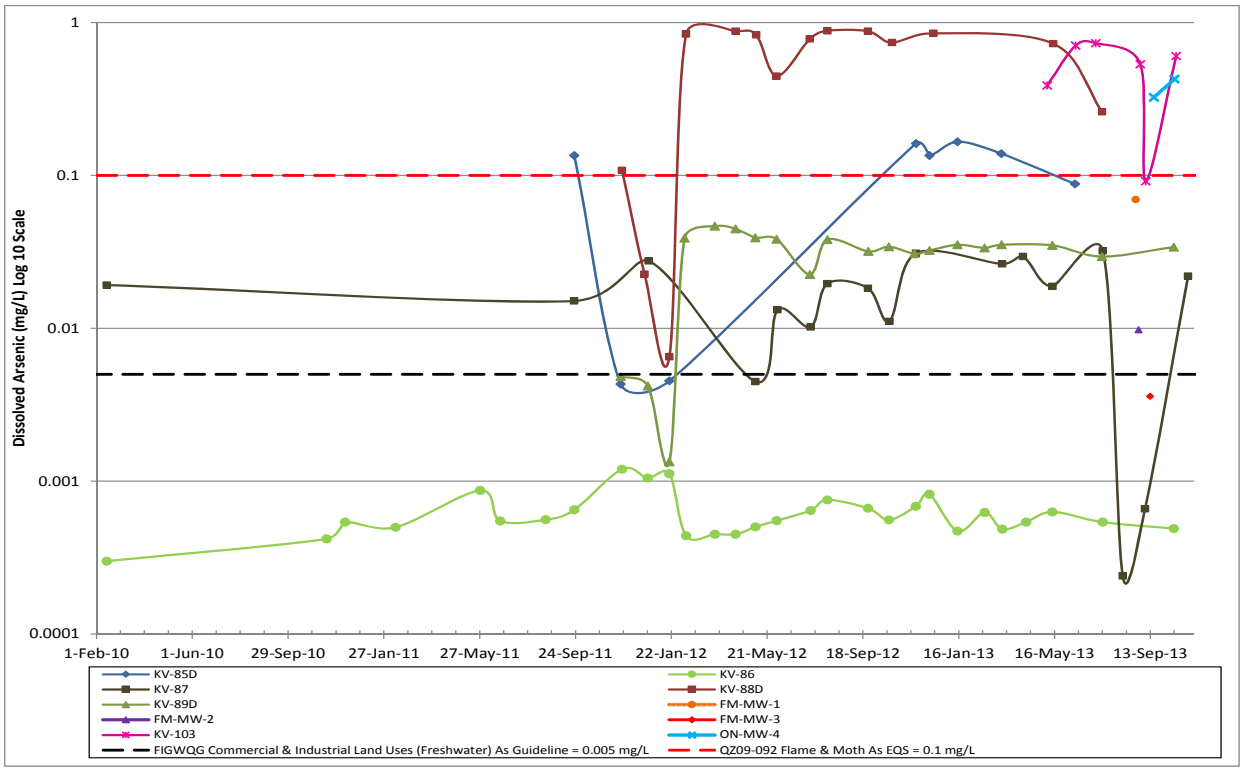


Figure 8-11 District Mill Area Groundwater Arsenic Concentrations

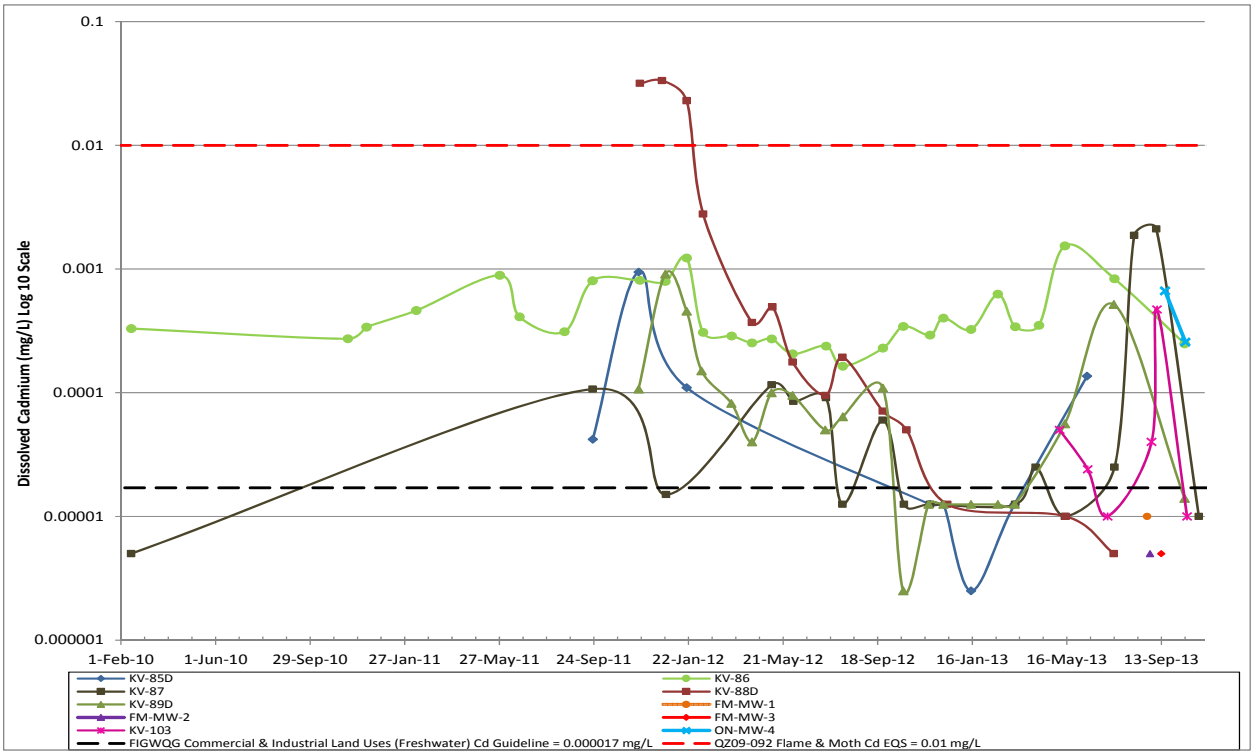


Figure 8-12 District Mill Area Groundwater Cadmium Concentrations

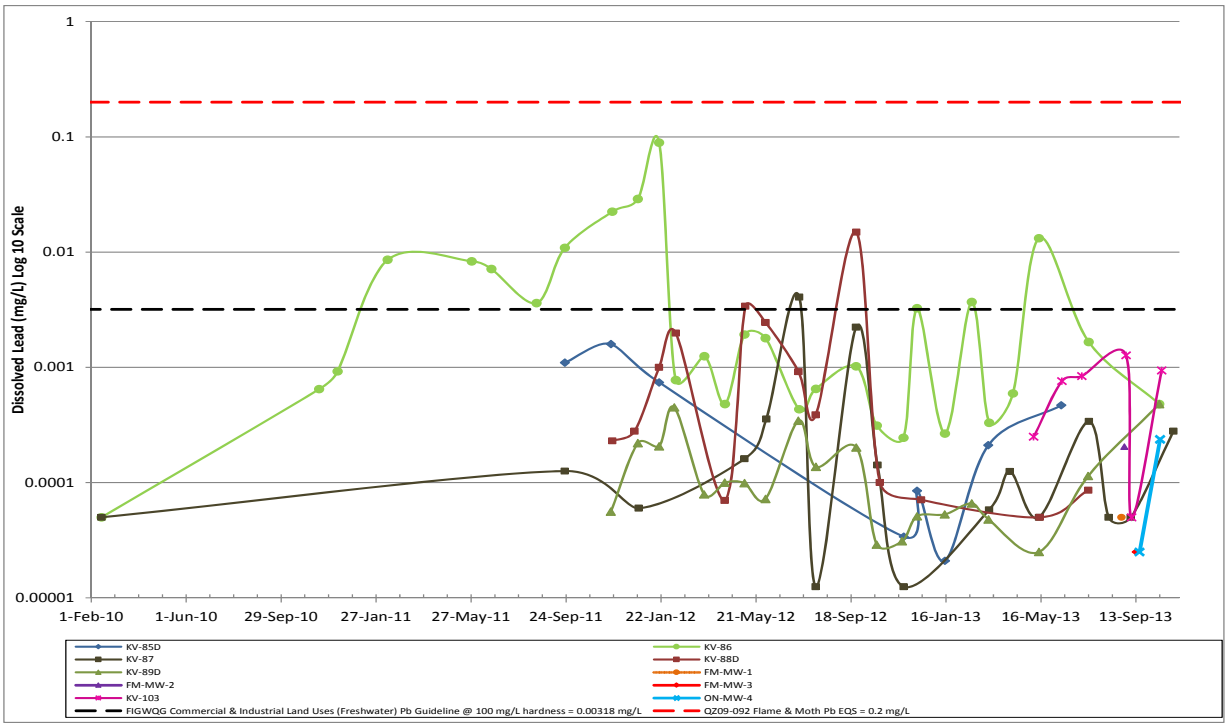


Figure 8-13 District Mill Area Groundwater Lead Concentrations

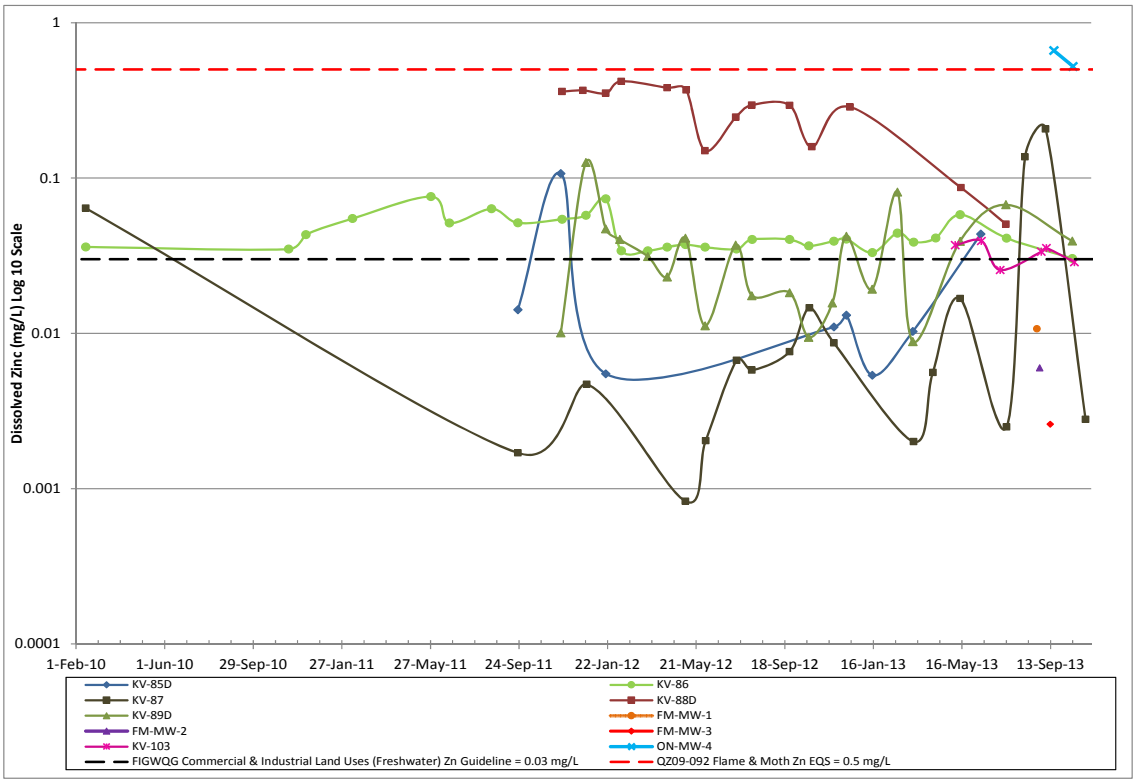


Figure 8-14 District Mill Area Groundwater Zinc Concentrations

8.2 WATER MANAGEMENT

8.2.1 Water Management

The proposed Flame and Moth underground development and production will require up to 141.1 m^3/day, which includes a contingency of 25%. Daily water usage during ongoing underground mine development and operation is estimated at 112.1 m^3/day when mining at an estimated maximum rate of 400 tpd. This water will be used to support activities including percussion drilling, dust suppression, equipment cooling and minor use for sanitation. The site infrastructure and water management structures for Flame and Moth are shown on Figure 8-15.

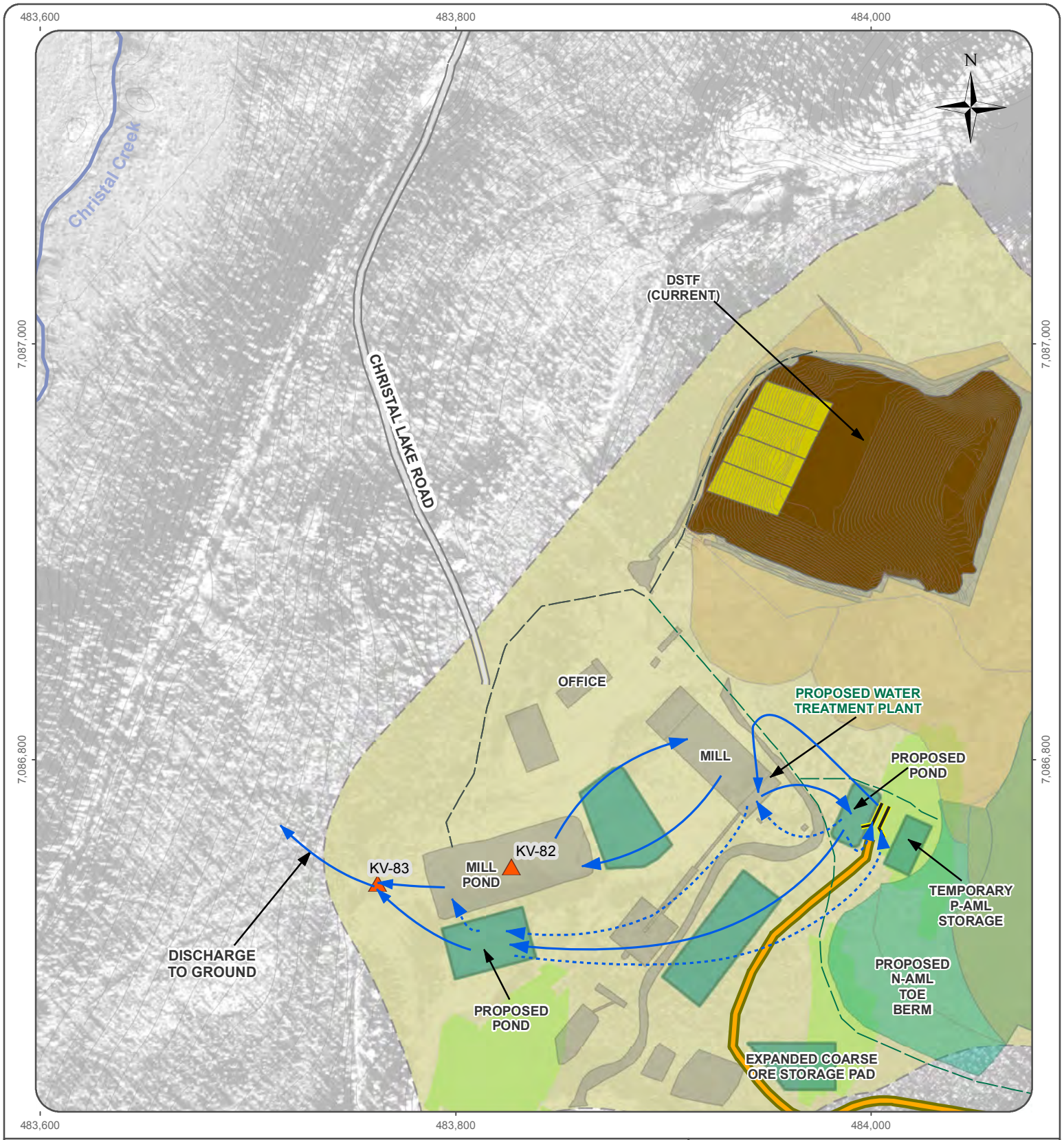
To the greatest degree possible, reused process water from the underground workings will be the primary source of water for Flame and Moth mine. This water will be supplemented by water sourced from groundwater encountered in the underground workings and any additional water initially will be sourced from the well supplying the Mill which currently is licenced at a rate of 81 m^3/day. Water will be pumped out of the workings into the proposed water treatment plant which includes an aeration pond (1,500 m^3) located adjacent to the Flame and Moth portal. There it will be treated via the proposed water treatment plant to meet the proposed standards. If further ammonia treatment is required, it will be sent for an additional water treatment step. Water with then be discharged to a receiving pond (1,500 m^3) prior to being discharged to ground. The overall Flame and Moth Mine water management schematic is presented in Figure 8-15.

Variations in water quality in the reused water from the underground workings may necessitate using the mill supply well or treated water for the proposed water treatment plant in addition to the reuse of water from underground. For example, poor settling of suspended solids in the underground sumps may limit the use of this water with equipment due to potential damage of mechanical systems. Makeup water could then be sourced from mill supply well or the proposed water treatment plant in this situation.

Operational changes underground may also result in an extended period where water used in the underground workings is not available for reuse. Water from the mill supply well or treated water for the proposed water treatment plant would be used to supplement mine operations requirements in these cases.

In terms of protocols and decision-making, the Mine Manager is the primary person responsible for determining if certain scenarios would require alternative water sources. In conjunction with Alexco Environmental Group support professionals, the decision would then be made to withdraw water from the mill supply well or use water from the proposed water treatment plant.

A diversion ditch will be excavated up gradient of the Flame & Moth portal (Figure 8-15). The purpose of this ditch is to divert surface water runoff from above the portal from reaching the portal pad and associated infrastructure, including the proposed pond. The ditch will run west from above the portal diverting the water to the diversion ditch being proposed for the dry stack tailings facility expansion. The surface water to be managed is intended to be minimal at the portal site and is designed to accommodate the 24 hour maximum rain event of 37.7 mm which was calculated for the Onek 990 mine which is at 990masl. This estimate is conservative as the Flame & Moth portal will be at a lower elevation (910masl), and thus a smaller 24 hour rain event would be expected.



Surface Water Quality Station
Proposed Road
Existing Diversion Ditch
Proposed Diversion Ditch
Christal Lake Road
Watercourse
Flow Direction
Alternate Flow Direction
Mill Site Footprint
Proposed Features
DSTF Cover and Revegetation Phase I
As Built, DSTF, Sept 2013
DSTF 322,000 Tonnes Design
Buildings/Structures

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 8-15

FLAME AND MOTH - WATER MANAGEMENT

NOVEMBER 2013

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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(*Last edited by: jpan; 2013-11-29/11:03 AM*)

8.2.2 Flame and Moth Mine Water Balance

A monthly water balance was developed for the Flame and Moth Mine to calculate the maximum potential discharge rate from the proposed mining activities at 270 m below ground surface. The water balances for the Flame and Moth mine at 200 and 400tpd including groundwater inflows, mine water supply sources, water storage sources such as ore (5%), waste rock (5%) and tailings backfill are presented in Table 8-8. A schematic showing the water conveyance is presented in Figure 8-15. The water management plan for the Keno Hill Silver District Mining Operations has been updated to include Flame and Moth, which is included as Appendix Q.

Table 8-8 Flame and Moth Mine Water Balance at 270m below ground surface, 200 tpd and 400tpd

200 tpd	Inputs (m^3/day)	Outputs (m^3/day)					Output (L/s)
Month	Groundwater	Water in Ore	Water In Waste Rock	Water to Septic	Tailings Paste Backfill	Adit discharge	Adit discharge
Jan	3025	10	5.3	1.4	40	2968.3	34.3
Feb	3025	10	5.3	1.4	40	2968.3	34.3
Mar	3025	10	5.3	1.4	40	2968.3	34.3
Apr	3025	10	5.3	1.4	40	2968.3	34.3
May	3025	10	5.3	1.4	40	2968.3	34.3
Jun	3025	10	5.3	1.4	40	2968.3	34.3
Jul	3025	10	5.3	1.4	40	2968.3	34.3
Aug	3025	10	5.3	1.4	40	2968.3	34.3
Sep	3025	10	5.3	1.4	40	2968.3	34.3
Oct	3025	10	5.3	1.4	40	2968.3	34.3
Nov	3025	10	5.3	1.4	40	2968.3	34.3
Dec	3025	10	5.3	1.4	40	2968.3	34.3
400 tpd	Inputs (m^3/day)	Outputs (m^3/day)					Output (L/s)
Month	Groundwater	Water in Ore	Water In Waste Rock	Water to Septic	Tailings Paste Backfill	Adit discharge	Adit discharge
Jan	3025	20	10.7	1.4	80	2912.9	33.7
Feb	3025	20	10.7	1.4	80	2912.9	33.7
Mar	3025	20	10.7	1.4	80	2912.9	33.7
Apr	3025	20	10.7	1.4	80	2912.9	33.7
May	3025	20	10.7	1.4	80	2912.9	33.7
Jun	3025	20	10.7	1.4	80	2912.9	33.7
Jul	3025	20	10.7	1.4	80	2912.9	33.7
Aug	3025	20	10.7	1.4	80	2912.9	33.7
Sep	3025	20	10.7	1.4	80	2912.9	33.7
Oct	3025	20	10.7	1.4	80	2912.9	33.7
Nov	3025	20	10.7	1.4	80	2912.9	33.7
Dec	3025	20	10.7	1.4	80	2912.9	33.7

8.2.3 Water Treatment Plant

Alexco is proposing to construct a water treatment plant to treat water from the Flame and Moth mine. Alexco is currently proposing to discharge the water consistent with the effluent quality standards established in Part D, Clause 40 of water licence QZ12-053 for the Keno District Mill. Within this section, Alexco provides a breakdown of the proposed water treatment process to ensure the discharged water from the Flame and Moth site meets the proposed effluent quality standards (Table 8-12).

Alexco has been treating water successfully for the past seven years in the Keno Hill Silver District as part of care and maintenance of the Silver King, Galkeno 300 and Galkeno 900 sites and mining operations at the Bellekeno mine. The four sites mentioned above each provide unique water treatment challenges which has provided Alexco with the experience to design water treatment plants for a wide range of contaminants and flow rates in the District. The design of the water treatment plant for the Flame and Moth mine has been designed based on the experience gained through the operations of the above water treatment facilities.

The Flame and Moth mine will require continual dewatering, with discharge flows dependent on mine depth. It is estimated that flow rates may reach a maximum of 35 litres per second (lps) with incoming water quality generally compliant except for some metals (current groundwater wells show some iron and zinc), and with elevated levels of ammonia and total suspended solids from underground mining activities. The new treatment facility would be located adjacent to and within the Keno District Mill, and the processes used in the treatment plant will be comprised of the following general processes:

a) Metals removal as needed with the addition of air, pH adjustment, a polymer, and settling in a clarifier/thickener;

b) Particle removal via a hydrocyclone, clarifier/thickener, and settling pond;

c) Ammonia removal via biological oxidation/degradation processes (with the addition of air and organic carbon) and an optional ion exchange (IX) system for final polishing.

Elements of the Proposed System

Figure 8-16 shows the layout of the proposed Flame and Moth Water Treatment Plant (WTP). All of the systems and technology proposed for the Flame and Moth WTP are proven technologies operating at Keno Hill or elsewhere in the industry. The system operates as follows:

- Water is collected underground and pumped to surface where it passes through one, or several, hydrocyclone(s). At the hydrocyclone, water enters tangentially and spins at the cylindrical entrance. The spinning action causes heavier particles to be thrown toward the wall of the chamber and drift downward, thereby removing total suspended solids. Water, which is less dense than the solids, continues spinning and moves vertically up and out of the unit.

- Water then passes through an aeration tower where high volumes of air and water are intimately mixed allowing for the oxidation of iron and air stripping of ammonia nitrogen (NH_3).

- Water then flows into a rapid mix tank where it is mechanically agitated and reagents are added to adjust the pH. By raising the pH, a small portion of the ammonia is transformed into a dissolved gas, and some treatment of ammonia occurs in the rapid mix tank and subsequent settling. A polymer is added to densify the sludge and in the future, additional reagents such as coagulant aids may be added into the reactor to remove other metals if determined necessary during plant commissioning.

- Water flows from the rapid mix tank into the clarifier settling body where heavier particles accumulate at the bottom of the cone as sludge. This sludge is pulled from the clarifier by a sludge blow-down system and sent to a thickener.

- Sludge and heavier particles from both the clarifier and hydrocyclone enter an optional thickener which increases the percent solids of this combined slurry before sending the sludge to either textile dewatering bags, the Bellekeno sludge disposal cell located in the Valley Tailings or the mill filter presses and dry stack tailings facility. The overflow from the thickener is sent to the rapid mix tank for additional treatment. The Sludge Management Plan under Water Licence QZ12-053 is presented in Appendix Q.

- Water from the clarifier travels vertically up and out of the settling body where it enters the aeration and treatment portion of a lined pond.

- Within the pond, both air and an optional organic carbon source are added. As an example, the optional organic carbon may be either an alcohol (methanol/ethanol) or a sugar source (corn syrup or molasses), in very low concentrations. In addition, a phosphate nutrient in the form of phosphoric acid or an organic phosphate source may be added with the organic carbon source. These organic carbon/phosphate nutrients support biological treatment processes for the removal/breakdown of remaining ammonia within the pond. Air will also be injected to create an aerobic condition throughout the pond.

- The pond is separated with baffling to divide the aeration and ammonia removal portion of the pond from the settling and equalization portion. Once water enters the settling and equalization area, residence time will allow for final particle removal and polishing of the treated water.

- Water can then be decanted from the pond for discharge, sent to the mill as make-up water, reused within the Flame and Moth underground activities, or pumped to an optional ion exchange ammonia removal system for final treatment.

- If additional ammonia removal is necessary, water will be transferred via a submersible pump to an ion exchange system. Resins within the ion exchange tanks sorb ammonia until they reach a maximum threshold at which time each tank must be regenerated with a salt water (brine) solution. This solution is pumped into one tank at a time, while the remaining tanks continue to remove ammonia prior to discharge. The brine/ammonia solution is collected and pumped to the brine/ammonia tank where it is disposed.

- Finally, the effluent from the ion exchange passes through a flow meter with a totalizer that tracks the total amount of discharged water that has passed through the system before it passes the Monitoring and Release Point (lined pond) where it passes to the environment.

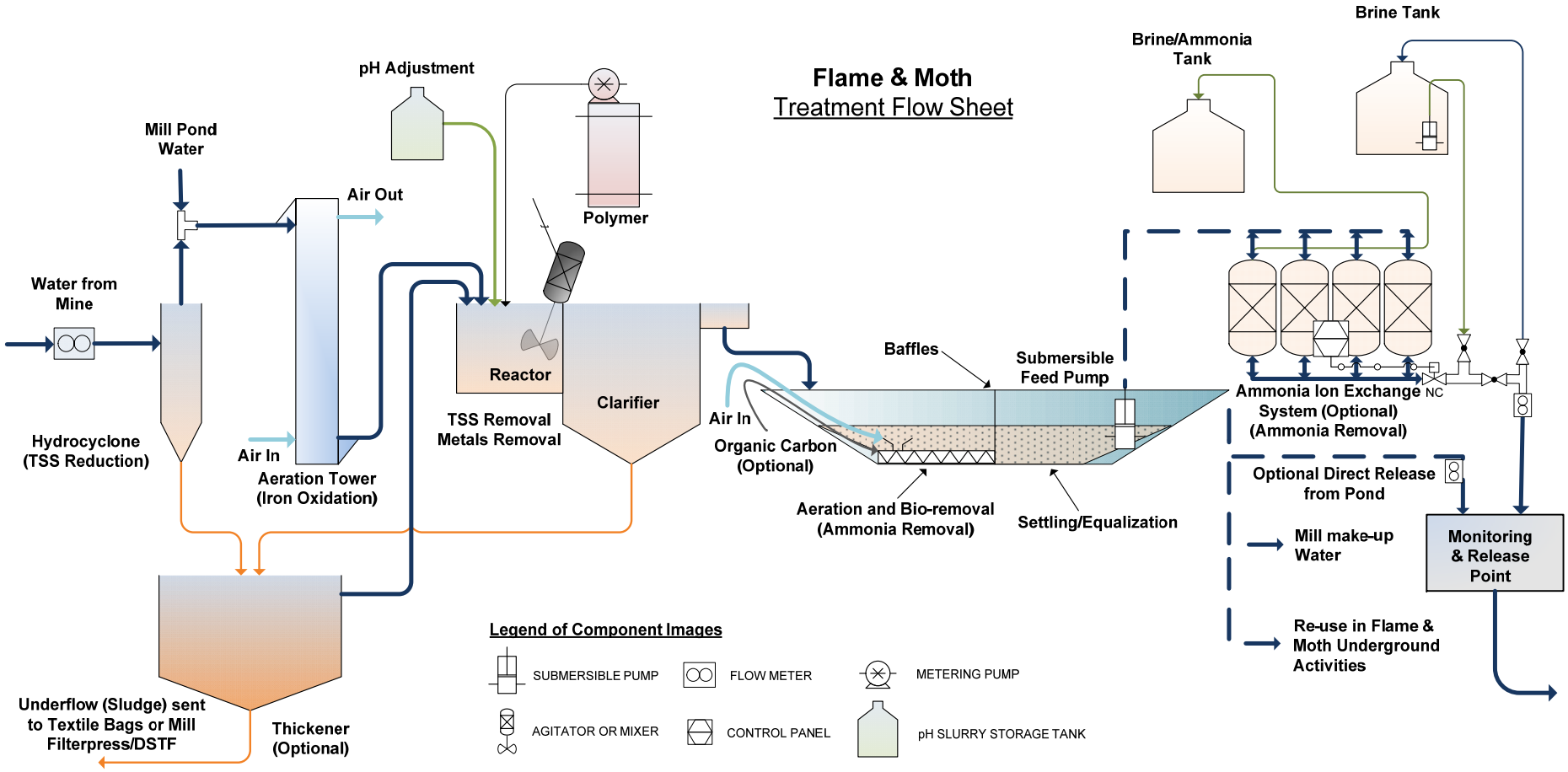


Figure 8-16 Flame and Moth Water Treatment Plant Flow sheet

8.3 CHRISTAL CREEK MASS LOADING MODEL RESULTS SUMMARY

A mass load model for Christal Creek was developed by Interralogic, Inc. using Goldsim simulation framework. The model was initially prepared for simulating metal loads in Christal Creek and to evaluate the reclamation options (currently being developed) for the Keno Hill Silver District Type 2 Abandoned Mines. Interralogic's revised draft report, Chemical Mass Load Model for Christal Creek: Description and results: 2013 update (Attachment A of Appendix R), dated November 12, 2013, provides a detailed description of the development of the model, including the loading sources, key assumptions, stochastic parameters and model calibration. The model has been recalibrated up to July 2013. The GoldSim model has also been updated to include potential loadings from the proposed Flame and Moth mine including N-AML waste rock and mine discharge for cadmium and zinc, the contaminants of concern (Minnow, 2013). Additional parameters for the model were not included as the N-AML waste rock humidity cell leaching rates (Access, 2013) and the deep ground water sampled from the three deep wells (FM-MW-1, FM-MW-2, FM-MW-3) did not identify any additional parameters of potential concern. Figure 8-17 is a schematic of the loading sources and monitoring locations within Christal Creek watershed.

The load model calculates metal loadings for three phases of the project: pre-mining, operations, and reclamation and post-closure. The load model calculates metal loading results for Christal Creek from 2008 to September 30, 2014 (during the initial decline development period when no discharge is anticipated) without any potential loading from the proposed mining activities from the Flame and Moth Mine. The model then accounts for operating the Flame and Moth mines from October 1, 2014 to December 31, 2020 at the maximum mining rate of 400 tonnes per day (tpd). The loading model incorporates potential loadings for the reclamation and post closure phase (2021 to 2030).

The loading model results include scenarios including a set of potential future reclamation options for the historic United Keno Hill Mines (UKHM) sites. Elsa Reclamation and Development Company Ltd. (ERDC), a subsidiary of Alexco, has been retained by the Government of Canada, to develop a district closure plan for the historic mines that were abandoned by United Keno Hill Mining Corp. On November 19, 2013, ERDC distributed a revised Keno District Closure Options Report (ERDC, 2013) and the Closure options evaluation workshops are scheduled to occur in December 2013. As the preferred Closure options for the Keno District have not been chosen at this time, a set of closure options for the Christal Creek watershed were selected for comparison purposes only to assess the potential impact from the Flame and Moth mine on the potential reclamation activities associated with District closure. The reclamation options chosen for this memo were done based on postulation and do not necessarily reflect the preferred option in Alexco's opinion nor the preferred option to be potentially assessed in YESAB. The reclamation options modeled for the Onek 400 discharge, Galkeno 300, Galkeno 900, Mackeno tailings and historic waste rock are:

- Option 3a for the Onek 400 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 3b for the Galkeno 300 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 3b for the Galkeno 900 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 1a for the Mackeno tailings, cover and close in place with lime addition; and
- Option 1a for waste rock, regrade and cover.

It is currently estimated that the reclamation of the historic mines in the Keno District will have been assessed, permitted and funded in late 2018 or early 2019. The model assumes the Keno District Closure construction begins in 2019, but the Silver Trail highway water treatment plant isn't commissioned and in operation until October 1, 2019.

This memo presents the results from four modelling scenarios for the Christal Creek watershed, which are:

- Base case: Operations of Bellekeno, Onek and Lucky Queen mines with no reclamation of the historic UKHM mines sites as licenced under QML-0009 and QZ12-053;
- Base Case and District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with reclamation of the historic UKHM mines sites (400 tpd scenario from these 3 mines sources);
- Base Case with the Flame and Moth Mine and District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with Flame and Moth and reclamation of the historic UKHM mines sites (400 tpd scenario from these 4 mine sources);
  Base Case and Flame and Moth mine without District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with Flame and Moth and reclamation of the historic UKHM mines sites (400 tpd scenario from these 4 mine sources);

8.3.1 Loading Sources

The loading sources for the Alexco mining operations have been broken out into currently licenced (Bellekeno, Onek 990, and Lucky Queen Mines), which present the base case. While the load sources for the proposed Flame and Moth Mine are presented below. In all of these scenarios, the Bellekeno mine is assumed to always discharge a load since even when the mine is not operating, the mine is either flooded or pumped down and discharged, which occurs into the Lightning Creek watershed. Similarly, Lucky Queen has a longterm discharge even under no mining conditions.

Proposed Load Source: Flame and Moth Mine Discharge via District Mill

The Flame and Moth Mine will be developed below the water table, but will not have discharge following the closure of the mine as the proposed portal location is located more than 20m above the groundwater table. Interralogic Inc. has predicted a conservative maximum mine inflow rate of 35 L/s (Appendix C) for the Mine at 270m below ground surface. The Flame and Moth mine discharge rate used for the load model was developed on a monthly time step taken from the water balance prepared for the YESAB Flame and Moth Project proposal, which incorporated Interralogic's mine inflow predictions. The Flame and Moth mine discharge for 400tpd is shown in Table 8-9. The model assumes that water infiltration into the Flame and Moth underground workings increases at depth as the mine is developed until it reaches a maximum 35 L/s.

Table 8-9 Flame and Moth Discharge (L/s) at 400 tpd

	2014	2015	2016	2017	2018	2019	2020	2021-30
January	0	21.7	22.7	22.7	26.7	26.7	29.7	0
February	0	21.7	22.7	22.7	26.7	26.7	29.7	0
March	0	21.7	22.7	22.7	26.7	26.7	29.7	0
April	0	21.7	22.7	22.7	26.7	26.7	29.7	0
May	0	21.7	22.7	22.7	26.7	26.7	29.7	0
June	0	21.7	22.7	22.7	26.7	26.7	29.7	0
July	0	20.7	22.7	22.7	26.7	26.7	29.7	0
August	0	20.7	22.7	22.7	26.7	26.7	29.7	0
September	0	20.7	22.7	22.7	26.7	26.7	29.7	0
October	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0
November	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0
December	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0

Alexco proposes to discharge treated mine water from the Flame and Moth mine via a proposed water treatment plant located in the District Mill at the existing Effluent Quality Standards (EQS) established for the District Mill (KV-83) in Water Licence QZ12-053 (Table 8-10). As the model is completed in monthly time steps, the model has incorporated conservative discharge concentrations presented in Table 8-10. The project expects to discharge on a regular basis given its experience treating water in the district at four water treatment plants (Galkeno 300, Galkeno 900, Silver King and Bellekeno 625). The model has included a concentration of 0.25 mg/L zinc, which is the upper 98th percentile for concentrations discharge to date at the Bellekeno 625 mine water treatment plant, while the cadmium concentration of 0.001 mg/L is the 90th percentile for the Bellekeno 625 mine water treatment plant discharge. The Flame and Moth discharge concentrations used in the model represent conservative loading rates given the experience at the Bellekeno Mine, yet discharge up to the Effluent Quality Standards are anticipated to be infrequent during the mine life, therefore the concentrations used in the model are appropriate to determine potential environmental effects.

Additionally, the concentrations for cadmium and zinc in the three deep groundwater wells are well below the discharge quality used in the model. The cadmium concentration in wells FM-MW-1, FM-MW-2 and FMW-2 ranged from <0.00001 to <0.00002 mg/L, while zinc concentrations ranged from 0.0026 mg/L to 0.0107 mg/L (all below the CCME guidelines). Through the closure planning process for the historic United Keno Hill Mines, zinc and cadmium have been demonstrated to be the Contaminants of Concern (COC) for aquatic effects and therefore are the appropriate metals to assess.

Table 8-10 Flame and Moth Discharge Water Quality (mg/L)

	Discharge	District Mill Effluent Quality Standards (KV-83) under QZ12-053	Percentile concentration of Bellekeno Discharge (KV-43)
Zinc	0.25	0.5	98th percentile
Cadmium	0.001	0.01	90th percentile

Proposed Load Source: Flame and Moth N-AML Waste Rock

The load rates for Flame and Moth N-AML waste rock (137,105 tonnes) used as construction are calculated with placement starting October 1st of 2014 and ending December 31st, 2015 (38,711 tonnes in 2014 and 98,394 tonnes in 2015). The waste rock from Flame and Moth will only be deposited in the Christal Creek catchment for the purpose of road building, toe berm for the dry stack tailings facility, expanded coarse ore stock pad and mill yard expansion. A portion of this N-AML rock may get backfilled underground if not required for construction purposes. No P-AML rock will be left on surface at closure.

The metal loading rates for the Flame and Moth N-AML waste rock were based on the upper quartile from the first 19 weeks of humidity cell data which are presented in Table 8-11. The humidity cell raw data is presented in Access Consulting Group's Flame and Moth Geochemical Characterization report (Appendix K).

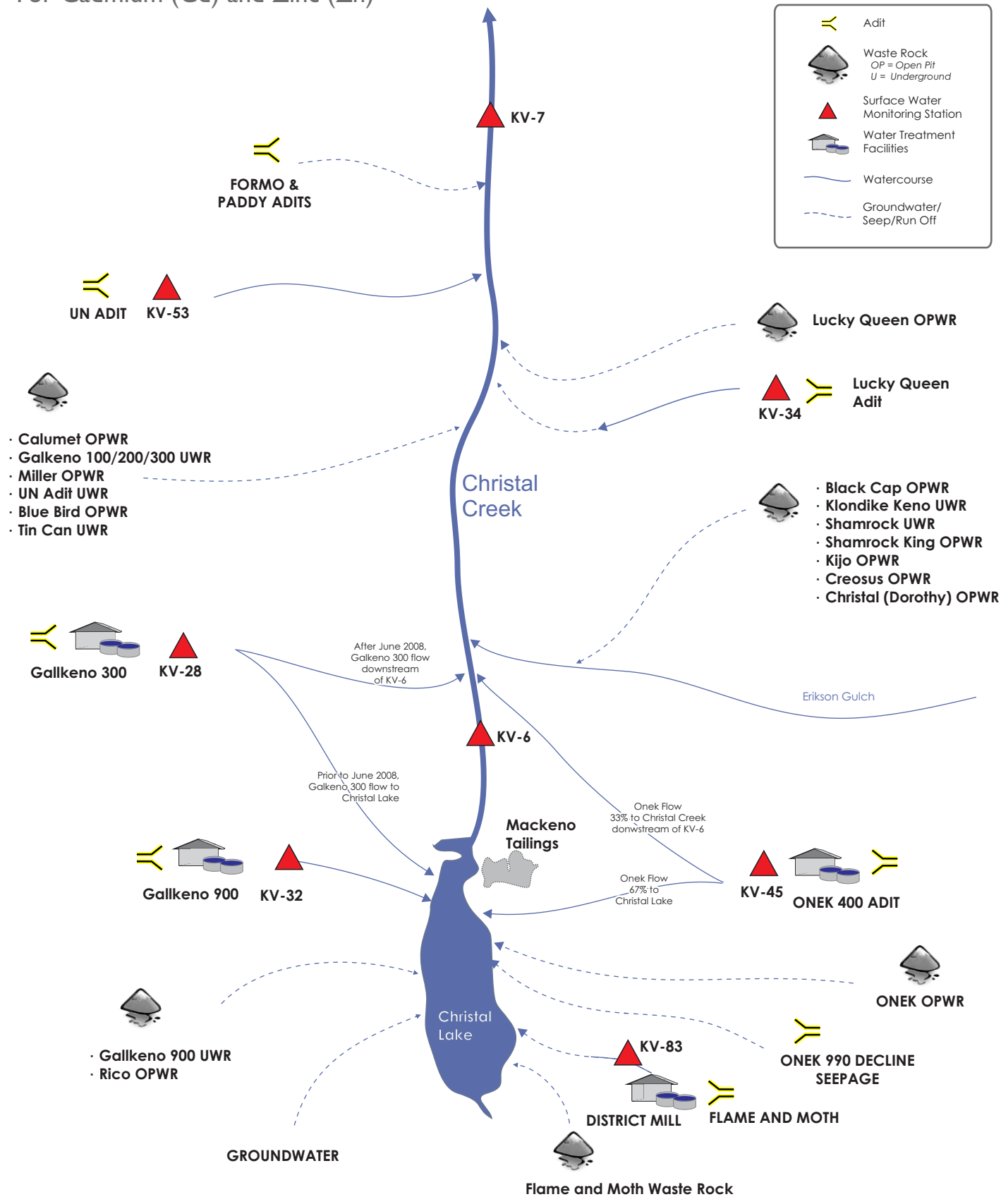
Table 8-11 Flame and Moth N-AML Waste Rock Loading Rates

	Loading Rate (Kg/Kg*year)
Zinc	$7.41*10^{-8}$
Cadmium	$3.69*10^{-10}$

Cadmium & zinc attenuation was not activated for the scenarios presented for the Flame and Moth mine. It should be noted that the loading model presented to YESAB for the Onek and Lucy Queen model assumed attenuation occurred at a natural attenuation factor of 12% for zinc and 3%.

CHRYSTAL CREEK MASS LOADING MODEL SCHEMATIC

For Cadmium (Cd) and Zinc (Zn)



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CONCEPTUAL DRAWING; FEATURES ARE NOT TO SCALE

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FIGURE 8-17 - CHRISTAL CREEK MASS LOADING MODEL SCHEMATIC

OCTOBER 2013

D:\Project\AllProjects\ALEX-05-01\Presentation Materials\Figures\Loading Models (all Years)\Schematics\ChristalCr20131022.cdr

8.3.2 Results

The mass load model for Christal Creek was run for the addition of the Flame and Moth Mine and the resulting monthly cadmium and zinc concentrations at KV-6 and KV-7 are presented in Figures 8-18 to 8-25 including the CCME guideline for protection of aquatic life. Station KV-6 is located on Christal Creek upstream of the Silver Trail highway and is located just downstream from the outlet of Christal Lake. Station KV-7 is located on Christal Creek at the Hansen Lake road, ~7km downstream of KV-6 and ~4km upstream of the confluence with the South McQuesten River. The concentrations observed at KV-7 include the loadings from the historic and active mines within the Christal Creek watershed. The CCME guidelines for hardness for cadmium was calculated at a hardness of 300 mg/L $CaCO_3$ for KV-6 and KV-7, which are conservative as the hardness for both those sites are typically range from 300 to 600 mg/L $CaCO_3$.

The model results for the Flame and Moth deposit show no significant increase in metal concentrations in the receiving environment are anticipated neither in magnitude or duration in the aquatic environment. The largest loading source, Flame and Moth Mine discharge, is only of short duration and will cease at the end of the mine life. The cadmium concentrations presented in Figures 8-18 through Figure 8-21 for KV-6 and KV-7 shows no significant change in baseline with the addition of the Flame and Moth Mine (discharge and waste rock) nor does it show a change to the cadmium concentrations when the District Closure measures are applied to Galkeno 300, Galkeno 900, Onek 400, Mackeno tailings and waste rock.

The zinc concentrations presented in Figure 8-22 to Figure 8-25 also show no significant change with the addition of the Flame and Moth Mine to the base case or the implementation of the assumed district closure options. Therefore, the Flame and Moth Mine does not result in any significant short term (operations) or long term (post-closure) metal concentrations when run in conjunction with the implementation of District Closure in the Christal Creek watershed. Therefore, no significant adverse effects to water quality are expected from the Flame and Moth Mine.

8.3.3 Monitoring

An extensive water quality surveillance network is in place at the site through Water Licence QZ12-053 and monitoring will continue during development of the Flame and Moth deposit to update site data and provide further information for closure planning. Additional monitoring locations and frequency have been identified in the revised Project Proposal submitted to YESAB to reflect the proposed mining activities. As part of ongoing closure planning, the water balance and mass loading calculations will be continually re-visited and updated.

8.3.4 Adaptive Management

The Adaptive Management Plan for the Keno Hill Silver District Mining Operations has been developed and will be updated to include the Flame and Moth deposit as part of the Water Licence application. The Adaptive Management Plan will be updated and submitted to the Water Board, which will specifically include events for changes in water quality or quantity in Christal Creek, mine adit water quality changes and District Mill groundwater quality changes, in addition to issues such as sludge and waste rock management providing

assurance that no significant impacts to the receiving environment will occur. The AMP will be updated to include the results of the Christal Creek Load Model to evaluate potentially triggered thresholds.

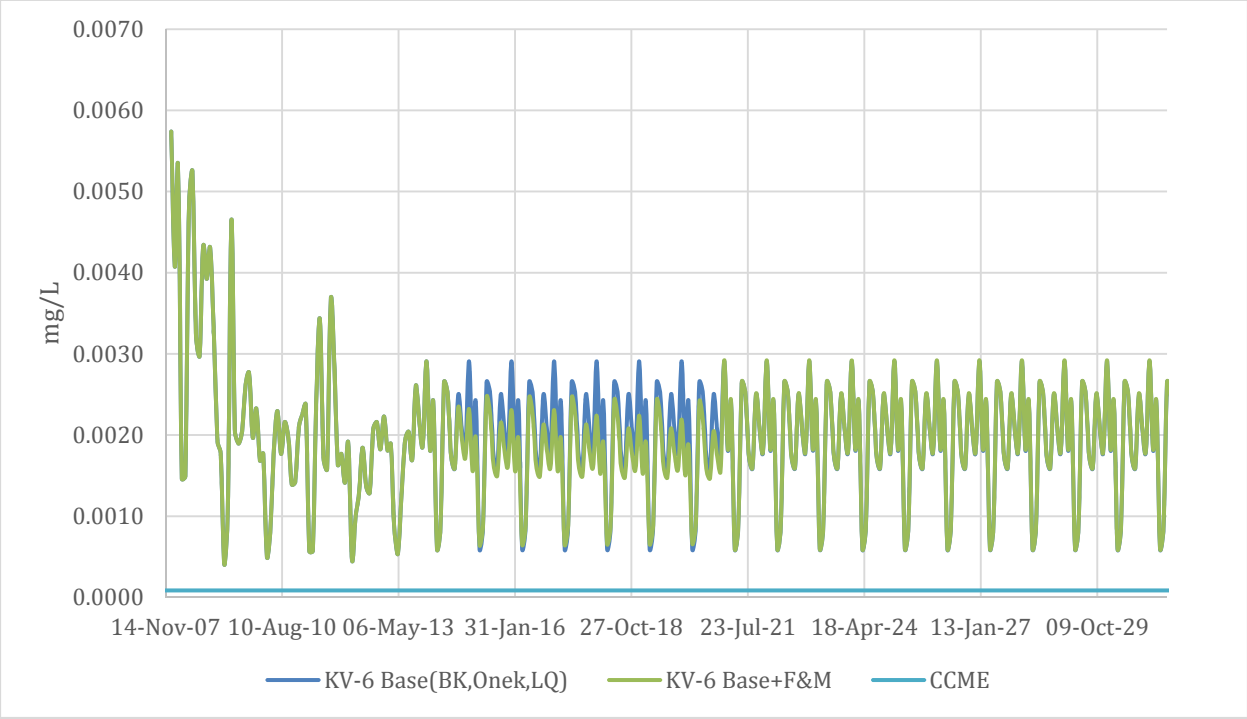


Figure 8-18 1 Calculated Total Cadmium at KV-6, Base Case vs. Base Case plus Flame and Moth

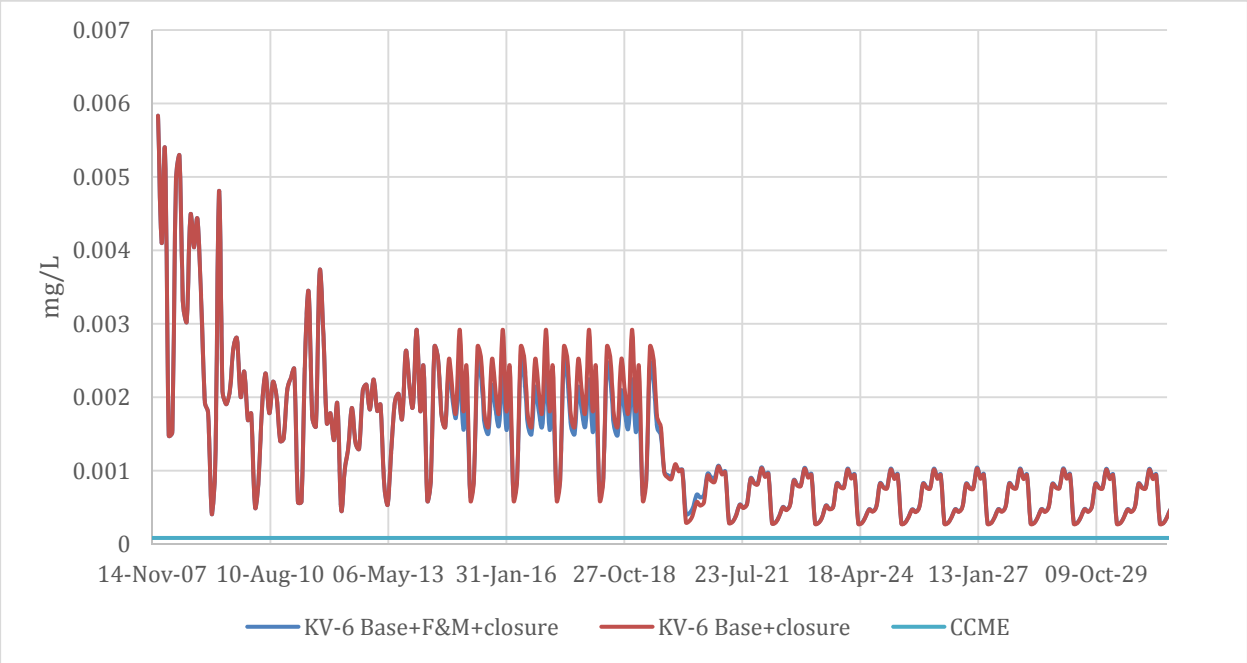


Figure 8-19 Calculated Total Cadmium at KV-6, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

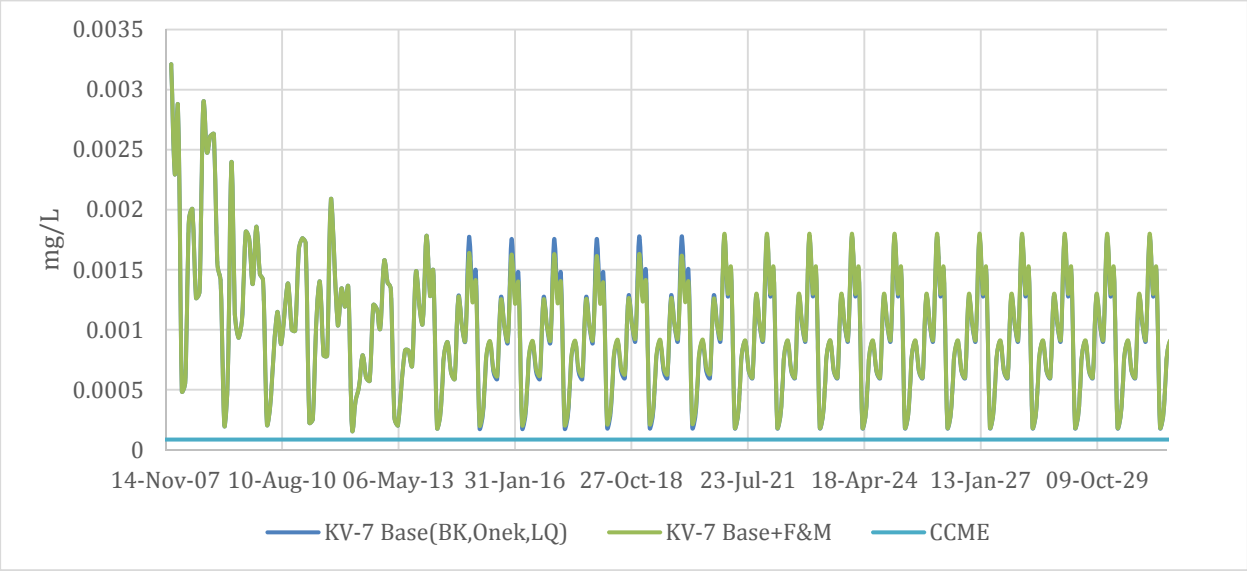


Figure 8-20 Calculated Total Cadmium at KV-7, Base Case vs. Base Case plus Flame and Moth

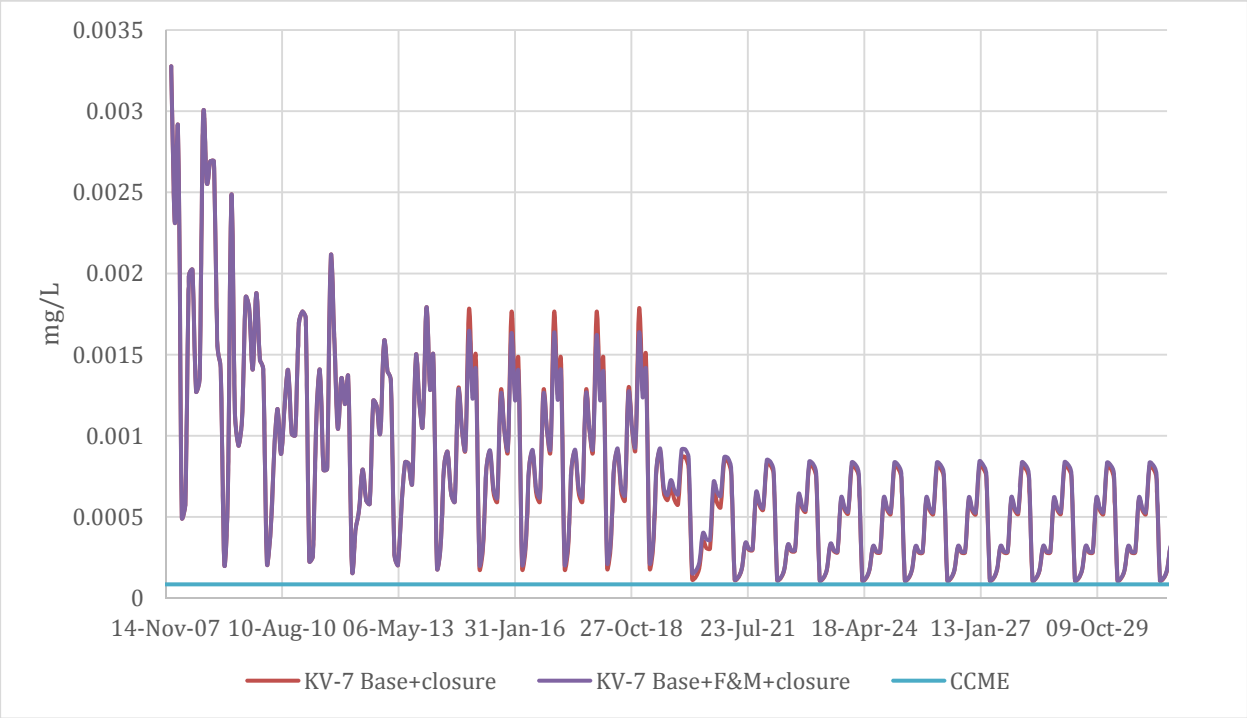


Figure 8-21 Calculated Total Cadmium at KV-7, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

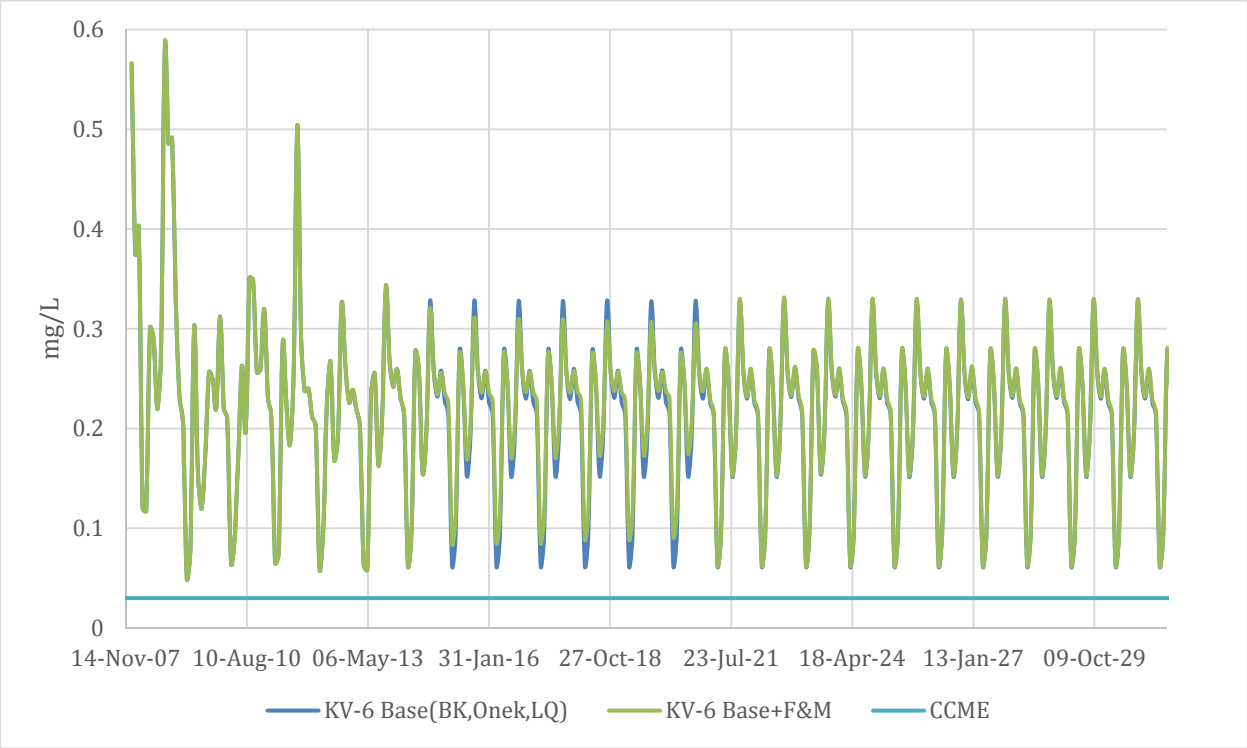


Figure 8-22 Calculated Total Zinc at KV-6, Base Case vs. Base Case plus Flame and Moth

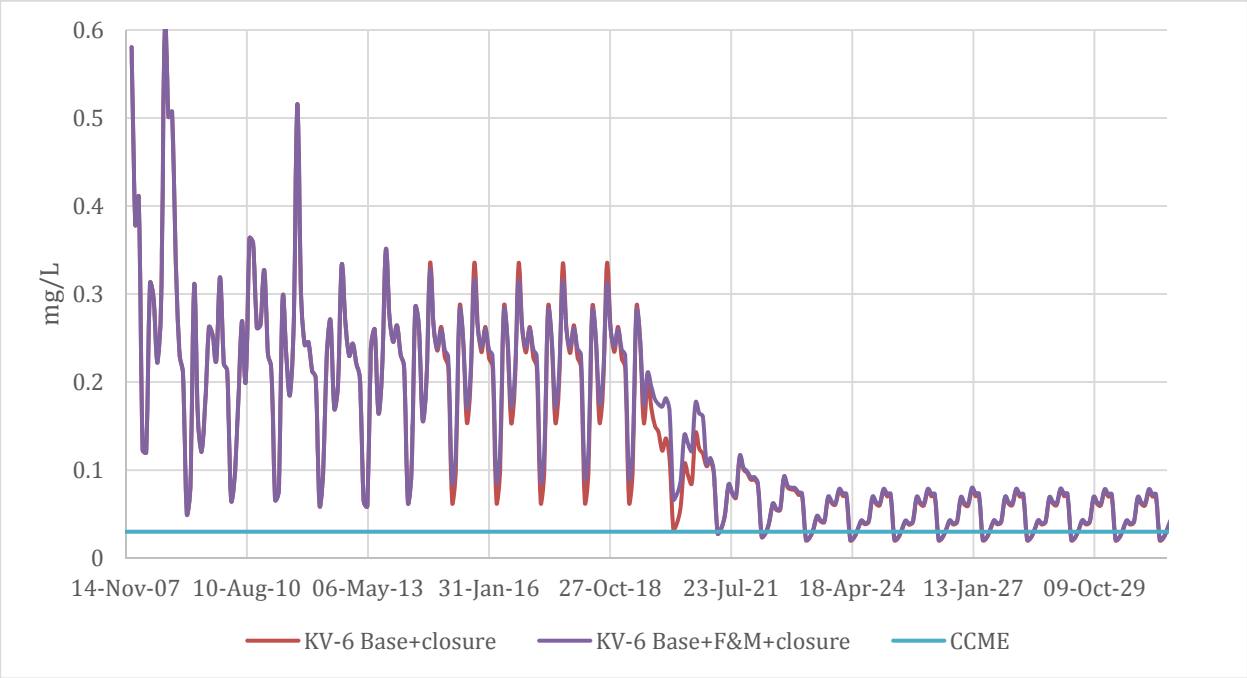


Figure 8-23 Calculated Total Zinc at KV-6, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

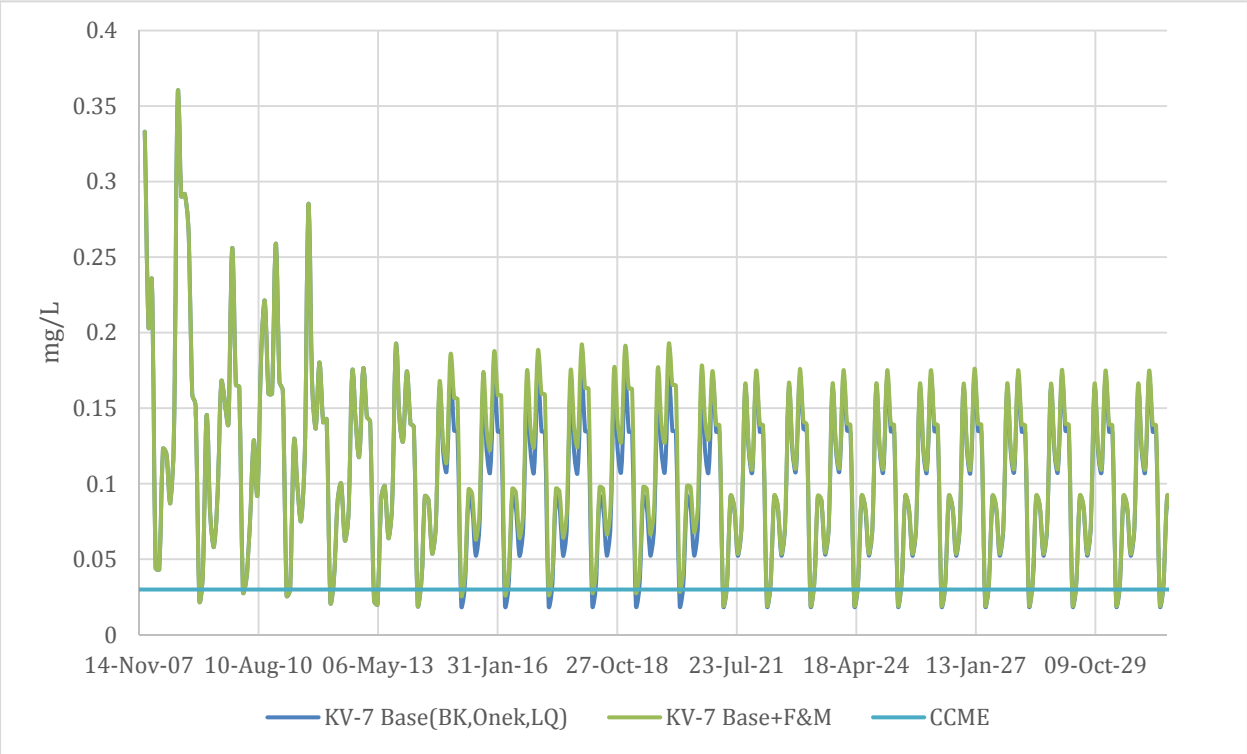


Figure 8-24 Calculated Total Zinc at KV-7, Base Case vs. Base Case plus Flame and Moth

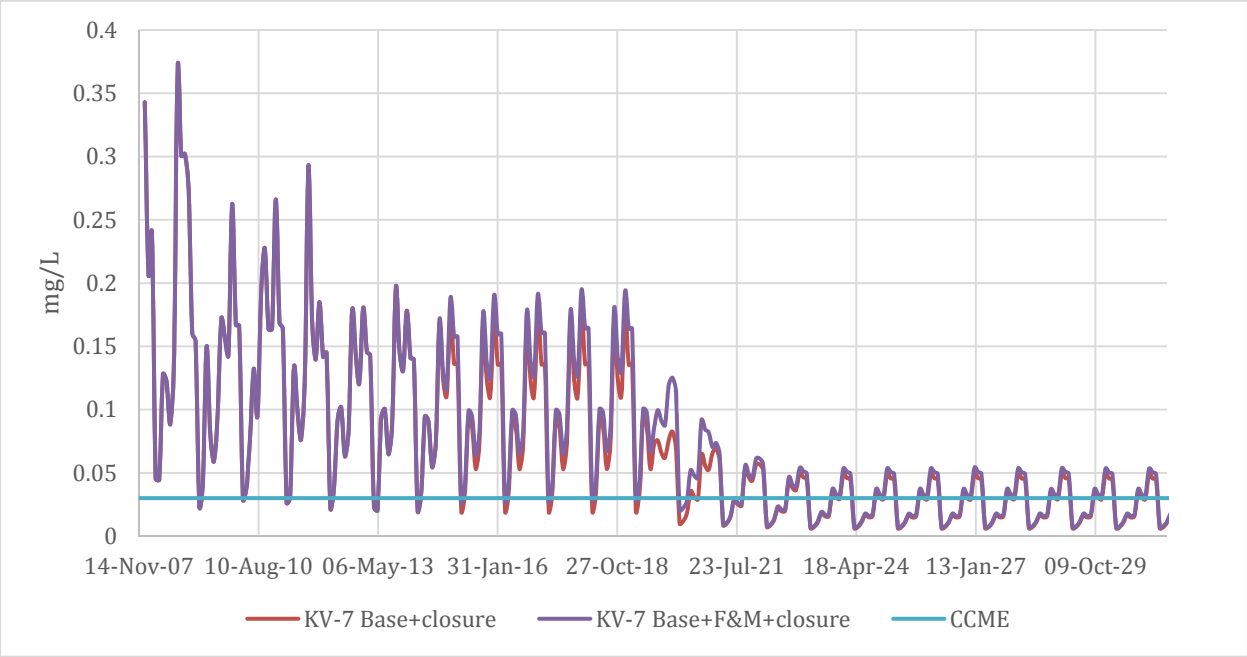


Figure 8-25 Calculated Total Zinc at KV-7, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

8.4 PROPOSED COMPLIANCE POINT AND EFFLUENT QUALITY STANDARDS FOR FLAME AND MOTH MINE DISCHARGE

Alexco is proposing to discharge water from Flame and Moth Mine at the currently established compliance point (KV-83) and EQS for District Mill under water licence QZ12-053. The EQS in place for the District Mill are presented in Table 8-12. The Flame and Moth mine will also become subject to the MMER, which specifies authorized discharge limits of deleterious substances for a number of set parameters.

Table 8-12 Proposed and Existing EQS for Flame and Moth Mine and Mill Discharges

Parameter	Maximum Concentration Grab Sample for Mill Discharge (QZ09-092) at KV-83
pH	6.5 – 9.5
Suspended Solids	25 mg/L
Arsenic (Total)	0.1 mg/L
Cadmium (Total)	0.01 mg/L
Copper (Total)	0.1 mg/L
Lead (Total)	0.2 mg/L
Nickel (Total)	0.5 mg/L
Silver (Total)	0.01 mg/L
Zinc (Total)	0.5 mg/L
Ammonia	5 mg/L
96-hour Rainbow trout	Non-Toxic, LC_{50} (100%)

8.5 CHARACTERIZATION AND MANAGEMENT OF POTENTIAL EFFECTS ON WATER

Significant adverse effects on surface water or groundwater quality/quantity from development and production of the Flame and Moth deposit are not anticipated. The proposed Flame and Moth mine discharge EQS are presented in Table 8-12.

Water that is dewatered from the proposed workings will be pumped to surface and directed to the proposed water treatment plant as outlined in Section 8.2. The collected water will be monitored regularly through production. As an adaptive management response, if deteriorating discharge quality is detected, an investigation will be undertaken to ascertain the source of the deterioration and appropriate mitigations will be developed.

The proposed mining methods will mitigate potential effects on water quality by limiting the interaction between water and the underground workings (e.g., mining “off the vein” through host country rock; shotcreting; and cement paste backfill).

The proposed Flame and Moth underground workings will be developed below the groundwater table; however, the Flame and Moth portal will be developed ~20m above the water table. As such, long term discharge from the site is not anticipated. The Flame and Moth mine operations only requires 141.1 m^3/day

whereas the groundwater predictions is estimated to be to 3,025 m^3/day, Thus, the majority of the water required for mining will be from water entering the underground workings.

The EQS being proposed for ammonia is 5 mg/L. Alexco does not anticipate the Flame and Moth discharge ammonia concentrations to exceed the proposed EQS of 5 mg/L. To reduce potential ammonia concentrations, Alexco will use short blast rounds rather than long blast rounds, maximize blast efficiencies and explosives will be stored above ground in an explosive magazine as per the Yukon Occupational Health and Safety Act Blasting Regulations. If ammonia is elevated during operations from use of explosives, ammonia will be treated using the appropriate technology to achieve the proposed EQS. Proven ammonia removal technologies (e.g. Ion exchange) has been implemented at Bellekeno 625 and may be directly applicable to Flame and Moth if required.

The Flame and Moth discharge must pass a distance over 550 m to reach the receiving environment, Christal Lake, following discharge to ground. Attenuation processes have been well documented in the area to remove metals from water sources as they flow in the soils, removing metals concentrations up to 90%. The eventual downstream receptor, Christal Lake, will continue to be monitored by the current water licence and adaptive management plan.

The data collected to date and presented by Interralogic in Appendix C supports the assertion that the proposed Project will not adversely impact groundwater. During operations, sumps will be established underground to manage water as required. A water treatment plant and two ponds will be established on the Mill site so water can be managed from underground as it is encountered. During a temporary closure scenario, this water management infrastructure would be sufficient to manage water infiltration in the short to medium term. Under a longer term temporary closure scenario, water would be allowed to infiltrate through the mine; significant adverse effect on local groundwater quality are not anticipated.

The Flame and Moth Geochemical characterization presented in Appendix K shows that the N-AML rock to be used as construction materials is non-acid generating or metal leaching through both shake flask extraction and humidity cells. Based on the results for these rock samples presented in the geochemical characterization and the modelling results presented in Appendix R, it is unlikely that the project will result in metal loadings that will deteriorate baseline water quality conditions in the long term.

Additionally, the proposed mining methods will mitigate potential effects on water quality over the long term by limiting the interaction between water and the underground workings (e.g., mining “off the vein” through host country rock; shotcreting; and cement paste backfill).

The Groundwater Monitoring Plan will be updated for the Water Licence amendment application which will also include an adaptive management plan. Operational experience and ongoing hydrogeological monitoring will inform closure plan development.

9 KENO HILL SILVER DISTRICT STAKEHOLDERS

Alexco and its subsidiaries have been operating in the KHSD since 2006 and have actively engaged the First Nation of Na-cho Nyak Dun (FNNND) and stakeholders, including Keno City and Mayo residents, other land and resource users in the area, and federal and territorial regulators and government agencies, throughout this period. In general, FNNND and stakeholders raise concerns about potential impacts on the following components:

- Quality and quantity of watercourses and waterbodies;
- Aquatic resources;
- First Nation traditional pursuits and subsistence harvesting;
- Community health and well-being; and
- Various land and resource uses, including tourism and recreation.

9.1 FIRST NATION OF NA-CHO NYAK DUN

Alexco has a signed Comprehensive Cooperation and Benefits Agreement (the "Agreement") that formally describes the nature of the relationship between it and the FNNND. The Agreement, signed on June 8th, 2010, recognizes both Alexco's mineral rights as well as FNNND's aboriginal rights, and sets out rights, obligations and opportunities for both parties.

Individual chapters in the Agreement include human resources (employment and training), contracting, a formal drug and alcohol policy, business contracting and business partnering opportunities, environmental issues and financial resourcing for the Agreement including legacy funding contributions. Implementation of the Agreement is formalized through regular Quarterly Implementation Meetings, wherein senior representatives of the parties meet to review all aspects of the two parties' interaction over the past calendar quarter, a forecast of upcoming opportunities such as contracts and employment, as well as upcoming regulatory events such as the amendments described in this document. All new job vacancies are posted on the FNNND website to ensure opportunities are not missed.

Since environmental matters occupy prime importance with FNNND, the Agreement includes detailed discussion about respecting and protecting the environment; including enhanced opportunities for FNNND to be involved in environmental management of all operations, from mining through to closure and reclamation. The Agreement describes the process to be followed with respect to consultation around new or amended permits and licences. This process, called the Cooperative Engagement Process, mandates Alexco to engage FNNND earlier in the mine permitting process than they would otherwise be involved, giving them unique opportunity to provide input that may influence the intended course of action on any of the many aspects of project design. This process has been followed, and will continue through the permitting process for the Flame and Moth project.

Alexco routinely engages in consultation on a variety of issues and matters associated with activities in the Keno Hill Silver District. These ongoing consultations collectively inform Alexco on the issues and concerns from stakeholders. Alexco has gained knowledge on the reoccurring concerns raised over the past several years and considers this knowledge and experience an important part of consultation for the Flame and Moth project. A summary of consultation over the past two years on major mine development projects is shown in Table 9-1.

Table 9-1 Summary of Engagement Activities

Date	Location	Party	Representatives	Topics	Follow up/ Action
2011					
Aug 31, 2011	FNNND Government House, Mayo	FNNND Government	Dennis Buyck, Lands and Resources Anne Leckie, Executive Director	• FNNND outlined their general position on development in their traditional territory. • FNNND explained that they would like to address with Alexco certain issues with the Cooperation Agreement between FNNND and Alexco. • Discussed general proposed project details. • Cooperation Agreement. • FNNND raised issues and concerns about the Dry Stack Tailings Facility and it proximity to and potential impact on the adjacent permafrost lens. • Discussed FNNND's involvement in development and review of assessment and regulatory applications and future engagement opportunities.	Meetings between Alexco and FNNND negotiators. Follow up with FNNND Technical Advisor to discuss the proposed project and address DSTF issues.
		Alexco / Access	Tom Fudge, Alexco Lauren Haney, Access Kai Woloshyn, Access		
Sept 28,	EMR Oil & Gas Branch Boardroom, Whitehorse	YG EMR Minerals	Bob Holmes, Director Arlene Kyle, Licencing Officer Erin Dowd, Mining Technologist Judy St Amand, Regional Mining Lands Officer Tim Smith, Mining Lands Manager	• Presented the proposed project details and provided rationale. Explained that Lucky Queen and Onek will provide flexibility and risk reduction by providing alternative ore sources. • Briefly discussed the broader context of district-wide licencing and associated district-wide management plans and mitigation strategies. • Discussed ore and waste rock characterization, waste rock disposal/ management, material balance, tailings characterization • Discussed proposed permitting timeline. • Existing waste dumps and mine drainage at Onek may need to be addressed. • Security will need to be updated. • Discussed liability issues and ensuring that liability between Alexco and THE FEDERAL GOVERNMENT is dealt with. It was noted that liability could affect the scope of activities proposed in the YESAB and regulatory submissions. Liability also affects closure mitigation and security. • Briefly addressed the reclamation and closure plan for Lucky Queen and Onek. • Water Board Secretariat indicated that it will review the Water Use Licence amendment application prior to formal adequacy review upon issuance of a Decision Document. • Noted the significance of having BK experience to show that management plans, treatment systems, etc. work. • Explained that there is no plan to move the mill at present. • Discussed the new bypass road and it was noted that a Water Use Licence could be triggered if culverts are required. • Discussed the volume of material to be submitted and it was agreed that to the extent possible the submissions should be concise. • Noted that future amendments to increase the overall ore volume may be required. • Discussed project scoping generally and MLU/QML and WUL amendment requirements. • Discussed scope of advanced exploration activities and what should be included in YESAB submission. Also discussed which exploration activities might be included in the QML versus the MLU Approval.	Development of "Licencing Analysis" outlining proposed amendments to WUL and QML. Development of assessment and permitting timeline. Further engagement on project scoping.
		Yukon Water Board Secretariat	Carola Scheu, Manager Neil Salvin, Licencing Officer Jennifer Logan, Licencing Officer		
		Alexco / Access	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access		
Sept 28	Access Office, Whitehorse	FNNND	Kim Winnicky, Technical Advisor Bill Slater, Technical Advisor	• Informal meeting • Preliminary introduction to proposed project. • Discussed general project details and key issues, including waste rock tonnages and management; ore/tailings characteristics. • Alexco confirmed commitment to begin Cooperative Engagement Process immediately	Arrange formal meeting when additional project detail available.
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access		
Oct 5	YESAB Mayo Designated Office, Mayo	YESAB Mayo Designated Office	Loralee Johnstone, Manager	• Presented general project details and assessment/licencing timelines. • Discussed the importance of Alexco's experience with Bellekeno and considered inclusion of a "lessons learned" section on water quality/discharge, water management, dust management, noise, tailings characteristics and management, waste rock management. • Noted that Keno residents have engaged Chief Medical Officer Brendan Hanley to address dust and noise issues on their behalf. He will likely be a part of Adequacy Review. • Indicated that site liability issues should be dealt with before starting the assessment process. Liability issues are likely to come up during the assessment process. • Discussed project scoping at length. Scoping is likely to be a key issue for this assessment. Discussed further scoping meetings involving YESAB as well as regulators. • Suggested a section outlining what activities are included within the scope of the assessment and which are not, plus rationale. • Noted that YESAB will scope maximum tonnages. Also noted that YESAB will now consider viable options in the assessment process. • Explained that Alexco is considering treating the Onek 400 level adit discharge. • Briefly discussed district-wide assessment and licencing and management protocols. • Discussed the bypass road. Raised issues of traffic volumes, erosion mitigations. • Suggested improvements to maps and figures of the mine plan to help conceptualize underground workings. • Discussed volume of information to be submitted to the assessment.	Ensure YESAB participation in future scoping discussions with regulators. Update YESAB on any significant changes to proposed project scope.
		Alexco	Brad Thrall, Alexco Lauren Haney, Access		
Oct 24	Access office, Whitehorse	Keno Residents	Dirk & Tracy Reintmeister	• Discussed access to Wernecke/Sign Post and continued use of the road to Onek/Lucky Queen. • Suggested knocking top off of berms during winter for snowmobile/dog sled use. • Identified that fuel trucks and large transport will be routed through town until the bypass road is in place. • Discussed dust control in town. • Concerned about the use of jake breaks on trucks coming down from Lucky Queen and noise if we plan to use the highway trucks for ore transport. • Concerned about blast vibrations from Onek and discussed some form of communication/protocol to notify of blasting times. • Expressed concerns about how the heritage process is working and involvement of Keno residents. Suggested developing a working group for heritage discussions. (This issue pertains to Keno Hill Silver District Care & Maintenance undertakings)	Consider options to maintain resident access to Wernecke and Sign Post Roads and discuss further with residents.
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco		

Date	Location	Party	Representatives	Topics	Follow up/ Action
Oct 24	Access Office, Whitehorse	FNNND	Kim Winnicky, Technical Advisor	• Discussed baseline ABA work on tailings from testwork at Onek/LQ. • Suggested installing a piezometer at the base of the waste dump that the existing Onek PAML storage facility is built on. • Suggested humidity cell tests for tailings from Onek/LQ. • Highlighted the importance of training opportunities for FNNND in the permitting/assessment/field stages.	Review of YESAA submission documentation.
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco		
Oct 24	Village office, Mayo	Village of Mayo	Mayor and Town Council Scott Bolton, Chris Pavlovich, Michael McGuinness, Trevor Elliss	• Discussed proposed project including timelines. • Indicated that Mayo has a need for demolition of an existing building with asbestos. Contractor quotes are significant, inquired whether Alexco assist or interested in assisting. • Alexco committed to reviewing capacity internally to determine potential to assist; • Expressed general support for the project. • Question where solid waste was to be transported, and Alexco confirmed none will be shipped to Mayo	-
		Alexco	Brad Thrall, Alexco Tom Fudge, Alexco Rob McIntyre, Alexco		
Oct 25	Keno City Café, Keno City	Keno Residents and Community Club	Mike Mancini Daniel Schuenemann Greg Keitel Gil Bradet Jordan Theriault	• Presented Lot 960 letter of commitment and discussed generally. • Concerned about maintaining access to Wernecke and Sign Post Roads and continued use of the road to Onek/Lucky Queen. • Discussed brushing a separate trail next to the road for winter use and/or an existing trail. • Inquired as to whether the mill is not now considered to be a district-wide mill. • Discussed the size of the potential water treatment plant at Onek.	Another meeting round in Keno.
		Alexco	Brad Thrall Tom Fudge		
Nov 9	Alexco Head Office, Vancouver and teleconference	YESAB Mayo Designated Office	Loralee Johnstone, Manager	• Discussed the only significant change to the proposed project scope: treatment of Onek 400 level adit discharge. Discussed the issues around which water licence the activity will fall under. • Discussed the stakeholder engagement activities conducted to date and further engagement activities planned. Addressed some of the specific issues raised during the stakeholder meetings, including resident access to/use of Wernecke and Sign Post Roads, noise and dust. • Addressed potential socio-economic effects on Mayo, which are anticipated to be minimally negative and there are potential benefits such as jobs and population growth. • Addressed dust specifically and Alexco explained that the dust report was sent to Brendan Hanley, but no response has been received.	Follow up meeting with regulators on scoping and to review draft licencing analysis.
		Alexco	Brad Thrall, Alexco Lauren Haney, Access (by phone)		
Nov 22	EMR Minerals Branch Boardroom	EMR Minerals	Bob Holmes, Director Arlene Kyle, Licencing Officer Erin Dowd, Mining Technologist Judy St Amand, Regional Mining Lands Officer Tim Smith, Mining Lands Manager	• Confirmed the scope of the project and the assessment. Discussed the sequencing of project activities. • Discussed approach to addressing project elements that are outside the scope of assessment in terms of providing appropriate rationale. • Addressed how to assess and licence a range of ore and waste rock tonnages. The Water Board suggested using "combined" water use rate terminology from placer mining Water Use Licence applications. • It was noted that having several applicable Decision Documents is confusing and it was suggested that Alexco provide a table in the application that cross references activities with their applicable Decision Document. • YESAB and the regulators reiterated the importance of clearly describing THE FEDERAL GOVERNMENT versus Alexco liability within the application documents. • Discussed including information on the performance of existing management plans and key facilities (e.g. DSTF). • Discussed YESAB's approach to Adequacy Review and YESAB indicated that they would solicit input from regulators. The Water Board confirmed that it could participate in a limited capacity. • Discussed whether the proposed early mill rate increase from 250 tpd to 400 tpd is an assessable activity and should be included in the scope of the assessment. • Identified and discussed water sources for each deposit. • The Water Board inquired about the stability/integrity of the existing waste dumps at Onek with underground blasting below them. • Discussed the Onek 400 level adit discharge treatment system. • Discussed potential effects on local residents. • It was noted that the Monitoring & Surveillance Plan is out for review with Environmental Health/ YG Environment	Bob Holmes to get back to Alexco on the early mill rate increase.
		Yukon Environment Water Resources	Jon Bowen, Manager		
		Yukon Water Board	Neil Salvin, A/ Manager Jennifer Logan, Licencing Officer		
		YESAB	Loralee Johnstone, Manager, Mayo Designated Office Jennifer Anthony, Manager, Whitehorse Designated Office		
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access		
Nov 22	Yukon Environment	Yukon Environment Water Resources	Jon Bowen, Manager, Water Resources Troy Searson, Water Inspections Officer Diane Gunter, Manager, Environmental Affairs	• Discussed details of the Onek 400 adit discharge treatment plant. • Discussed regulatory options for addressing the Onek 400 adit discharge treatment plant.	-
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco		
Dec 6	Mayo Mining Inspections Office	EMR	Bill Leary, Senior Natural Resources Officer	• Discussed the scope of the proposed project. • Discussed potential effects on local residents – especially in terms of maintaining local residents' access to Wernecke and Sign Post Roads. • Addressed public access on active mining roads in the Lucky Queen and Onek area, as well as appropriate explosives storage locations on site.	-
		Village of Mayo	Scott Bolton; Trevor Elliss		
		YESAB	Loralee Johnstone, Manager, Mayo Designated Office		
		Alexco	Tom Fudge		
Dec 6	Access Consulting Group Boardroom, Whitehorse	FNNND	Dennis Buyck, Lands and Resources Kim Winnicky, FNNND Technical Advisor Jim Cassey, BGC	• Discussed use of the DSTF for Lucky Queen and Onek tailings. • Discussed BGC's technical review of the DSTF. • Addressed future tailings storage requirements for the Keno Hill Silver District.	-
		Alexco	Brad Thrall, Alexco Justin Pigage, EBA		

Date	Location	Party	Representatives	Topics	Follow up/ Action
Dec 6	Mayo Curling Rink Lounge	Mayo community	-	• Discussed general aspects of the proposed project. • Distributed project information overviews with maps and contact information.	-
2012					
Jan 18	Access Consulting Group Boardroom, Whitehorse	Health & Social Services	Brendan Hanley, Chief Medical Officer Benton Foster, Manager, Environmental Health	• Discussed the Project Proposal in terms of adequacy of the information. • Addressed adequacy of dust monitoring. Discussed covering the crusher, or alternative methods. • Env Health indicated that they are going to establish independent monitoring. The monitoring program is to be developed by an out-of-territory consultant – Health Impact Assessment. • Potential human health impacts in terms of cumulative effects were discussed. • Discussed participation of Environmental Health in the YESAA process generally. They solicited Health Canada for input.	-
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access Ethan Allen, Access		
Jan 19	EMR Oil & Gas Branch Boardroom, Whitehorse	EMR Minerals	Arlene Kyle, Licencing Officer Judy St Amand, Regional Mining Lands Officer Tim Smith, Mining Lands Manager	• Discussed adequacy of Project Proposal and Adequacy Review period process. • Reviewed main sections of Project Proposal.	-
		YESAB	Loralee Johnstone, Manager		
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access		
Feb 20	Access Consulting Group Boardroom, Whitehorse	Environment Yukon	Diane Gunter, Environmental Assessment Analyst Bob Truelson, Water Resources	• Discussed generally whether certain questions would be addressed during the assessment or licencing stage. • Addressed information requirements required for Adequacy Review. • The Waste Rock Management Plan was discussed and in particular, the WRMP's performance in terms of the effectiveness of N-AML/P-AML classification. • Implications of the project for groundwater quality were discussed. Onek 400 adit discharge treatment and liability were discussed. • Closure issues were addressed. Alexco explained that the QML requires the Closure Plan to be updated every 2 years and that an updated Plan was just accepted by EMR. • Environment Yukon raised questions about pyretic tailings.	Send Annual Reports directly to Wayne Kettley Forward Information Request Response directly to Environment Yukon/Water Resources
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access Scott Davidson, Access		
Feb 20	Access Consulting Group Boardroom, Whitehorse	Environment Canada	Benoit Godin John Miller	• Discussed Environment Canada's questions about the Dry Stack Tailings Facility – general operations; • Geochemical implications of combining Lucky Queen, Onek and Bellekeno tailings. • Application of the Waste Rock Management Plan was discussed and specifically operational issues around misclassification of some P-AML material. • Discussed tailings streams and related mill processes. • Mine site liability was discussed; in particular, liability associated with Onek and treatment of the historic Onek 400 level adit drainage. Alexco agreed to keep Environment Canada apprised of the company's discussions with AANDC. • Discussed the possible connection between the Onek old and new workings and implications for local groundwater. • Discussed scope of the project and some clarifications that are required in the Project Proposal. Also discussed licencing considerations in terms of which Water Use Licence would incorporate certain activities.	-
		Alexco	Brad Thrall, Alexco Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access Scott Davidson, Access		
Mar 13	Teleconference	AANDC	Robert Lauer Lou Spagnuolo Jason Berkers	• Discussed the possible connection between the historic Onek workings and new workings, and implications for local groundwater. • Addressed Onek Mine site liability; in particular, liability associated with water treatment of the historic Onek 400 level adit discharge. • Discussed potential adaptive management responses to Onek 400 adit discharge.	AANDC and Alexco will continue to discuss Onek liability and water treatment on Tuesday March 20th.
		Alexco	Brad Thrall, Alexco Jim Harrington, Alexco Kai Woloshyn, Access		
Mar 23	Access Consulting Group Boardroom, Whitehorse	FNNND	Kim Winnicky, Technical Advisor	• Reviewed FNNND's comment submission, date March 12, 2012. • Generally discussed provision of detailed information on the project during the assessment and licencing process.	Alexco to provide written response. Alexco to provide additional detail on the Reclamation and Closure Plan, as well as the Onek 400 level discharge treatment facility.
May 16	Silver Moon Bunkhouse, Keno	Keno City Residents	Residents	• Presented additional design mitigations for Sign Post Portal that would mitigate potential noise impacts on Keno. • Presented other portal options considered. • Community members expressed significant concerns about the Sign Post Portal and potential effects on community well-being (noise, dust, proximity to Keno).	Alexco to return to Keno residents with additional portal options.
		Alexco	Tom Fudge, Alexco Lauren Haney, Access		
June 7	Keno City Snack Bar	Keno City Residents	Residents	• Follow up on previous meeting, in which significant concerns about the Sign Post Portal and potential effects on community well-being. • Reviewed the Onek 990 Portal and mine access option details. • Presented the noise mitigations built into the design of the 990 option.	Alexco to make decision on Onek portal option.
		Alexco	Brad Thrall, Alexco Tom Fudge, Alexco		
July 10	Access Consulting Group Boardroom,	Environment Canada	Eric Soprovich John Miller	• Presented details of the Onek 990 portal and mine access.	

Date	Location	Party	Representatives	Topics	Follow up/ Action
	Whitehorse		Denis Lacroix	• Reviewed the additional data collection and studies to be completed for the water licence application.	
		Alexco	Rob McIntyre, Alexco Lauren Haney, Access Kai Woloshyn, Access Scott Davidson, Access		
July 10	Access Consulting Group Boardroom, Whitehorse	Environment Yukon	John Ryder Julie Houle	• Presented details of the Onek 990 portal and mine access. • Reviewed the additional data collection and studies to be completed for the water licence application.	
November 12, 2013	EMR Minerals Branch Boardroom Whitehorse	EMR Minerals Branch Alexco	Bob Holmes Julie Houle Kai Woloshyn Brad Thrall	• Update and status of care and maintenance activities, mine suspension • Overview of Flame and Moth Project	
November 13, 2013	FNNND Government House, Mayo	FNNND Chief and Council Alexco	FNNND Chief and Council Rob McIntyre Brad Thrall	• Overview of Flame and Moth Project	

10 SOCIO-ECONOMIC EFFECTS ASSESSMENT AND MANAGEMENT

The socio-economic effects assessment considers potential effects of the Project on the following valued components:

- Community Health & Well-being
- Land and Resource Use
- Local Economic and Human Resources
- Heritage Resources

10.1 COMMUNITY HEALTH & WELL-BEING

Addressing potential effects on community health and well-being is of key importance given the proximity of the proposed project to Keno City. Implications for health and well-being are considered in terms of noise and dust generation, as well as mine traffic considerations.

10.1.1 Noise

During the previous assessments for the Bellekeno and Lucky Queen and Onek projects, Keno City residents raised concerns about noise from construction and mining activities. In 2012, YESAB, (YG) and AKHM jointly commissioned an independent Noise Impact Assessment (NIA)[2] to assess the potential noise impacts associated with the Lucky Queen and Onek mining operations, including noise at the portals, traffic, and operation of the mill and DSTF. The NIA included five monitoring locations within Keno City. The Lucky Queen portal is located approximately 2.5 km from Keno City and the Onek portal is located 400 m from the community. The NIA concluded that significant noise impacts on the community were not anticipated. The noise monitoring results collected as the part of the Noise Management Plan (Appendix T) are presented in Appendix U.

10.1.1.1 Effects Characterization

The Flame and Moth site is located adjacent to the existing Keno District Mill, approximately 1 km from Keno City. Operations at the Flame and Moth Mine will *not* result in a mill rate increase, they will *not* require significant additional haul road construction and will *not* result in a traffic increase (see Section 7.6 for traffic management details).

[2] The Noise Impact Assessment (July 2012) is attached to Appendix U.

The scope of this assessment includes noise generated at the Flame and Moth mine including portal fan and compressor, haul truck traffic to and from the portal and crusher, operation of the DSTF and traffic from the Mill to the expanded DSTF area.

At the Flame and Moth mine, noise will be generated by new sources that are not currently being generated at the Keno District Mill. The additional noise sources from the Flame and Moth mine includes 15 tonne haul truck traffic from the portal to the crusher, blasting and ventilation fans. As Section 7.6 describes, an average of approximately 28 roundtrips per 24 hour day using 15 t trucks will be required to haul ore from Flame and Moth to the crusher, a distance of only ~175 m. Some light traffic will also be required. The ore haulage from Flame and Moth will offset some of the tonnage that would have been sourced from Bellekeno, Lucky Queen and Onek and therefore overall potential traffic impact on Keno City will be reduced from operations at Flame and Moth. Access to the Flame and Moth mine will be via the existing Christal Lake road which provides access from the Silver Trail Highway to the Keno District Mill. There will be no increase in traffic through Keno City as a result of the Flame and Moth mine.

10.1.1.2 Mitigation and Management

Alexco has developed a Noise Management Plan that meets the requirements of the QML, including addressing relevant noise-related mitigations from the YESAA Decision Document for the Lucky Queen and Onek Mine Production project. The revised plan is included as Appendix T.

The Noise Management Plan is expected to effectively mitigate and manage potential noise impacts associated with the project. Alexco proposes the following additional measures to address potential effects associated with noise generation:

- Blasting at the Flame and Moth surface portal will only be conducted during the dayshift period (7am to 7pm) until the portal reaches a distance of 20 m underground. At that point 24 hour blasting will occur. A community notification protocol will be developed and posted within Keno City outlining blasting schedules during the initial portal development.

- Noise silencer or enclosure will be part of the ventilation fan for Flame and Moth portal.

Alexco proposes the following additional mitigations to address noise associated with mine traffic to and from the Flame and Moth mine:

- The use of existing bypass roads around Keno City will continue to be used;

- Access to the Flame and Moth Mine will be routed through the Christal Lake road;

- Avoid the use of engine breaks in the vicinity of Keno City;

- Flame and Moth Mine traffic management protocols have been incorporated in the revised draft Traffic Management Plan (Appendix F).

10.1.2 Dust

Through the assessment processes for the previous KHSD mining projects, and during operations, Keno City residents have raised concerns about dust generation. Dust emissions around the Keno District Mill and DSTF are currently monitored under the approved Monitoring and Surveillance Plan under QML-0009. Dust monitoring around the Keno District Mill was initiated during the Bellekeno Mine project to meet the requirements of the YESAA Decision Document (YESAB Project 2009-0030) and QML-0009. In accordance with terms and conditions 36 and 37 of the Decision Document for the assessment of the Onek and Lucky Queen Deposit Production Project (YESAB Project 2011-0315), total suspended particulates (TSP) monitoring was initiated in August 2012 at two sites around the Keno District Mill and DSTF. Figure 10-1 shows the dust monitoring locations.

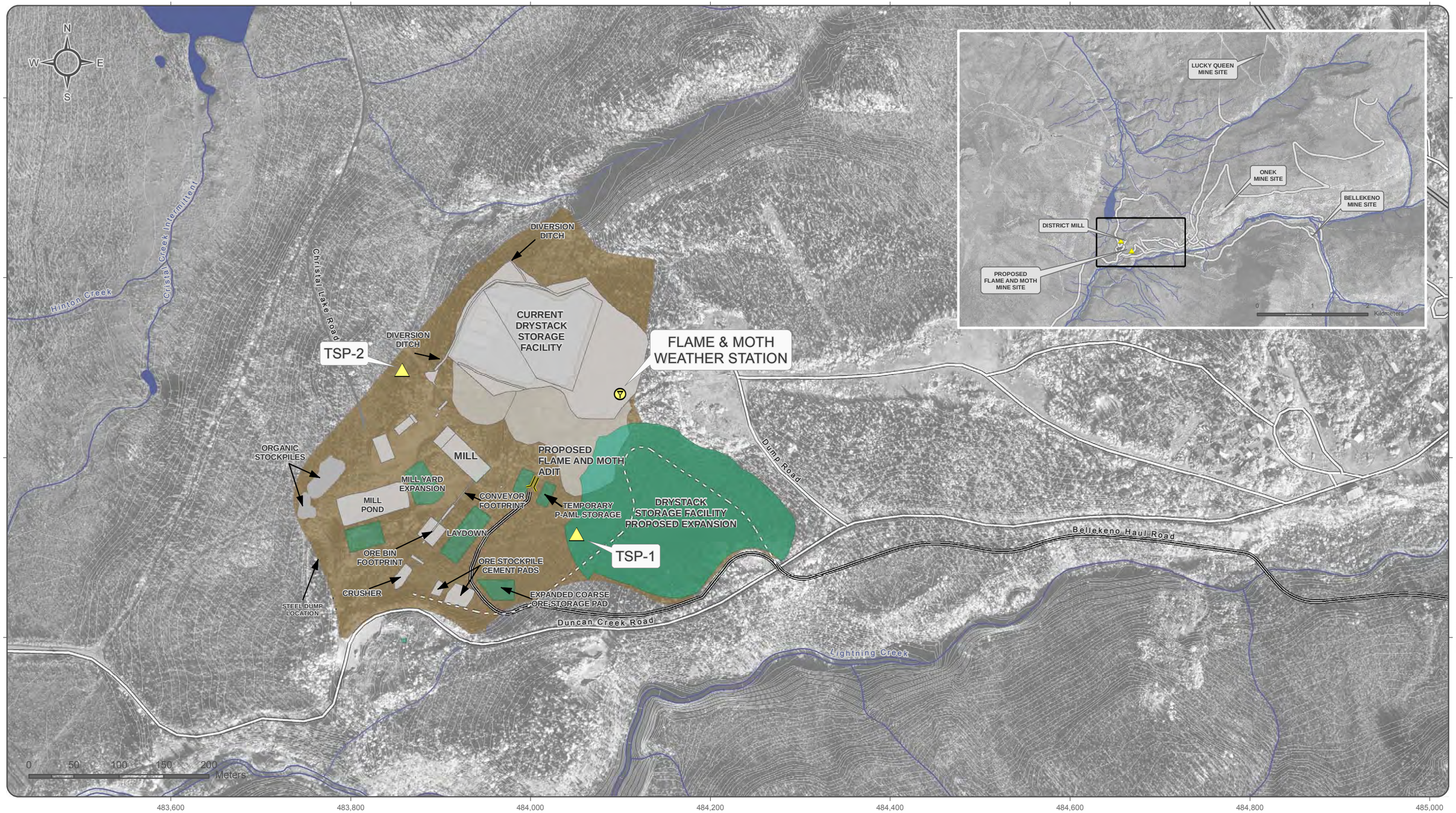
10.1.2.1 Effects Characterization

Activities at Flame and Moth that may generate dust beyond current activities that have not already been assessed include: fugitive dust emissions from the ~175 m long Flame and Moth haul road between the portal and the crusher, and dust from operation of the DSTF expansion area. No other activities will be conducted at Flame and Moth that would add new fugitive dust sources; operation of the mill, crusher and surface support will not change from currently assessed and permitted activities. Operation of the expanded DSTF will not occur simultaneously with operation of the current DSTF and therefore is not a new source of dust. Final reclamation of the current DSTF will be complete when the expanded DSTF becomes operational.

All TSP samples (71 samples) collected to date near the District Keno Mill and DSTF are on average at least 10 times below the Yukon Ambient Air Quality Standard for TSP. The TSP and metals data collected to date are presented in Appendix V. Given the demonstrated low dust generation from current operations, the incremental contribution from the Flame and Moth project (via haul truck traffic from the portal to crusher) is not expected to exceed the Yukon Ambient Air Quality Standard for TSP. Alexco will continue to monitor dust around the District Mill and DSTF. Once the current DSTF is complete, monitoring station TSP-1 will be relocated further east/southeast to accommodate the DSTF expansion. Alexco will also continue to implement the following measures to control dust from the project:

- Dust will be controlled by application of water as necessary and/or use of non-petroleum dust suppressants (e.g. Calcium Chloride).
- Where possible, progressive reclamation measures, such as revegetation, will be implemented to help stabilize the soil and control dust.

If Keno residents raise concerns about dust from Flame and Moth, Alexco will work with the stakeholders to identify additional mitigation options.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Flame and Moth Adit
- Dust Monitoring Station
- Weather Station
- Highway,
- Local Road
- Proposed Haul Road
- Mill Road
- Former Haul Road
- District Mill Footprint
- DSTF Cover and Revegetation Phase I
- Proposed Features

ALEXCO

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ALEXCO KENO HILL MINING CORP.

FIGURE 10-1

DUST MONITORING AND WEATHER STATION LOCATIONS

DECEMBER 2013

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(*Last edited by: jpan;2013-12-05/14:35 PM*)

10.1.3 Vibrations from Underground Blasting

Keno City residents raised concerns about underground blasting at Onek 990 (~300m from Keno City) and whether the blasting vibrations might be felt in their homes. Although Alexco is of the opinion that it is unlikely that vibrations from blasting at Flame and Moth (>1km from Keno City) will be perceptible by residents, it is very difficult to definitively predict.

In order to address the uncertainty in characterizing this potential effect, Alexco proposes to work closely with the residents to determine whether underground blasting is affecting them. All residents will be notified when blasting is to begin and directed to contact an assigned Alexco representative if the vibrations are perceptible. Periodically, as the underground workings are developed closer to the community, residents will be notified and asked to contact the representative if there are any issues.

If blasting vibrations affect residents, Alexco will implement certain mitigations, such as:

- Working with the residents to determine appropriate blasting timing windows;
- Notifying the residents of blasting; and
- Grouping blasting events to the extent possible to reduce the frequency of disturbance.

10.2 LAND AND RESOURCE USE

The regional land use within the Keno Hill Silver District has evolved from a long history of occupation and development. Significant development activity and local population fluctuations have historically occurred in the area. The general area is utilized for several purposes by a variety of users. Regional land use has been influenced by the following activities:

- the area has been utilized by First Nations for thousands of years;
- a variety of anthropogenic activities have occurred throughout the region including both hard rock and placer mining, forestry, hunting and gathering, transportation, recreation and residential;
- the project footprint lies within Registered Trapline Concession (RTC) #82;
- the sites lie within outfitting Concession #7;
- numerous historic mining related structures exist in the general area and are of interest to local community groups and government; and
- the area is known and used for recreational pursuits and has potential for tourism development.

This section addresses: recreation and tourism; First Nations subsistence harvesting and traditional use; sport/commercial hunting, fishing and trapping; and mineral exploration and development.

In general, potential effects on land and resource use resulting from the project are not anticipated to be significant. This outcome has been determined as Flame and Moth is situated within the area of existing

disturbance, minimal footprint expansion is proposed, and Flame and Moth activity is consistent with activity already occurring within the proposed footprint.

10.2.1 Recreation and Tourism

Recreation and tourism are important in the Keno area and concerns have been raised by stakeholders about potential impacts on these values from mining activities in the KHSD. The Flame and Moth Mine is not anticipated to adversely impact recreation and tourism in Keno. The mine site is located in a currently disturbed area hidden from Keno City and Silver Trail Highway by topography and vegetation. The project involves limited footprint expansion and no increase in mine traffic.

The Flame and Moth mine site is not anticipated to significantly affect the visual aesthetics of the area because the site is not visible from Keno City or the Silver Trail Highway. The visual disturbance of mine traffic to and from the Flame and Moth site is expected to be minimal, because the traffic will be routed along the privately controlled Christal Lake road, which is not visible from Keno City.

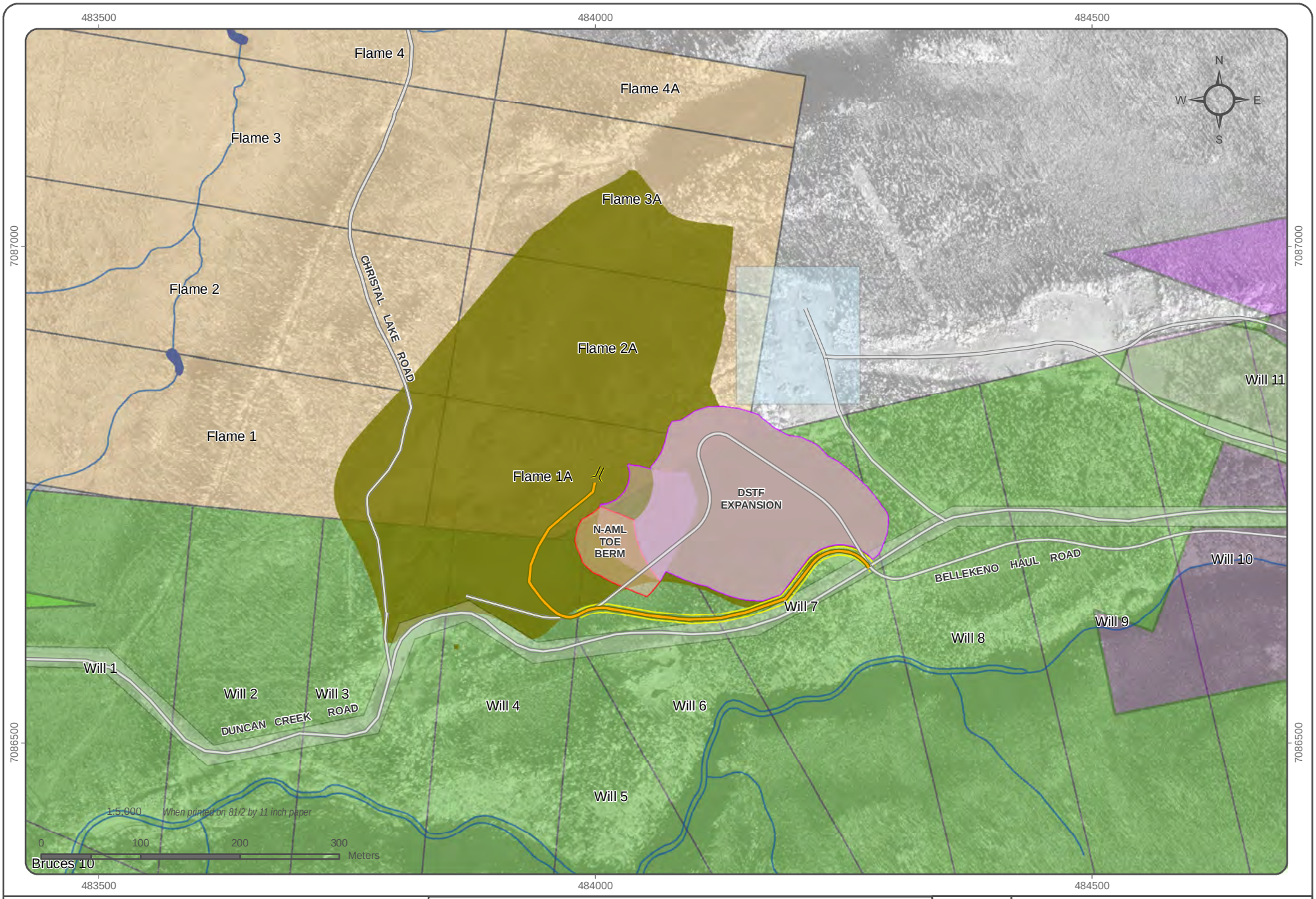
Noise disturbance is addressed in Section 10.1.1. Impacts on tourism associated with noise disturbance from the Flame and Moth mine site are not anticipated.

Consistent with the trend in most small Yukon communities, tourism in the region has decreased over the past five years, as indicated by decreasing visitor numbers to the Mayo and Keno Visitor Information Centres (Derome & Associates, 2013). Fluctuations in visitor numbers in Keno City are consistent with the same trends in other communities within the Yukon.

Risks to public health and safety could result from access to the active mine sites and interactions with mine traffic along public roads. Signage is already in place at the Christal Lake road prohibiting the public from entering the mine site and warning of the dangers.

10.2.2 First Nations Subsistence Harvesting

The proposed project is not anticipated to impact traditional harvesting pursuits. While First Nations subsistence harvest in the general region, the project area is not known to be of particular importance for this purpose, most likely because of the high level of activity on the property. There is no settlement land in the vicinity of the project area.



Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13th and 14th 2006.Site hydrography derived from 2006 aerial imagery obtained from Aero Geometrics, Calgary Alberta

Datum: NAD 83; Map Projection: UTM Zone 8N

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Adit
ProposedRoad
Road

Land Parcels/Dispositions
- LOT 53 GROUP 1054
- LOT 78 KENO
- SURFACE LOT 128 GROUP 1054
- Land Disposition - Garbage Dump
- District Mill and Flame & Moth Minesite Footprint

Placer Claims
- Alexco Exploration Canada Corp. - 100%
- Frank Taylor - 100%

AKHIM
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KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 10-2

PLACER CLAIMS OVERLAPPING THE PROJECT AREA

DECEMBER 2013

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10.2.3 Sport/Commercial Hunting, Fishing and Trapping

Very limited sport/commercial hunting or trapping is conducted in the Keno Hill Silver District, likely because of the high level of historic and present mineral development activity and general use of the area.

The project sites lie within RTC#82, which is currently unassigned (though FNNND have expressed interest in the trapline), and near RTC#83, assigned to Christine Hager. Alexco is aware of some trapping on Galena Hill, but otherwise trapping in the district is limited. The project is not anticipated to affect trapping. Alexco personnel will continue to be instructed not to disturb trapping equipment or activities.

The Flame and Moth Mine lies within hunting outfitting concession #7, operated by Rogue River Outfitters. Hunting on the Flame and Moth site is not allowed due to employee safety concerns and its close proximity to current operations and impacts on outfitting activities are not anticipated.

10.2.4 Mineral Development

Alexco owns the majority of quartz claims in the Keno Hill Silver District, and all the quartz claims within the Flame and Moth mine. There are also several placer claims in the area (Figure 10-2). Alexco has interacted with other mineral exploration and development users for several years and is of the opinion that continued communication will address any issues concerning claim holders.

10.3 LOCAL ECONOMY AND HUMAN RESOURCES

The economy of Keno City is based on tourism and mining. Consistent with the trend in most small Yukon communities, tourism in the region has decreased over the past five years, indicated by decreasing visitor numbers to the Mayo and Keno Visitor Information Centres (Derome & Associates, 2013). In addition to the Keno City Mining Museum, which provides excellent historical perspective on the Keno Hill Silver District, a population of butterflies also exists in the region and attracts interested individuals. The Signpost Viewpoint on Keno Hill Summit also attracts numerous tourists throughout the summer months.

Tourism in the Mayo area is an important industry. Accommodations, food services, recreation services (i.e. guiding and outfitting) and retail cater to tourists and provide employment for local residents. Tourist attractions in the area are linked with the history of mining around Mayo and Keno City. Camping and hiking, hunting and fishing, and other outdoor pursuits comprise the activities undertaken by tourists in the area.

The economy of Mayo is linked to the provision of services to the people of Mayo and the surrounding areas. One third of the jobs in the community are related to government services, including First Nation and territorial administration. Placer mining and mineral exploration and development also provide an economic base for the community. Construction also provides considerable employment to Mayo residents.

The Mayo Official Community Plan outlines local economic conditions and describes community priorities: “Mayo's economy is presently based on its role as a regional administrative and service centre, mineral exploration and placer mining and tourism. In addition, traditional activities play a large role in the community's economic life. Diversification and stabilization of the regional economy remains a community priority” (2006, p. 11). The Mayo Official Community Plan recognizes opportunities for local economic diversification in terms of supporting mineral exploration and development, expanding the local service sector, maximizing the use of the local labour force and reducing dependence on outsiders to fill local employment opportunities.

In cooperation with industry (developers/companies), the FNNND Development Corporation is establishing a number of training, work, and apprenticeship programs in the community. The First Nation works toward participation in land and resource development in their traditional territory and employs many FNNND citizens.

10.3.1 Economic and Employment Opportunities

Alexco's operations in the Keno Hill Silver District have provided numerous economic and employment opportunities to local and regional people and businesses. Alexco has a corporate commitment to hire as many Yukoners as possible and is very active in mine training initiatives necessary to increase the number of positions available to qualified Yukon residents. During active mine operations, Alexco employs ~70 Yukoners including approximately 15 Mayo residents and over 20 FNNND and other First Nations citizens. Alexco has entered into joint venture partnerships through the FNNND Development Corporation and has retained local contractors to provide a variety of services. The Comprehensive Cooperation and Benefits Agreement between FNNND and Alexco guides the creation of business development and employment opportunities for the First Nation.

Development and production at Flame and Moth is expected to require over 125 positions, including mine and mill operations and site services. To the extent possible, Alexco will source these positions locally or regionally. Under the Comprehensive Benefits and Cooperation Agreement between FNNND, Alexco notifies FNNND about new job postings as part of the company's internal posting procedure.

10.4 HERITAGE RESOURCES

The KHSD has rich historical significance and is characterized by numerous historic/heritage resources, largely related to past mineral development. As part of the KHSD Closure Plan, Elsa Reclamation Development Company (ERDC) is developing a district-wide heritage plan in consultation with stakeholders, including YG Heritage Resources, FNNND, the Silver Trail Tourism Association, the Binet House Museum, the Village of Mayo, Keno City Mining Museum, Keno City and Aboriginal Affairs and Northern Development Canada (AANDC).

Adverse effects on heritage resources are not anticipated. Heritage Resources in the KHSD in general are known and in many cases, documented. The extent of new footprint associated with the project is limited and no heritage resources are known to exist in that area. In order to mitigate potential significant effects of the project on heritage resources, Alexco proposes to implement the existing Heritage Resources Protection Plan developed under QML-0009[3]. The Plan outlines specific response and notification protocols and mine site personnel training to protect heritage resources.

[3] Available on YG Energy, Mines and Resources website
http://www.emr.gov.yk.ca/mining/pdf/mml_khsdmo_heritage_resources_protection_plan(1).pdf

11 DECOMMISSION, RECLAMATION AND CLOSURE

Alexco has in place an approved (September 2012) Reclamation and Closure Plan (RCP) that addresses the currently permitted operations at Bellekeno, Lucky Queen and Onek including the mine(s) and Keno District Mill facilities. The Reclamation and Closure Plan - Keno District Mining Operations is structured to be amended and updated as new mines are developed and permitted. Financial security for implementation of the RCP is fully posted with YG and the plan is scheduled to be updated every two years. Alexco currently has in place $4.2M in security through a Letter of Credit to implement the approved RCP.

The Keno District Mining Operations RCP will be updated as part of the QML and WUL processes to reflect the addition of the Flame and Moth deposit and will be refined through the outcomes of the assessment process and ongoing engagement with FNNND, regulatory agencies and stakeholders. The only new mine components of the Flame and Moth project that are not already included in the currently approved RCP are the Flame and Moth mine portal and surface facilities (pond, office trailers, fuel storage, etc.) and the expanded DSTF. The closure objectives that guide the selection and refinement of reclamation and closure measures in the approved RCP will be used to update the RCP and the additional mine components associated with Flame and Moth.

11.1 CLOSURE OBJECTIVES

Closure objectives established in the Keno District Mining Operations RCP will be incorporated into the closure of the Flame and Moth mine. To ensure that the overall closure philosophy can be achieved, the following primary closure objectives were emphasized during the development of the RCP and will be continued for the update of the RCP to include Flame and Moth.

Protect Public and Worker Health and Safety, and Protect and Restore the Environment by:

- incorporating progressive reclamation where possible;
- providing slope stabilization and erosion control on linear and non-linear disturbances;
- ensuring long-term chemical stability of the waste rock disposal areas and components constructed from waste rock to minimize effects to downstream aquatic resources;
- ensuring the long term physical stability of materials placed into the dry stack tailings facility;
- ensuring the long-term physical stability of key structures such as the dry stack tailings facility, portals, waste rock storage facilities, and access roads;
- conducting post closure monitoring of the site and adaptive management to assess effectiveness of closure measures for the long term;
- Ensure Land Use Commensurate with Surrounding Lands;
- Ensure Meaningful Participation of the FNNND;
- Ensure Cost Effectiveness; and
- Realize a Walk-away Closure Scenario.

These closure principles and objectives work to ensure both physical stability and chemical stability of the site in the long term and are reflective of the guidelines derived from the YG's Reclamation and Closure Policy. The effectiveness of closure measures implemented at the Keno District Mining Operations will be the subject of review by regulatory agencies and under the Yukon Quartz Mining Act; the company would be able to apply for a certificate of closure from the YG once there is agreement with their effectiveness.

Closure objectives can be considered in terms of the following key areas:

- (geo)chemical stability;
- water quality;
- physical stability; and,
- land use, aesthetics and public health and safety.

At closure the facilities for which physical stability must be addressed will be the portals, waste rock storage areas, any access roads not decommissioned, mill pad, and dry stack tailings facility.

11.2 MINE CLOSURE MEASURES

There are only minor amendments and adjustments necessary to the RCP to incorporate development activities at Flame and Moth. The same closure measures associated with the Bellekeno mine will be transferred and used for closure of similar facilities at Flame and Moth. The Flame and Moth portal will be developed above the water table and is a decline and therefore no long term water is expected to discharge from the portal.

11.2.1 Closure Objectives

The objective for decommissioning the Flame and Moth infrastructure is to ensure: (1) physical stability (2) chemical stability of any mine discharge (3) that there are no threats to public health and safety, and (4) that the mine area is reclaimed such that it is aesthetically acceptable.

11.2.2 Closure Measures

Closure of the Flame and Moth mine will include restricting access and identifying and removing hazards and hazardous materials. Concern regarding physical stability of infrastructure at closure will be mitigated for the most part through disassembly and removal from the site, and by eliminating underground access. Additional chemical stability objectives will be associated with any soil contamination by fuel, chemicals or other wastes in the areas around the portal and treatment system. Since the Flame and Moth portal is above the groundwater table is not expected produce a long term discharge therefore treatment is not currently anticipated.

At closure, underground equipment will be removed from the underground mine through the portal. The portal entrances will be blocked by inserting rock fill to protect human health and safety and prevent wildlife

access. This method, in use at other northern Canadian mines, allows for movement of water and air through the opening, as well as allowing for any movement of rock walls, to prevent failure as would occur with a concrete plug for example.

Reclamation of the portal site will include removal of the surface facilities and other buildings (e.g. explosives and cap magazine). Fuel tanks will be cleaned and removed along with liners for reuse or landfilling. Any additional debris will also be removed for reuse or proper disposal. All solid waste will be disposed of in accordance with the Yukon Environmental Act Solid Waste Regulations. Alexco has a permitted commercial solid waste facility located in Elsa. All waste petroleum products and any other special waste, as defined in the Special Waste Regulations will be disposed of in accordance with the Regulations. Any soil contamination will be documented through a final site contamination assessment. Contaminated soil will be removed and/or remediated in an approved manner. A land treatment facility has been constructed near the Elsa Valley Tailings Facility for remediation of such soils for district closure, and can be used for remediation of any hydrocarbon contamination at the Flame and Moth mine. The portal site would then be recontoured and scarified to facilitate revegetation and establish drainage. Signage will be installed to indicate the portal presence.

11.3 WASTE ROCK CLOSURE MEASURES

Waste rock extracted from the Flame and Moth mine will be characterized according to industry standards laid out in the Waste Rock Management Plan (Appendix L). Waste rock is identified as being one of the following types: (a) potentially acid-generating (P-AML) (b) non-acid-generating (N-AML). Waste rock is separated according to its acid-generation potential and stored in a manner protective of the environment.

11.3.1 Closure Objectives

During operations and at closure, the physical and chemical objectives for the waste rock storage facilities and disposal areas are erosion control, geotechnical stability and geochemical stability.

11.3.2 Closure Measures

P-AML waste rock from Flame and Moth mine development and production activities will be used as priority material for underground backfill and it is not expected that any P-AML produced from Flame and Moth will remain on surface longterm.

Rock that is not potentially acidic or metals-leaching (N-AML), will be deposited in a waste rock disposal area (WRDA) as described in Section 3-4 or used for construction purposes including roads, laydown areas and the DSTF toe berm.

Permanent P-AML WRSF

There is no longterm WRSF envisioned for P-AML waste produced from Flame and Moth as all P-AML will be used as backfill.

Non-AML WRDA

In order to further increase stability and improve aesthetics, Alexco will recontour the structures constructed with N-AML by pulling the crests back with an excavator followed by scarification and revegetation of the flat surfaces. The final overall (crest to crest) slope of the WRDA will be 3H:1V.

11.4 ROAD CLOSURE MEASURES

The only new road required for Flame and Moth is a realignment of the current haul road from Duncan Creek road to the crusher. There will be a short road from the Flame and Moth portal to the coarse ore stockpile. All roads either developed new or reconstructed/upgraded from existing roads will be subject to standard road decommissioning and reclamation measures at closure.

These roads will be resloped and scarified, culverts removed and seeded in areas where erosion control is necessary.

11.4.1 Closure Objectives

The primary consideration for the physical stability of roads at closure will be slope stability where culverts have been removed and intermittent drainage channels have been established through the road alignments which could lead to localized erosion.

11.4.2 Closure Measures

Standard road decommissioning and reclamation measures at closure include culvert removal, resloping banks and removal of the safety berm to reflect the natural topography as well as provide stability, and surface scarification to encourage natural revegetation). Regrading/contouring the roads will ensure that runoff sheds off the road surface. Localized seeding will take place where erosion control is necessary.

11.5 DRY STACK TAILING FACILITY EXPANSION CLOSURE MEASURES

Closure measures for the expanded DSTF are consistent with the already implemented progressive reclamation closure measures for the DSTF and the approved RCP.

11.5.1 Closure Objectives

The primary closure objectives for the expanded DSTF are to:

1) ensure physical and geochemical stability of the DSTF;

2) minimize erosion;

3) effectively manage run off;

4) reduce water infiltration into the DSTF;

5) minimize safety risks to people and wildlife; and

6) reclaim the site to an aesthetically acceptable level.

11.5.2 Closure Measures

Closure measures for the DSTF are included in the final design report for the facility. Although the DSTF will be built in compacted 0.3 – 0.6 m lifts to limit water penetration, closure measures will include covering the recontoured stack with an approximately 0.25 - 0.5m thick evapotranspiration cover consisting of growth media and granular material that is locally stored in stockpiles. The cover will limit water migration through the stack. The first phase of reclamation has been completed on the western slope of the DSTF and includes recontouring to a 3:1 slope, placement of a 0.25 meter cover and seeding/fertilization

12 PROJECT ALTERNATIVES

There are several project alternatives that were considered in developing this Project Proposal. Each of these are further described and rational for the final alternative selection is discussed.

Pursuing advanced exploration only at Flame and Moth

An alternative to the advancement of Flame and Moth into production is the interim step of advanced exploration. This approach would require amendment of the QML and WUL to allow the necessary activities of advanced exploration to proceed. The activities required under advanced exploration are also required for production, including the development of the portal and decline. Alexco has developed increased confidence in its understanding of the geological models and resources from surface exploration that an interim phase of advanced exploration is not necessary and would add unnecessary time and cost to the project schedule. The current environmental assessment and regulatory regime would require a further environmental assessment and licensing stage to move the deposit into production. Given the history and experience of the timelines associated with these processes, this would result in unacceptable regulatory risk, significantly higher costs and uncertainty in project timelines.

Development and Production at other deposits

Advancing an alternative deposit other than Flame and Moth (i.e. Silver King, Bermingham, Husky) to advanced exploration and production at this time is a consideration. There are not sufficient resources at any other deposit in the district that would supersede the Flame and Moth deposit in terms of tonnage, grade, value, location and level of risk.

Alternative Locations for Portal and Decline

Alternative locations for entering the Flame and Moth deposit were considered. A new decline entering from the Christal Creek side of the deposit rather than adjacent to the mill was considered. Ground conditions in this location consist of thick overburden which would have required significantly higher excavation volumes, higher execution risk and an increased footprint. This location was also further away from existing infrastructure at the mill and would have required additional costs and impact on providing duplicative facilities that are currently available. Final design and optimization prior to development of the Flame and Moth portal may result in a change in the exact location of the portal.

Alternative location for DSTF

Alternative locations for expanding the DSTF were considered including expansion of the current DSTF, a new location closer to the Silver Trail Highway as assessed in the original Bellekeno mine project and haulage and disposal in open pits. Expansion of the current DSTF to the north is limited due to design concerns expressed by FNND due to ground conditions. Further expansion to the east of the DSTF is limited due to land tenure and the boundary of the Keno Hill landfill. Seepage and surface flow conditions at a site near the original Wernecke mill and Silver Trail highway raised concerns with potential fisheries issues as well as a closer proximity to Christal Lake. Haulage and disposal of tailings to existing open pits (i.e. Onek) is an option but issues surrounding current environmental liability, location and distance to Keno City are not resolvable in the current timeframe.

13 REFERENCES

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APPENDICES - UNDER A SEPARATE COVER

Appendix A

ALEXCO

Health, Safety and Environmental Policy Statement

Alexco Resource Corp. is committed to preventing the accidental loss of any of its resources, including employees and physical assets.

In fulfilling this commitment to protect both people, property and the environment, Alexco management will provide and maintain a safe and healthy work environment, in accordance with industry standards and in compliance with legislative requirements, and will strive to eliminate any foreseeable hazards which may result in property damage, accidents, or personal injury/illness.

Alexco recognizes that the responsibility for health, safety and environment are shared. All employees will be equally responsible for minimizing accidents, incidents and spills within our facilities and on our work sites. Safe work practices and job procedures will be clearly defined in the company's Health and Safety Manual for all employees to follow.

Accidental loss can be controlled through good management in combination with active employee involvement. Safety is the direct responsibility of all managers, supervisors, employees, and contractors.

All management activities will comply with company safety requirements as they relate to planning, operation and maintenance of facilities and equipment. All employees will perform their jobs properly in accordance with established procedures and safe work practices.

I trust that all of you will join me in a personal commitment to make safety a way of life.

CRN

Clynt R. Nauman. President and CEO

Sept. 25 '11

Date

***The safety information in this policy does not take precedence over Yukon Occupational Health and Safety Regulations. All employees should be familiar with the Yukon *Occupational Health and Safety Act* and the *Regulations*.**

Appendix B

1 REGIONAL GEOLOGY

The Keno Hill Silver District is located in the western part of the Selwyn Basin in an area dominated by deformed and metamorphosed Upper Proterozoic to Mississippian sedimentary rocks formed at the edge of a continental margin. During the Jurassic and Cretaceous, the area was subjected to compressional tectonic forces producing two major thrust sheets (Robert Service and Tombstone) and widespread folding. Early large scale deformation produced recumbent folds, resulting in local structural thickening of strata. A second (and possibly third) deformational event produced gentle south westerly plunging syn- and antiform pairs.

The Robert Service Thrust Sheet in the south is composed of Late Proterozoic to Cambrian sandstone, locally with interbedded limestone and argillite, a Cambrian to Middle Devonian succession of siltstone, limestone and chert, and Upper Devonian argillite, chert, and chert pebble conglomerate. The latter unit uncomfortably overlies the lower units.

The Tombstone Thrust Sheet to the north consists of Devonian phyllite, felsic meta-tuffs and metaclastic rocks, overlain by Carboniferous quartzite. This latter rock unit is locally thickened due to folding and or thrusting and hosts the mineralization of the Keno Hill Silver District.

Intrusive rocks formed during four episodes of plutonism. Early Paleozoic fine-grained diabase occurs as metre-scale dikes and sills in the Upper Proterozoic to Lower Cambrian rocks. During the Mid-Triassic, gabbros to diorites formed pods of various sizes, primarily in the Devonian and Mississippian rocks of the Tombstone thrust sheet. A third phase of plutonism took place around ninety-two million years ago in the early Cretaceous and resulted in widespread and voluminous Tombstone intrusions of commonly granitic to granodioritic composition. The youngest magmatic activity occurred around sixty-five million years ago in the Upper Cretaceous and resulted in the formation of peraluminous megacrystic potassium feldspar granite.

In addition to where polymetallic veins were exploited, the area hosts a number of occurrences, and showings of tungsten, copper, gold, lead, zinc, antimony and barite. Tin, tungsten, and molybdenite occurrences are possibly related to the suite of Cretaceous intrusion, whereas lead, zinc, and barite occur in stratiform calcareous sedimentary rocks of early to mid-Paleozoic age typical of sediment-hosted deposits.

2 PROPERTY GEOLOGY

The Keno Hill District is underlain primarily by Yukon Group metasedimentary rocks, locally divided into three formations; Upper Schist, Central Quartzite and Lower Schist. The Upper Schist (Hyland Group, pre-Cambrian to Cambrian age) overlies the quartzite in what is inferred to be a thrust contact (Robert Service Thrust) and consists of quartz-mica schist, quartzite, graphitic schist and minor limestone. The Central Quartzite (Keno Hill Quartzite, Mississippian age) contains thick-and thin-bedded quartzite, massive quartzite, graphitic phyllite, graphitic schist, calcareous schist and minor Triassic greenstone. This unit is approximately 700 m thick and is host to most of the past producing ore bodies. Structurally juxtaposed below the quartzite is the Lower Schist which has been correlated with the Devonian-Mississippian Earn Group. The Lower Schist includes graphitic schist, argillite, thin-bedded quartzite, calcareous schist, phyllite, slate, sericite schist, minor thick-bedded quartzite and locally significant intervals of Triassic greenstone. The greenstone forms sills and / or boudins and consists of metadiorite and metagabbro. The sills and boudins form bodies up to one kilometre long and thirty metres thick. Regional, greenschist facies metamorphism of all units is believed to have occurred in the Middle Cretaceous, about 105 million years ago.

A number of quartz-feldspar porphyritic sills have intruded the stratigraphy parallel to schistosity. The sills are most common in the Lower and Upper Schists and can reach thicknesses of up to fifty metres; reports of occurrences in the Central Quartzite are inconclusive and vague. The quartz-porphyry sills are believed to be of Cretaceous age.

Structurally, the property is characterized by four sets of faults; many of which have been filled by hydrothermal minerals, forming veins. The oldest fault set consists of south dipping structures that are generally parallel to foliation and are apparently associated with the Tombstone Thrust Fault since movement was contemporaneous or slightly later. Locally, brittle deformation has been observed along these structures. A second fault set, known as "longitudinal veins" strikes north east to east northeast and dips steeply southeast. The latest movement along these faults is sinistral with offsets locally reaching more than 150 metres; however, more than one episode of movement commonly is indicated. Depending on the competency of the host rock, longitudinal veins can be up to thirty metres wide in an anatomising system of sub-veins. Essentially all mineralized rock was mined from these longitudinal veins. A third set of faults, known as "transverse faults", is north-west striking and dips steeply to the north. Transverse faults typically do not contain silver and lead mineralization but are commonly filled by quartz with trace to minor arsenopyrite, pyrite and jamesonite.

A younger set of faults, known as cross faults, strike north to north east with a dip of sixty degrees west to south west and offset vein or longitudinal faults by up to 2,000 metres. In the western part of the property, dextral movement is the most recent event along these structures, whereas in the eastern part of the property sinistral movement with less magnitude prevails.

At Keno Hill, the largest accumulation of ore minerals occurred in structurally prepared competent rocks, such as the Central Quartzite, resulting in areas of increased fluid flow. Incompetent rocks like phyllites tend to produce fewer and smaller, if any, open spaces, limiting fluid flow and resulting mineral precipitation.

Mineralization in the Keno Hill Silver District is of the polymetallic silver-lead-zinc vein type. In general, common gangue minerals include manganiferous siderite and to a lesser extent quartz and quartz breccia as well as calcite and other carbonates. Silver occurs in argentiferous galena and argentiferous tetrahedrite (freibergite). In supergene assemblages, silver is further found as native silver, in polybasite, stephanite, and pyrargyrite. Lead occurs in galena and zinc in sphalerite, which is iron-rich. Other sulphides include pyrite, arsenopyrite (locally gold-bearing) and chalcopyrite.

The veins of the Keno Hill Silver District display characteristics associated with both mesothermal and epithermal deposits and it is not clear if a continuum exists or if separate and distinct mineralizing events are involved. The most prominent examples of epithermal style mineralization are found in the western part of the district, although the Lucky Queen mine on Keno Hill produced native silver and ruby silver in quantity. Proximity to a magmatic heat source has often been called upon to explain the district zonation, though this is by no means a complete explanation.

Mineral zonation is common within base metal-rich veins (zinc-rich margin and silver/lead-rich center). Changes in mineralogy within individual oreshoots is less clearly documented, although there has long been a conviction that silver and lead rich zones occur higher in the veins while zinc becomes dominant at depth. Anecdotal evidence suggests that vertically stacked oreshoots may repeatedly show zoning of lead rich upper portions to zinc dominant roots, but data confirming this has not been found. In general, Pb-Zn mineralization appears to be nearly contemporaneous in age.

Mechanisms triggering deposition of ore and gangue minerals have been suggested by district wide studies of fluid inclusions and light stable isotopes. Fluid boiling appears to have been ubiquitous and some evidence exists for fluid mixing. The hydrothermal fluids responsible for mineral deposition contained significant quantities of CO2 which may have "boiled" during abrupt changes in pressure produced during fluid movement from confined fractures to more open conduits formed in quartzite.

Irrespective of stratigraphic formations or regional map units only a few major rock types are commonly encountered in the area of the old mine workings. These are:

- schists and phyllites with variable carbon content;
- chloritic phyllites or schists;
- quartzites and phyllitic quartzites;
- sericite-quartz phyllites; and,
- greenstones.

3 PHYSIOGRAPHY AND SURFICIAL GEOLOGY

The Keno Hill Silver District lies within the northeastern part of the Yukon Plateau, and the terrain is mountainous with elevations ranging from 1,848 m (Summit of Keno Hill) to 610 m (McQuesten River valley). The area has been profoundly influenced by the latest glaciation but shows more subtle evidence of an earlier event as well.

The lower slopes of Galena Hill show clear evidence of ice marginal deposits such as kame terraces related to the glacial lobes occupying the major valley. The retreat of the Cordilleran ice sheet has had a major impact on the south McQuesten valley. Till blankets much of the valley and glacio-fluvial deposits are widespread. Glacio-lacustrine deposits formed in ice marginal lakes occur in the deeper part of the valley. Large meltwater streams have left huge meander scars. Boyle (1965) provides the following additional description of the physiography and glacial deposits in the area.

Galena Hill trends northeast between Duncan Creek and the McQuesten River valley. It has an elevation of 4,740 feet, a moderately steep southwestern slope, and steeper north, northwestern, and southeastern slopes. The terrain above 4,300 feet is relatively flat and rolling, and marked by several level grassy meadows. The north, northwestern, and southeastern slopes of the hill are crossed by several streams that have cut steep gulches into the rock strata. The principal streams responsible for these gulches are Galena, Flat, Brefalt, and Sandy Creeks and Porcupine Gulch on the northwestern slope and Hinton and Fisher Creeks on the eastern and southeastern slopes.

Keno Hill and Sourdough Hill are adjacent hills separated by Lightning Creek. Keno Hill trends northeast and lies between the Keno Ladue-McQuesten River valley and Allen, Faith, Lightning, and Christal Creeks. The hill has relatively gentle southern and southeastern slopes and a precipitous northern slope, marked by two cirques, Faro Gulch and Silver Basin Gulch. The terrain above 4,500 feet is relatively flat and rolling with five prominent rocky knolls known as Keno, Minto, Monument (the highest point on Keno Hill, elevation 6,065 feet), Caribou, and Beauvette. On the slopes of the hill several streams follow steep gulches in the rock strata, the principal ones being Gambler, Faro, McKay, and Silver Basin on the northern slope, Faith, Hope, and Charity on the northeastern and southern slopes, and Erickson on the western slope.

Sourdough Hill lies southwest of Keno Hill and trends north between Thunder, Lightning, and Duncan Creeks. The part of the hill described in this report is on the northern and northwestern slopes, which are gentle up to 4,200 feet and from there rise abruptly to a steep rocky hogsback that trends southwest for some 6,000 feet.

Extensive rock outcrops are uncommon on Galena, Keno, and Sourdough Hills, and with the exception of the gulches and cirques where relatively good geological sections are present, detailed mapping can only be done by observing float. Below an elevation of 4,400 feet rock outcrops are sparse, and the slopes are covered with till, soil, rock debris, much, and muskeg, in which conifers, birch, aspen, Arctic black-birch, and other vegetation grow abundantly. Above this elevation the soil is thin, outcrops are more numerous, the ground is covered with local rock float, the terrain is treeless, and the vegetation is limited to alpine species and grassy meadows.

The lower slopes of the hills were severely glaciated during Pleistocene time by ice-sheets that spread, from the east, over the entire area. Glacial till, gravel, and other debris lie in a series of benches on the slopes of the hills and floor the valleys. The deposits are generally 5 feet to 20 feet thick, but in some areas as on the southern slope of Keno Hill facing Lightning Creek and north of Christal Lake, they are 30 feet to 50 feet thick or more.

The Keno Hill-Galena Hill area is in the region of permanently frozen ground. The permafrost is irregularly distributed and its occurrence is dependent upon the elevation, hillside exposure, depth of overburden, amount of vegetative cover, and presence of flowing underground and surface water. At high elevations and on slopes with a northern exposure it is generally present. Thus, on Keno Hill, the mine workings on the top of the hill and on the northern slope encountered permafrost some 400 feet below the surface. On the northern slopes of Sourdough Hill and Galena Hill a similar situation prevails, and frost and ice lenses have been encountered at depths of 250 feet or more in the mine workings. On the lower southern slope of Keno Hill, however, the workings of the Onek and Mount Keno mines show little evidence of permafrost. In places where surface and underground water are flowing the permafrost has been thawed out and frost free windows and strips are present. These provide access and egress for waters that are oxidizing the lodes.

The effects of frost action, soil creep, and slope wash are marked on the hills, particularly at the higher elevations. Frost action is responsible for features such as stone rings and stripes, and produces a general 'boiling action' that brings rock float, mineralized float, and soil from deeper layers to the surface, thus facilitating the mapping of both the underlying bedrock and the tracing of vein faults. On steep slopes, however, frost action and land creep have transported float downhill places, 100 feet or more, making the accurate mapping of contacts and vein faults difficult.

Draft Technical Memorandum

TO:	**Alexco Resource Corp.**
FROM:	**Interralogic, Inc.**
DATE:	**November 27, 2013**
SUBJECT:	**Flame & Moth Groundwater Evaluation**

INTRODUCTION

This technical memorandum summarizes a groundwater investigation performed in the Flame & Moth (F&M) area to evaluate future mine dewatering requirements and associated impacts to Lightning Creek and the Keno City water supply. In other areas of the mining district, groundwater is known to be affected by vein structures and cross-faults, which at some locations can operate as higher permeability conduits within the quartzite and schist bedrock. As shown on Figure A, known structures in the F&M area include the following:

- Christal Zone of the Flame Vein
- Lightning Zone of the Flame Vein
- Mill Fault
- Parallel Fault
- Garbage Fault

The primary objective of the field investigation was to assess the water bearing characteristics of the Christal Zone, Lightning Zone, and Mill Fault, which would all be intersected by underground workings of the proposed F&M Mine.

The field investigation consisted of the following activities:

- Groundwater level monitoring of available wells in the F&M and Keno City areas
- Installation of three new monitoring wells (KAR-1, KAR-2, and KAR-16 also known as FM-1, FM-2 and FM-3, respectively) including measurements of air-lift flow rates during air-rotary drilling
- Monitoring water level drawdown in well KAR-2 during the drilling of KAR-16
- 72 hour air-lift pumping test in KAR-1, with water level monitoring in available F&M and Keno City bedrock monitoring wells

These activities are discussed in the following sections.

FIELD INVESTIGATION AND ANALYSIS

Groundwater Level Monitoring

On 17 October 2013, a set of water levels were measured at available wells in the F&M and Keno City areas. Using surveyed elevations of the measuring points (typically top of PVC casing), the depth-to-water measurements were converted to water-level elevations. Figure 1 shows the well locations, measured water-level elevations, and interpreted groundwater elevation contours. The configuration of contours is interpreted as follows:

- Lightning Creek is a perennial stream that is in hydraulic communication with the groundwater system.
- South and west of Keno City, Lightning Creek is a losing stream that recharges groundwater.
- In the F&M area, it is uncertain if Lightning Creek is a gaining or losing stream.
- In the F&M area, groundwater flow is generally to the northwest towards Christal Lake or west towards Christal Creek.
- Natural groundwater flow does not occur from the F&M area to the Keno City area.

New Monitoring Wells

Three new monitoring wells were drilled and completed in the F&M area:

- KAR-1, which intersected the Christal Zone
- KAR-2, which intersected the Lightning Zone
- KAR-16, which is believed to have intersected the Mill Fault, but the intersection depth is uncertain.

Drilling/completion information is summarized in Table 1 and boring logs for KAR-1, KAR-2, and KAR-16 are provided on Figures 2, 3, and 4, respectively. The boreholes were cased through the overburden and then drilled open hole in bedrock using standard air rotary. At the three drilling locations, the bedrock water table was at a depth of 22 to 25 m below ground surface (bgs). During bedrock drilling, air-lift flow rates were measured periodically as the open holes were advanced, and plots of flow rate versus depth for each borehole are shown on Figure 5. In general, there was minimal flow (less than 0.5 L/s) from the water table to a depth of 50 to 135 m bgs, suggesting relatively low permeability. The general trend was for progressively

increasing air-lift flow rates with depth. The air-lift flow rate at maximum depth for each borehole was:

- KAR-1: 4.73 L/s (75 gpm) at maximum depth of 183.5 m bgs.
- KAR-2: 3.60 L/s (57 gpm) at maximum depth of 244.4 m bgs
- KAR-16: 2.46 L/s (39 gpm) at maximum depth of 178.3 m bgs.

In each borehole, the rate of change in flow rate with depth was roughly linear, suggesting relatively uniform hydraulic conductivity with depth. There were no indications of higher permeability bedrock structures, which would have caused distinct "jumps" in the air-lift flow rate as they were penetrated by a borehole. In addition, noticeable flow rate increases were not observed as boreholes penetrated the Christal Zone (KAR-1), Lightning Zone (KAR-2), and Mill Fault (KAR-16). These results suggest that the rock mass can be conceptualized as an equivalent porous medium and the known structures do not operate as higher permeability conduits within the groundwater flow system. Specific capacity analysis of air-lift flow rates at the end of each borehole is provided in Table 2. These results are summarized as follows:

- KAR-1: Hydraulic Conductivity (K) = 0.0449 m/d = 5.20 x 10^{-5} cm/sec
- KAR-2: Hydraulic Conductivity (K) = 0.0185 m/d = 2.14 x 10^{-5} cm/sec
- KAR-16: Hydraulic Conductivity (K) = 0.0259 m/d = 3.00 x 10^{-5} cm/sec

The 6-inch diameter boreholes were completed with 4-inch schedule 80 PVC casing and slotted screen. During the first completion (KAR-1), the sand pack bridged at an estimated depth of 78 m, approximately 50 m above the top of the upper screen (128 m). In the subsequent completions, no sand pack or bore seals were placed, although the overburden was sealed with grouted 6-inch steel conductor casing in all boreholes.

Water Level Response in KAR-2 During Drilling of KAR-16

During the drilling of KAR-16, a transducer/logger installed in KAR-2 measured a water level response after the KAR-16 depth exceeded 128 m bgs. As shown on Figure 6, as the depth of KAR-16 increased from 128 to 196 m (over a period of about 8 hours), the water level in KAR-2 was lowered by approximately 3.6 m. After air-lift in KAR-16 was discontinued, the water level in KAR-2 recovered to an apparent stabilized level that was about 1 meter lower than the initial

static water level. This residual drawdown after recovery suggested that the groundwater system was not subject to a major recharge source such as Lightning Creek.

The response in KAR-2 was analyzed by computing drawdown versus time after the initial response was observed. In this case, the KAR-2 drawdown was computed as the difference between the measured water level and the background trend observed prior to the response (see Figure 6). The resulting data were plotted as log of time versus drawdown, commonly referred to as a Jacob semilog plot (Kruseman and deRidder, 1989), which is shown on Figure 7. Two straight-lines were fit to the data; an early time fit shown in red and a late time fit shown in green. The flow rates associated with these fits are different because the air-lift rate increased during the deepening of KAR-16. The flow rates used for each fit were taken as the actual average flow rate which occurred for that portion of the data minus the flow rate measured prior to the KAR-16 being deepened below 128 m (61 L/min). The slope of each line is given by the parameter (Δs), which is the change in drawdown per log cycle of time.

Calculations associated with this analysis are shown on Table 3 and the results are summarized as follows:

Transmissivity	T = 3.2 to 3.6 m^2/day
Storativity	S = 3.3 x 10^{-5}
Hydraulic Conductivity	K = 6.8 x 10^{-5} to 1.2 x 10^{-4} cm/sec
Specific Storage	S_s = 1.1 x 10^{-6} m^{-1}

KAR-1 Pumping Test

From November 5 to 8, a 72 hour pumping test was conducted in the completed KAR-1 monitoring well by air-lifting at a fairly uniform pumping rate of 2.5 L/s (40 gpm). During the test, water levels were measured in the pumping well, F&M area bedrock wells KAR-2, KAR-16, KV88D, KV-89D, KV103, and Keno City area bedrock wells KV-84, KV-84N, ON-2, Café. The locations of these wells are shown on Figure 1. The only wells with significant water level fluctuations during the test were KAR-1 (pumping well), KAR-2, KAR-16, and KV-103, which are shown graphically on Figure 8. The water level rise in KAR-2 and KAR-16 is the opposite of what would be expected during pumping and this is interpreted to have resulted from infiltration of the discharge water. As a consequence, it is concluded that there was no definitive hydraulic

response to pumping in KAR-2 and KAR-16. The water level in KV103 (Mill Well) declined shortly after the pumping test began, but continued to decline after the pumping was discontinued. It is uncertain if this was a response to pumping or due to external influences including the fact that KV-103 is sometimes pumped to supply water to the mill. These observations lead to the conclusion that there were no analyzable responses in any of the observation wells during and after the KAR-1 pumping test.

The only well with an analyzable response was the pumping well itself. A hydrograph of the water level in KAR-1 is shown on Figure 9 and a Jacob plot of drawdown versus log pumping time is provided on Figure 10. Standard analysis of the straight line fit to the data provides a transmissivity equal to 3.60 m^2/day and hydraulic conductivity of 3.95 x 10^{-5} cm/sec. The lack of response in any of the other observation wells suggests the presence of a low permeability (possible structural) boundary near KAR-1 and if this is the case, the actual transmissivity and hydraulic conductivity could be greater than the above values. Note that storage coefficient cannot be evaluated from the response of a pumping well.

The recovery hydrograph for KAR-1 (Figure 11) indicates a residual drawdown of about 1.2 m thirteen days after the end of pumping. The slow and incomplete recovery suggests that the groundwater system was not subject to a major recharge source such as Lightning Creek. The Theis recovery plot (Kruseman and deRidder, 1989) for KAR-1 is shown on Figure 12, and a straight line fit to later-time data (left side of plot) gives a transmissivity value of 6.44 m^2/day and a hydraulic conductivity of 7.06 x 10^{-5} cm/sec. The straight line projects to a residual drawdown of about 0.75 m at t/t' equal to 1, which theoretically represents infinite recovery time. This extrapolation provides further evidence that the groundwater system was not subject to an external recharge source.

Using the average of the pumping and recovery transmissivities (5.0 m^2/day) and the storage coefficient determined from the KAR-2/16 drilling response (3.3 x 10^{-5}), a standard Theis analysis (Kruseman and deRidder, 1989) predicts that about 9 m of drawdown would have be observed at KAR-2 and KAR-16 for an ideal infinite aquifer. The fact that pumping-related responses were not observed in these wells suggests that the groundwater system is compartmentalized by a geologic structure that operates with lower permeability compared to the adjacent country rock. A likely candidate is the Mill Fault, which exists between the pumping well (KAR-1) and the non-responding observation wells (KAR-2 and KAR-16).

Hydrogeologic Interpretation of Flame & Moth Area

A summary of the hydraulic conductivity results from drilling and testing is provided in Table 4. For the current dewatering evaluation, it is suggested to use a bulk hydraulic conductivity equal to 0.050 m/day (5.8×10^{-5} cm/sec).

The monitoring and testing results lead to the following interpretations of the F&M area hydrogeology:

- While Lightning Creek is interpreted to provide recharge to overburden groundwater in the Keno City area, the recent field testing data provide no evidence that it is a significant recharge source to bedrock groundwater at F&M. It is possible that Lightning Creek could be hydraulically connected to structures near F&M that were not tested during the field program.

- There is no field evidence to suggest that the Christal Zone, Lightning Zone, or Mill Fault operate as higher permeability conduits within the F&M bedrock groundwater system.

- The groundwater system at F&M is compartmentalized by one or more geologic structures that operate as partial barriers to groundwater flow. Due to the lack of response in KAR-2 and KAR-16 during the pumping of KAR-1, the Mill Fault is a likely candidate to operate as a low permeability structure. Other geologic structures could further compartmentalize the bedrock flow system, but field data are not available to identify and characterize such structures if they exist.

DEWATERING EVALUATION

The proposed F&M mine will develop two mineral zones within the Flame Vein, which is displaced laterally by the Mill Fault. The mineral zone east of the fault is called the Christal Zone and the mineral zone west of the fault is the Lightning Zone. Access to the mine will consist of a main decline that splits into a series of ramps and tunnels that access the two mineralized zones. In addition to intersecting the mineralized portions of the Flame Vein, access tunnels will pass through the Mill Fault at several locations. The bottom of the final mine workings will be about 270 m below ground or about 245 m below the bedrock water table.

Impact to Lightning Creek

Drilling and testing provided no evidence that Lightning Creek would act as a significant recharge source to the groundwater system when the mine is in a dewatered condition. The evidence for this is as follows:

- During standard air rotary drilling, the was very little water production from the water table to depths of 50 to 135 m bgs, suggesting that the upper portion of bedrock has relatively low hydraulic conductivity. The existence of low permeability bedrock below Lightning Creek would limit the hydraulic connectively between the Creek and deeper bedrock that would be depressurized by mining activities. While the field data are not definitive, it is suggested that mine dewatering would not likely induce significant leakage from Lightning Creek stream channel compared to current conditions.

- Hydraulic responses observed during the drilling of KAR-16 and the 72 hour pumping test conducted at KAR-1 did not show any indications of a significant external recharge source to the bedrock flow system. In both cases, the system did not approach a steady state during pumping (as would be expected if a recharge feature were present) and water levels at the end of recovery were a meter or more lower than the pre-pumping static water level.

For these reasons, it is concluded that F&M Mine dewatering will not have a significant impact on surface water flows in Lightning Creek.

Impact to Keno City Water Supply

During and after the 72 hour pumping test conducted at KAR-1, there were no measurable groundwater level changes in bedrock wells monitored in the Keno City area (KV-84, KV-84N, ON-2, and Café well). The groundwater level contour map (Figure A) indicates that under current conditions, Lightning Creek is a losing stream south of Keno City and this seepage recharges the overburden groundwater system below Keno City. The overburden is in hydraulic communication with the bedrock groundwater that supplies the Keno City water supply (Firehall) well. The distribution of groundwater level contours within and northwest of Keno City has been interpreted to indicate the presence of a high permeability feature that conveys groundwater from Lightning Creek into the Keno City area and then northwest towards Christal Lake. A water balance study conducted by Interralogic estimated that the groundwater flow rate from Lightning Creek towards the Keno City area is on the order of 20 L/s. These conditions lead to

a conceptualization that the groundwater system below Keno City is characterized by relatively high permeability and locally derived recharge. Given the lack of response during the pumping test, the above conceptualization, and the large distance from the proposed F&M Mine (greater than 1 km), it is highly unlikely that mine dewatering will have an effect on groundwater levels and the availability of water supply in the Keno City area.

Estimated Dewatering Flow Rates

Dewatering flow rates associated with development of the F&M mine have been estimated based on the analytical model shown on Figure 13. This model considers radial groundwater flow towards a mining area (with dewatered workings) that is subject to net infiltration (recharge) of meteoric water. The cone of depression associated with dewatering creates a capture area where meteoric recharge enters the saturated flow system and is conveyed to the mine area. The equations used to compute the mine inflow rate are provided in Marinelli and Niccoli (2000). Using this analytical model, the inflow rate (Q) as a function of the depth of mine workings (D) is plotted on Figure 14. For these calculations, the recharge flux is assumed to be 20 percent of mean annual precipitation of 420 mm/yr. It is also assumed that the saturated thickness at the mine boundary (h_p) is one-half the initial (pre-mining) saturated thickness (h_o). As shown on Figure 14, the inflow rate is zero for depths down to the water static water level (SWL) of 25 m below ground. As the mine depth increases below the water table, the estimated dewatering rate increases in a nonlinear manner. At the maximum mine depth of about 270 m bgs, the computed inflow rate is about 35 L/s (555 gpm). This result is considered a conservative overestimate for the following reasons:

- The analysis assumes that the bedrock flow system is uniform in lateral extent. However, the KAR-1 pumping test provided credible evidence that bedrock is “compartmentalized” due to the presumed presence of low permeability geologic structures that represent partial barriers to groundwater flow. Such barriers would reduce groundwater flow to the mine area and result in lower mine dewatering rates.

- The analytical solution assumes that the fractured rock mass has uniform bulk hydraulic conductivity. It is well know that depressurization causes fractures to close and the hydraulic conductivity tends to decrease in the vicinity of underground mine openings. This reduction in hydraulic conductivity would decrease the inflow rates to the mine workings.

For these reasons, it is expected that the actual mine inflow rates will be less than the rates shown on Figure 14. However, the inflow curve serves as a conservative overestimate that is appropriate for mine planning and permitting.

The F&M geology is complex and unidentified/untested geologic structures could be water-bearing and potentially connected to Lightning Creek. During mine development, it is recommended to drill boreholes ahead of advancing tunnels to identify water bearing features (if any) before being intersected by underground excavations. The use of underground boreholes to depressurize such structures will reduce uncontrolled inflows into mine openings and lead to more efficient mining operations.

REFERENCES

Kruseman, G.P. and N.A. deRidder. 1989. *Analysis and Evaluation of Pumping Test Data.* International Institute for Land Reclamation and Improvement, Publication 47.

Marinelli, F. and W.L. Niccoli. 2000. Simple Analytical Equations for Estimating Ground Water Inflow to a Mine Pit. *Ground Water*, vol. 38, no. 2, pp. 311-314.

Table 1: New Monitoring Wells in Flame & Moth Area

All measurements in meters

Well	ID	MAP ID	ALT ID	Geology	E	N	Elev Top of PVC (d)	PVC Height	Ground Elev
1	KAR13-001	KAR-1	FM-1	Christal Zone	484025.71	7086770.45	912.23	0.50	911.73
2	KAR13-002	KAR-2	FM-2	Lightning Zone	483854.14	7086562.16	913.10	1.68	911.42
3	KAR13-016	KAR-16	FM-3	Mill Fault	483910.16	7086627.86	905.94	0.97	904.97

Distance from KAR-1	Distance from KAR-2	Distance from KAR-16
0	270	184
270	0	86
184	86	0

Well	ID	MAP ID	ALT ID	Geology	Screen 1 Depth Interval		Screen 2 Depth Interval		Sand Pack Depth Interval		Total Depth	Estimated Vein or Fault Depth Interval	
1	KAR13-001	KAR-1	FM-1	Christal Zone	128	140.2	152.4	164.6	0	78 (a)	183.5	153.3	164.9
2	KAR13-002	KAR-2	FM-2	Lightning Zone	178.9	191.1	203.3	215.5	(b)	(b)	244.4	227.1	228.6
3	KAR13-016	KAR-16	FM-3	Mill Fault	166.1	178.3			(b)	(b)	178.3	173 (c)	175 (c)

(a) Estimated based on forty-two 50-pound sacks added to annulus; apparent bridge at 78 m.
(b) No sand pack placed.
(c) Fault location uncertain.
(d) Finished PVC height.

Table 2: Specific Capacity Analysis of Air-Lift Flow Rate at End of Drilling

Well ID	Depth to Water	Hole Bottom	Saturated Thickness (a) L	Air-Lift Flow Rate Q	Effective Drawdown (b) s	Shape Factor (c) F	Transmissivity T	Hydraulic Conductivity K	
	m bgs	m bgs	m	L/s	m		m^2/day	m/d	cm/sec
KAR-1	22	183.5	161.5	4.73	53.8	6	7.26	0.0449	5.20×10^{-5}
KAR-2	25	244.4	219.4	3.60	73.1	6	4.07	0.0185	2.14×10^{-5}
KAR-16	25	178.3	153.3	2.46	51.0	6	3.98	0.0259	3.00×10^{-5}

(a) Saturated thickness equal to hole bottom depth minus depth to water.

(b) For air-lifting, assume effective drawdown is equal to 1/3 of the open borehole saturated thickness (L).

(c) Typical value for borehole with large length to diameter ratio.

$T = Q F / (2 \pi s)$

$K = T / L$

Table 3: Jacob Analysis of Response in KAR-2 Associated with KAR-16 Drilling

Early Response (red on Jacob plot) - Pertains to the KAR-16 borehole interval of 134.1 to 164.6 m bgs

$Q := (106 - 61)\cdot\frac{liter}{min}$	Air-lift flow rate associated with new drilling zone	$Q = 45.0\cdot\frac{liter}{min}$	$Q = 11.9\cdot gpm$
$\Delta s := 3.72\cdot m$	Change in drawdown per log cycle of time (Jacob plot)		
$t_o := 48.5\cdot min$	Zero drawdown intercept (Jacob plot)		
$r := 86\cdot m$	Observation well radial distance FM3 to FM2		
$T := \frac{2.303\cdot Q}{4\cdot\pi\cdot\Delta s}$	Transmissivity	$T = 3.192\cdot\frac{m^2}{day}$	$T = 34.36\cdot\frac{ft^2}{day}$
$S := 2.246\cdot\frac{T\cdot t_o}{r^2}$	Storativity	$S = 3.265\times10^{-5}$	
$b := (164.6 - 134.1)\cdot m$	Test interval thickness	$b = 30.5\,m$	$b = 100.066\cdot ft$
$S_s := \frac{S}{b}$	Specific storage	$S_s = 1.071\times10^{-6}\,\frac{1}{m}$	$S_s = 3.263\times10^{-7}\cdot\frac{1}{ft}$
$K := \frac{T}{b}$	Average hydraulic conductivity	$K = 0.105\,\frac{m}{day}$	$K = 0.343\cdot\frac{ft}{day}$
		$K = 1.211\times10^{-4}\cdot\frac{cm}{sec}$	

Late Response (green on Jacob plot) - Pertains to the KAR-16 borehole interval of 134.1 to 195.7 m bgs

$Q := (148 - 61)\cdot\frac{liter}{min}$	Air-lift flow rate associated with new drilling zone	$Q = 87.0\cdot\frac{liter}{min}$	$Q = 23.0\cdot gpm$
$\Delta s := 6.35\cdot m$	Change in drawdown per log cycle of time (Jacob plot)		
$T := \frac{2.303\cdot Q}{4\cdot\pi\cdot\Delta s}$	Transmissivity	$T = 3.62\cdot\frac{m^2}{day}$	$T = 38.92\cdot\frac{ft^2}{day}$
$b := (195.7 - 134.1)\cdot m$	Test interval thickness	$b = 61.6\,m$	$b = 202.1\cdot ft$
$K := \frac{T}{b}$	Average hydraulic conductivity	$K = 0.0587\,\frac{m}{day}$	$K = 0.193\cdot\frac{ft}{day}$
		$K = 6.794\times10^{-5}\cdot\frac{cm}{sec}$	

Table 4: Hydraulic Conductivity Results

Well ID	Hydraulic Conductivity (m/day)				
	Specific capacity analysis of air-lift at end of drilling (a)	Jacob analysis KAR-2 response during KAR-16 drilling		Jacob analysis of KAR-1 (pumping well) response for 72 hour test	
		Minimum value	Maximum value	Pumping response	Recovery response
KAR-1	0.0449			0.0341	0.0610
KAR-2	0.0185	0.0587	0.105		
KAR-16	0.0259				

(a) Specific capacity analysis tends to underestimate hydraulic conductivity due to well loss.

Average: 0.050 m/day

5.8×10^{-5} cm/sec

Table 5: Example of Mine Inflow Calculation (maximum inflow rate)

Input Values

$r_p := 120 \cdot m$	Effective radius of mine boundary	
$D := 270 \cdot m$	Depth of mine workings below ground surface	
$SWL := 25 \cdot m$	Static water level below ground surface	
$W := 0.20 \cdot 420 \cdot \frac{mm}{yr}$	Net infiltration (recharge) flux (20% of mean annual precipitation)	$W = 0.084 \cdot \frac{m}{yr}$
$K := 0.050 \cdot \frac{m}{day}$	Rock mass hydraulic conductivity	$K = 5.8 \times 10^{-5} \cdot \frac{cm}{sec}$

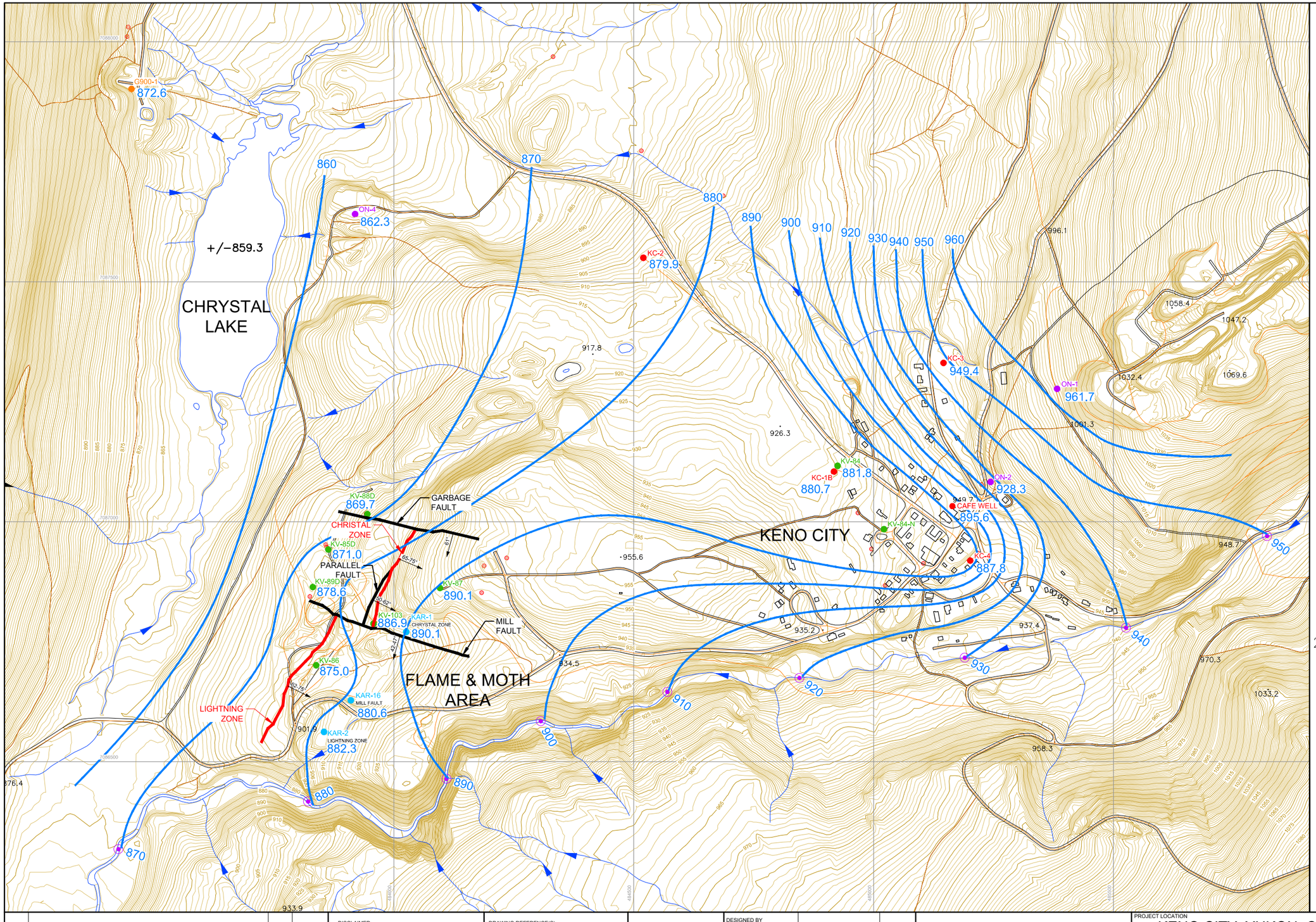
Calculations

$h_o := D - SWL$	Initial (pre-mining) saturated thickness (vertical distance from static water level to mine bottom)	$h_o = 245\,m$
$h_p := \frac{h_o}{2}$	Saturated thickness at exterior mine boundary (assume equal to 1/2 of vertical distance from static water level to mine bottom)	$h_p = 122.5 \cdot m$

$$F(a) := \sqrt{h_p^{\,2} + \frac{W}{K} \cdot \left[a^2 \cdot \ln\left(\frac{a}{r_p}\right) - \frac{\left(a^2 - r_p^{\,2}\right)}{2} \right]} - h_o$$

Root equation to estimate effective radius. r_o = a when F(a) = 0

$a := 1000 \cdot m$ (guess)	$r_o := root(F(a), a)$	Computed effective radius	$r_o = 2046 \cdot m$
$Q := W \cdot \pi \cdot r_o^{\,2}$	Total mine inflow		$Q = 35.0 \cdot \frac{liter}{sec}$
			$Q = 555 \cdot \frac{gal}{min}$



LEGEND:

- KV-3 920 — REGULATORY WELL w/ WATER LEVEL ELEVATION (m MSL)
- KC-3 920 — KENO CITY WELL w/ WATER LEVEL ELEVATION (m MSL)
- KAR-3 920 — FLAME & MOTH TEST HOLE w/ WATER LEVEL ELEVATION (m MSL)
- ON-2 920 — ONEK WELL w/ WATER LEVEL ELEVATION (m MSL)
- G900-1 920 — ADIT AREA w/ WATER LEVEL ELEVATION (m MSL)
- 920 — PERENNIAL STREAM WATER LEVEL ELEVATION (m MSL)
- 880 — GROUND WATER LEVEL CONTOUR (m MSL)

ISSUE / REV	DESCRIPTION	ENG	DATE
0			

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RECEIVED, OCTOBER 2013.

DATUM: AMSL

CAD FILE: MONITORING WELLS 2013-10-17

DESIGNED BY		
DRAWN BY	STEVEN C.	10-17-2013
CHECKED BY	FRED M.	
APPROVED BY		
PROJECT MANAGER		
CLIENT APPROVAL		

PROJECT LOCATION: KENO CITY, YUKON, CANADA
PROJECT: KENO - FLAME AND MOTH OPERATIONAL SUPPORT
TITLE: WATER LEVEL CONTOUR MAP

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Fort Collins, Co 80525
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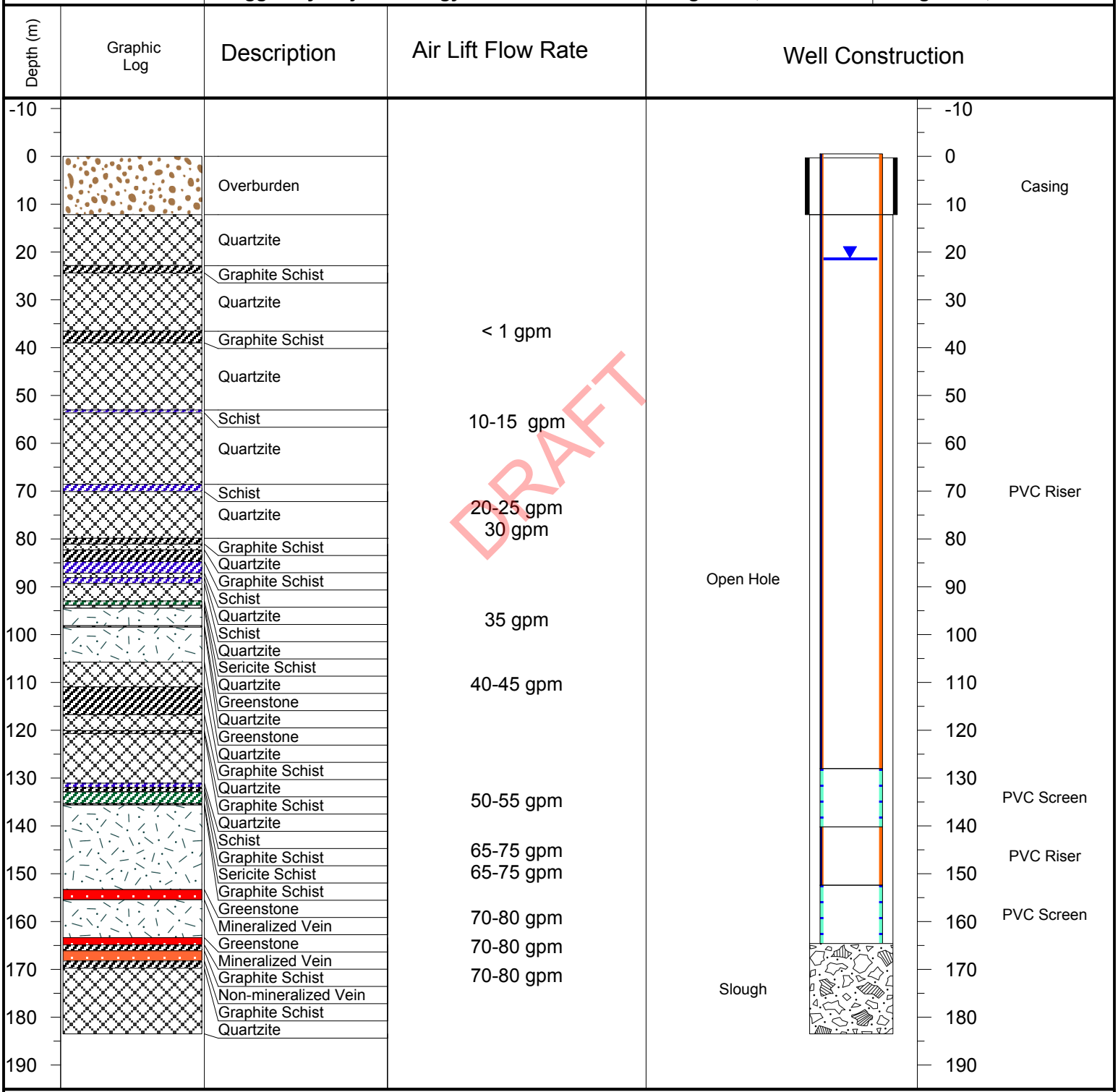
PROJECT NO: 102006 | REVISION: 0
SCALE: 1 cm = 60 m
DRAWING NAME: FIGURE 1 | SHEET NUMBER: 1 OF 1

DRAWING FILENAME: I:\Projects\102000 - Keno\102004 - Keno Operational Support\04 - Flame and Moth\AUTOCAD\Exhibits\MONITORING WELLS 2013-10-17.dwg LAYOUT NAME: FIGURE 1 DATE: Nov 27, 2013 - 10:08am CAD OPERATOR: jhowell
LIST OF XREFS: [New DIST] [Beta_Master_Pub] [Roads_GIS_Master] [ROADS_GIS_Master] [EXHIBIT TITLE]

PROJECT: **ERDC Site Wide Monitoring Plan (13 002-04)**	WELL ID: **KAR13001 (FM-1)**	
LOCATION: **Keno Hills Silver District (KHSD)**	WELL MATERIAL: **Christal Zone**	
DRILLING CONTRACTOR: **Access Consulting Group**	NORTHING: **7086562.16**	EASTING: **483854.14**
DRILLING EQUIPMENT: **Midnight Sun Drilling Inc.**	GROUND SURFACE ELEV. (masl): **913.1**	TOC ELEVATION (m ags): **0.5**
DRILLING METHOD: **Air Rotary**	TOTAL DEPTH (m): **182.3**	WATER DEPTH (m bgs): **21.431**
LOGGED BY: **MR/LF**	SAMPLING METHOD: **Logged by major lithology**	DATE STARTED: **August 22, 2013**	DATE COMPLETED: **August 24, 2013**

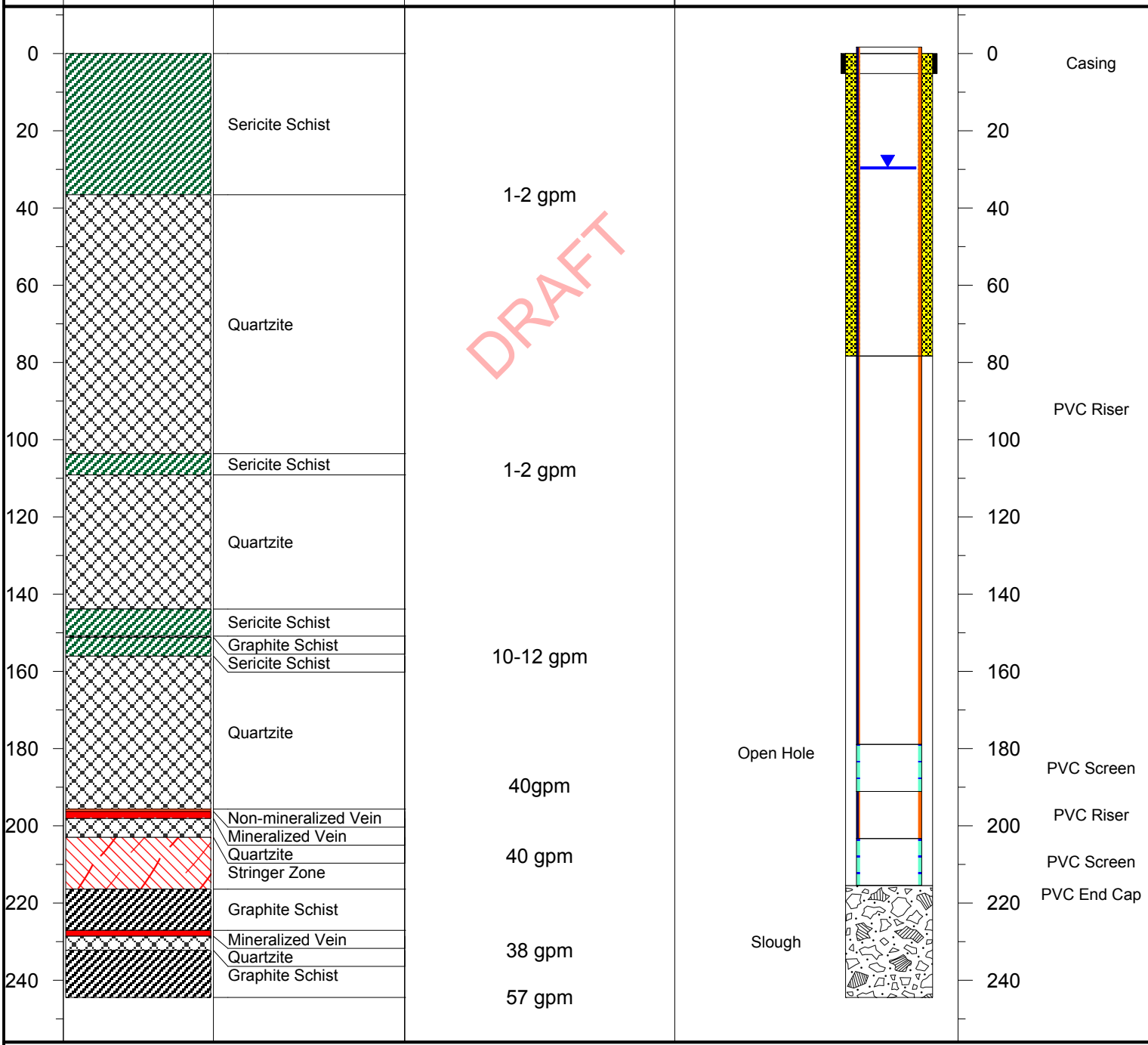


NOTES:

Figure 2 KAR-1 Boring Log

Overburden Borehole Diameter: 7 3/8"
Bedrock Borehole Diameter: 6"

PROJECT: **ERDC Site Wide Monitoring Plan (13 002-04)**	WELL ID: **KAR13002 (FM-2)**	
LOCATION: **Keno Hills Silver District (KHSD)**	WELL MATERIAL: **Lightning Zone**	
DRILLING CONTRACTOR: **Access Consulting Group**	NORTHING: **7086770.45**	EASTING: **484025.71**
DRILLING EQUIPMENT: **Midnight Sun Drilling Inc.**	GROUND SURFACE ELEV. (masl): **912.23**	TOC ELEVATION (m ags): **1.68**
DRILLING METHOD: **Air Rotary**	TOTAL DEPTH (m): **244.4**	WATER DEPTH (m bgs): **29.615**
LOGGED BY: **MR/EB**	SAMPLING METHOD: **Logged by major lithology**	DATE STARTED: **August 26, 2013**	DATE COMPLETED: **August 28, 2013**

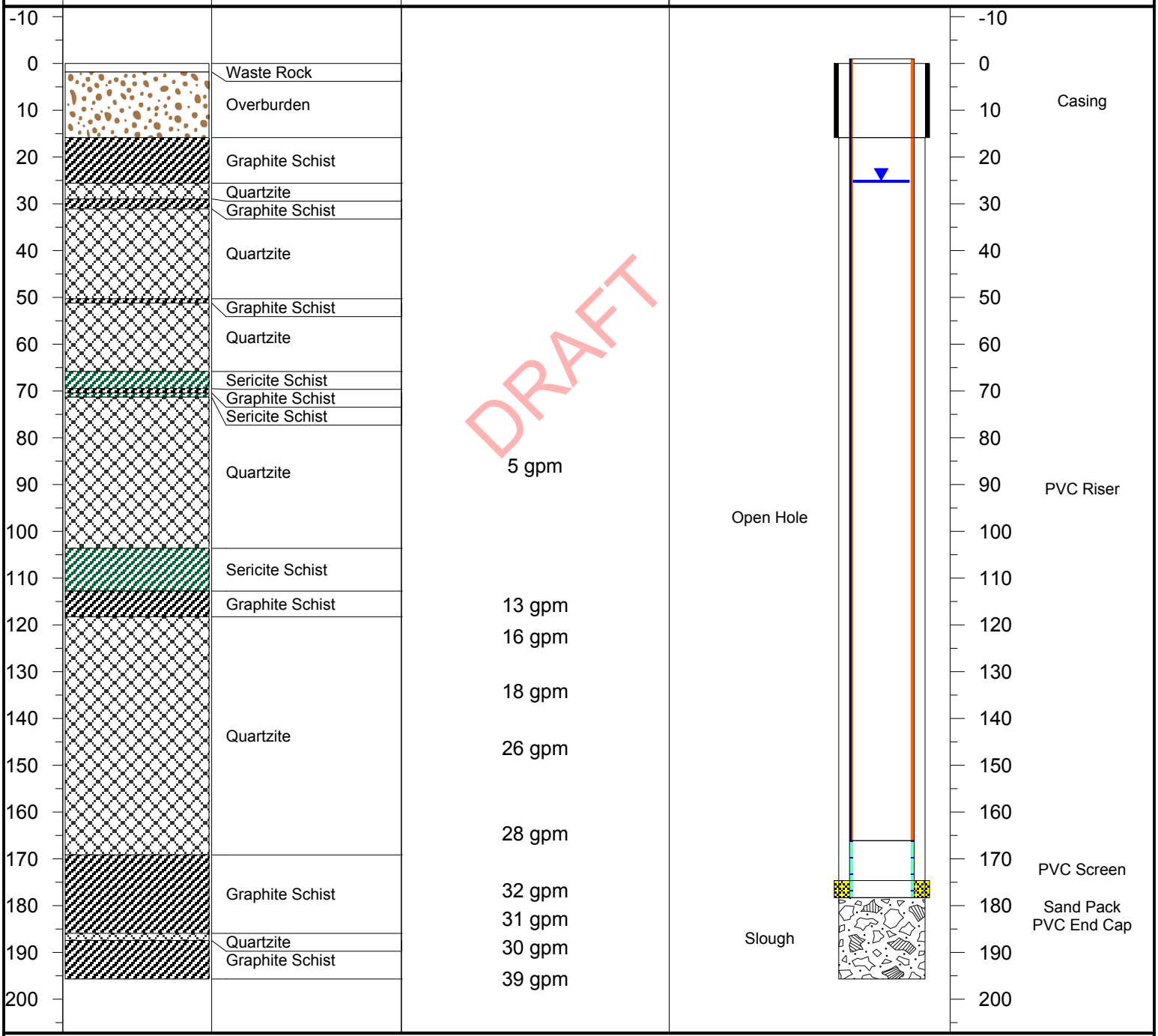


NOTES:

Figure 3 KAR-2 Boring Log

Overburden Borehole Diameter: 7 3/8"
Bedrock Borehole Diameter: 6"

PROJECT: **ERDC Site Wide Monitoring Plan (13 002-04)**	WELL ID: **KAR13016 (FM-3)**	
LOCATION: **Keno Hills Silver District (KHSD)**	WELL MATERIAL: **Mill Fault**	
DRILLING CONTRACTOR: **Access Consulting Group**	NORTHING: **7086627.86**	EASTING: **483910.161**
DRILLING EQUIPMENT: **Midnight Sun Drilling Inc.**	GROUND SURFACE ELEV. (masl): **907.0729**	TOC ELEVATION (m ags): **0.97**
DRILLING METHOD: **Air Rotary**	TOTAL DEPTH (m): **195.7**	WATER DEPTH (m bgs): **25.197**
LOGGED BY: **MR**	SAMPLING METHOD: **Logged by major lithology**	DATE STARTED: **September 10, 2013**	DATE COMPLETED: **September 21, 2013**



NOTES:

Figure 4 KAR-16 Boring Log

Overburden Borehole Diameter: 7 3/8"
Bedrock Borehole Diameter: 6"

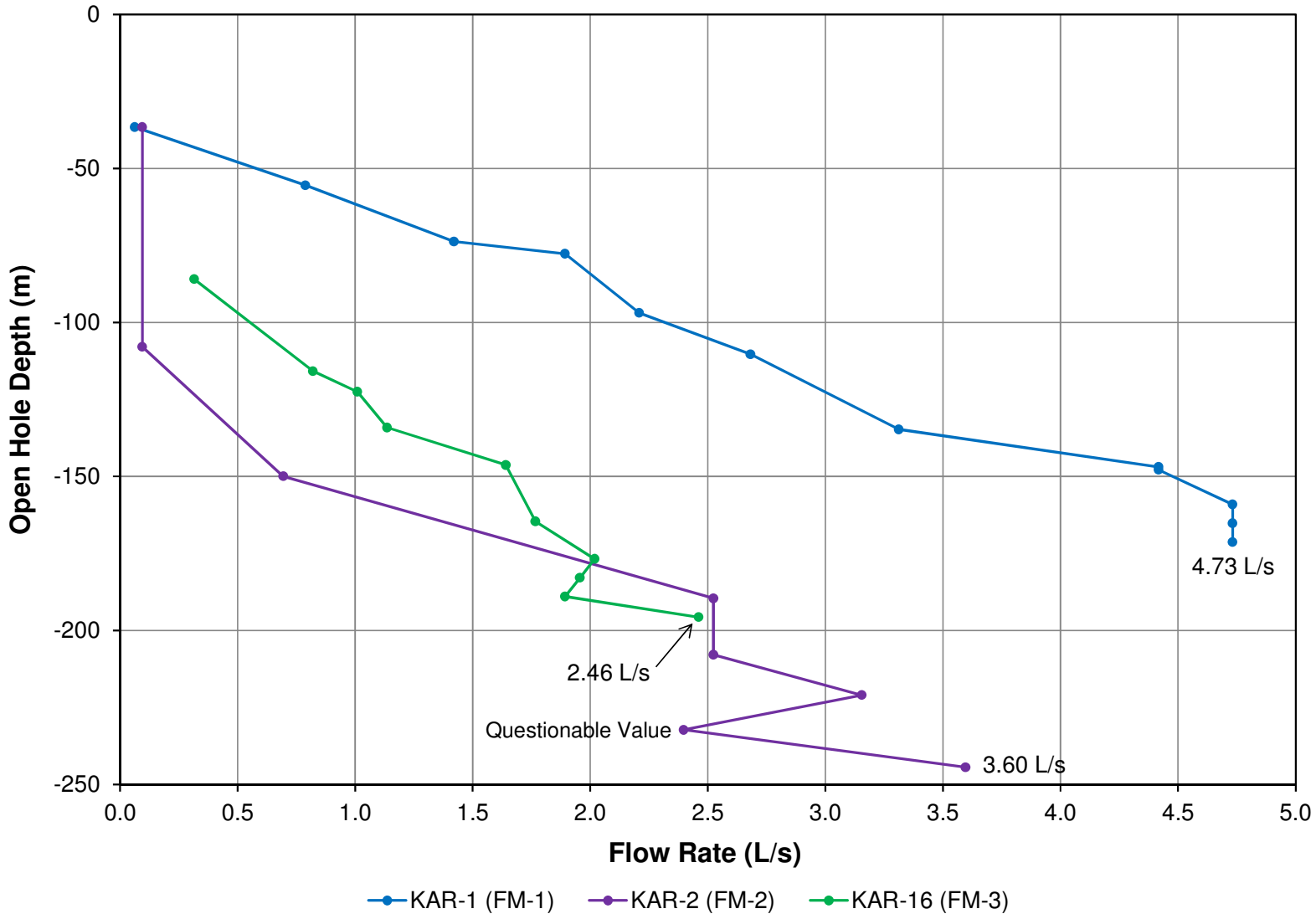


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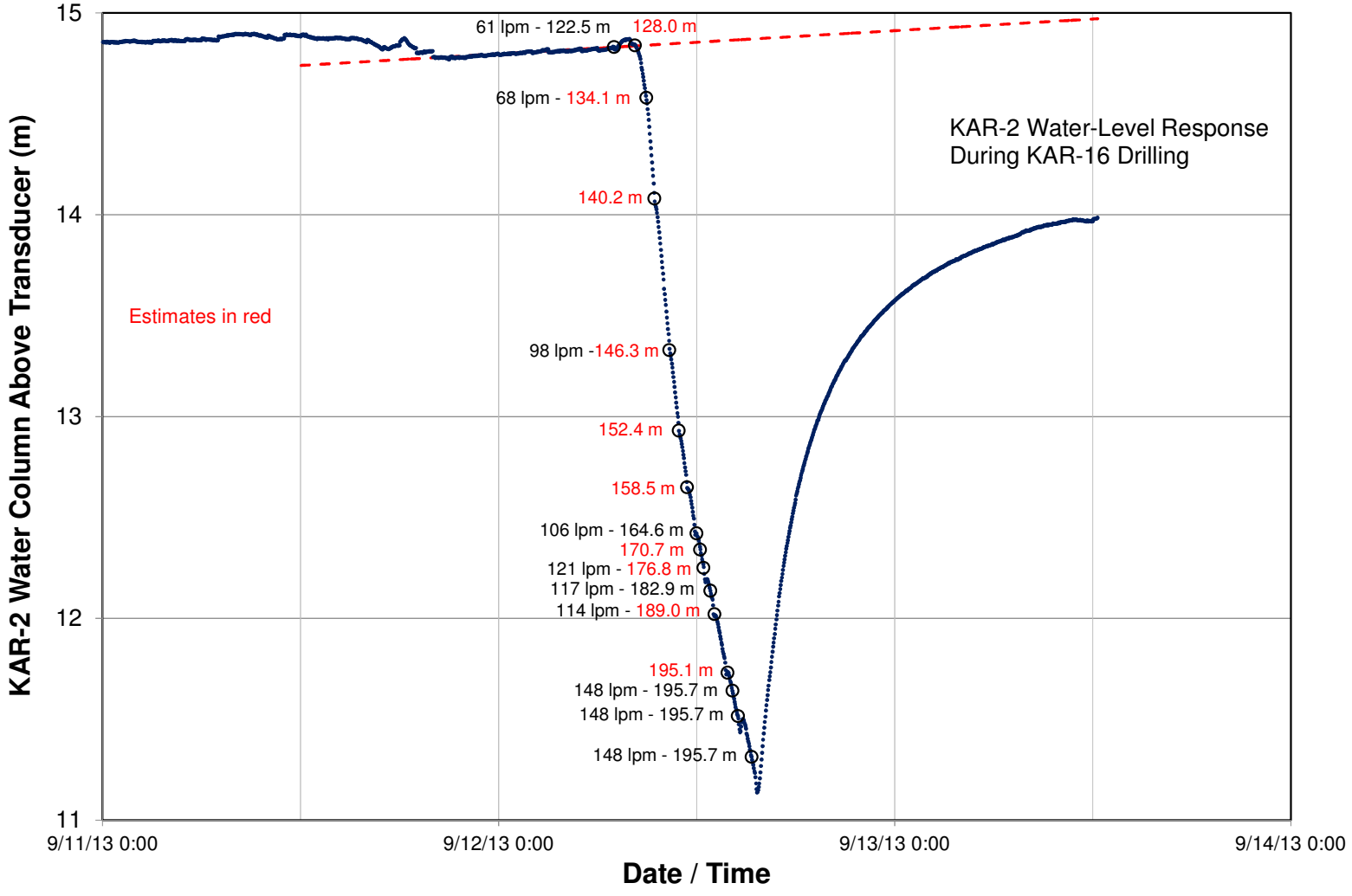
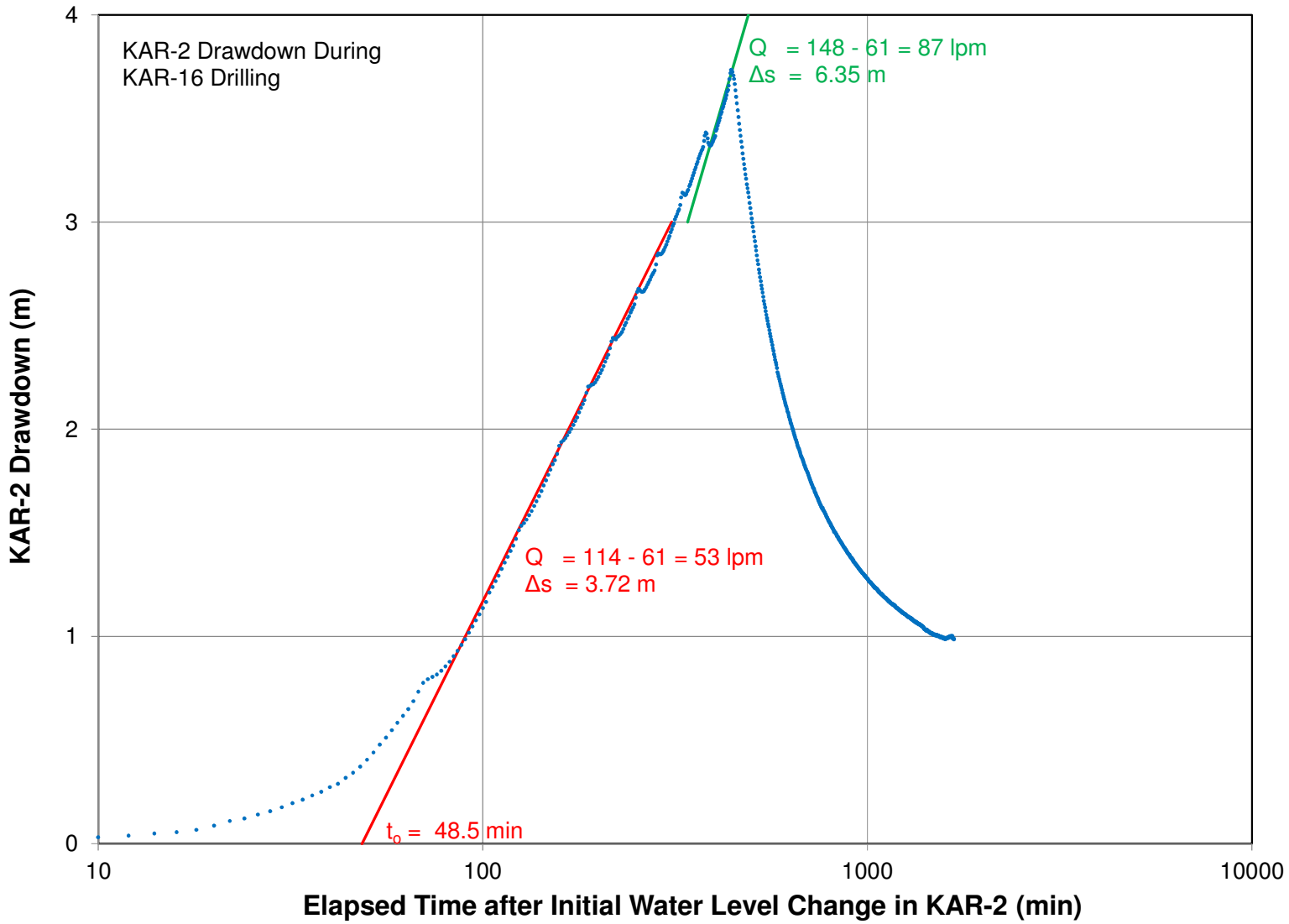
Figure 5
Air-Lift Flow Rates During Drilling

PREPARED FOR:

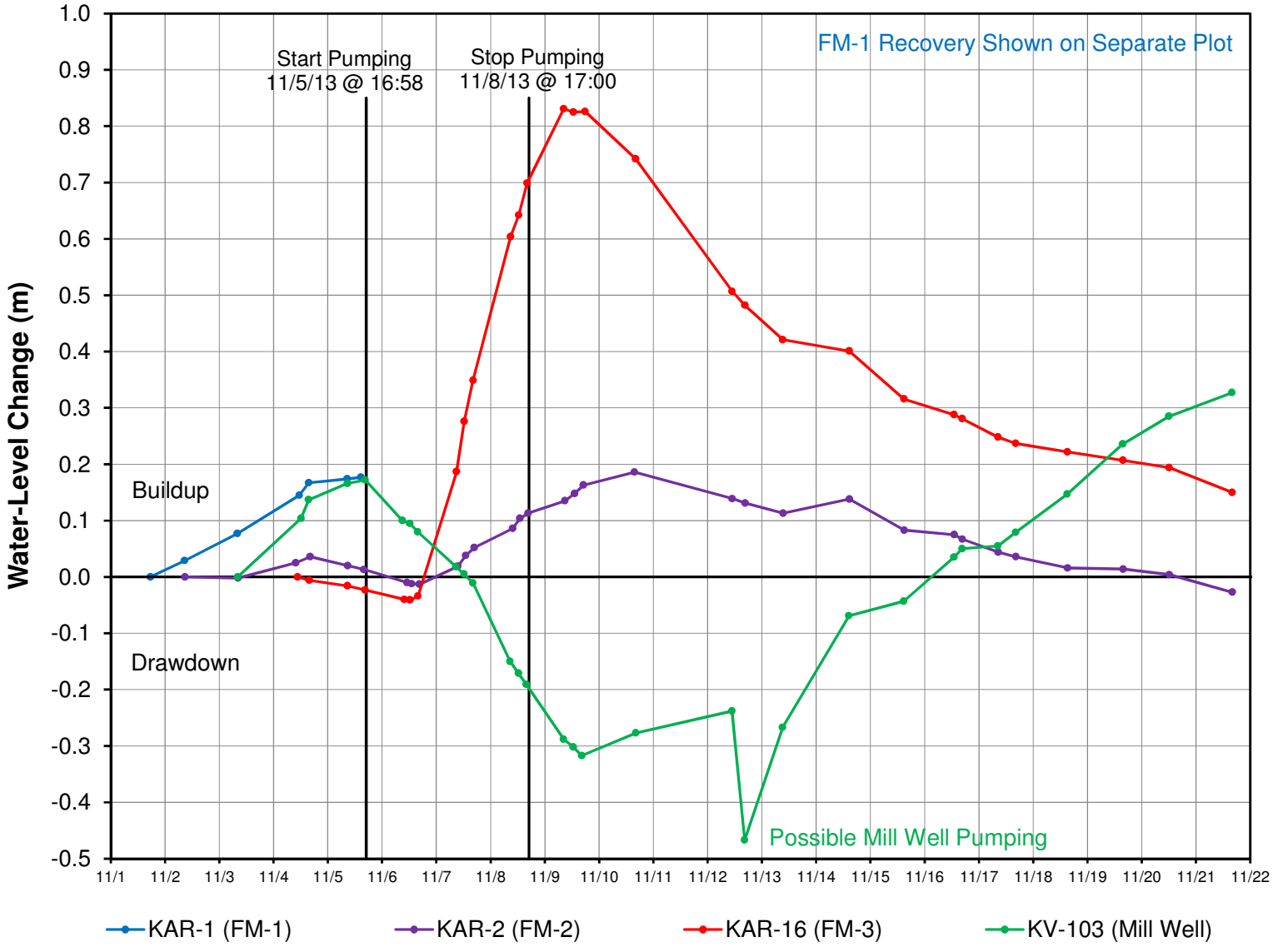
Alexco Resource Corp



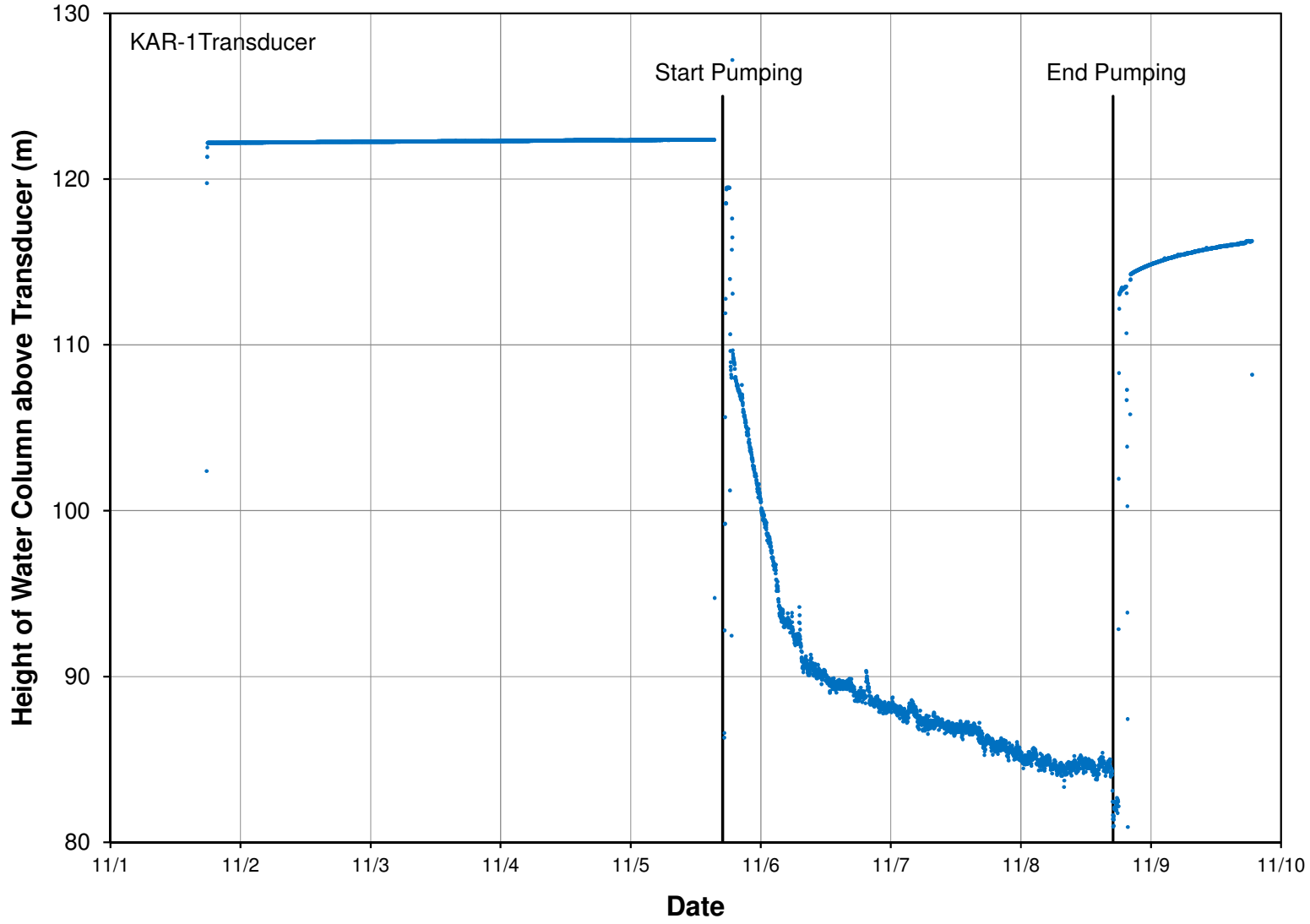
PROJECT: INSERT #	TASK: #	Figure 6 KAR-2 Water-Level Response	PREPARED FOR: Alexco Resource Corp
INTERRA logic			



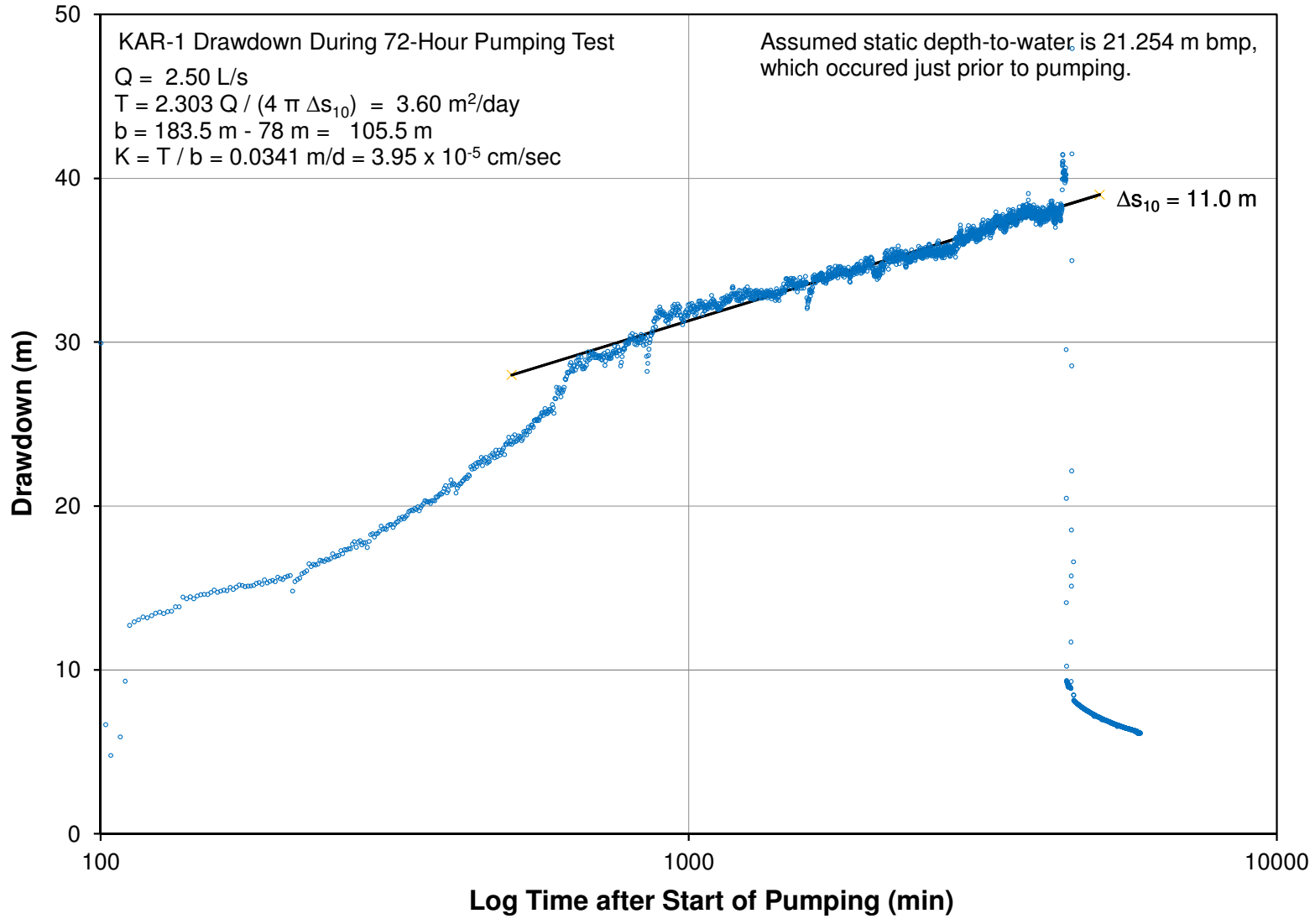
PROJECT: INSERT # TASK: #	**Figure 7** **Jacob Plot of KAR-2 Drawdown**	PREPARED FOR: Alexco Resource Corp



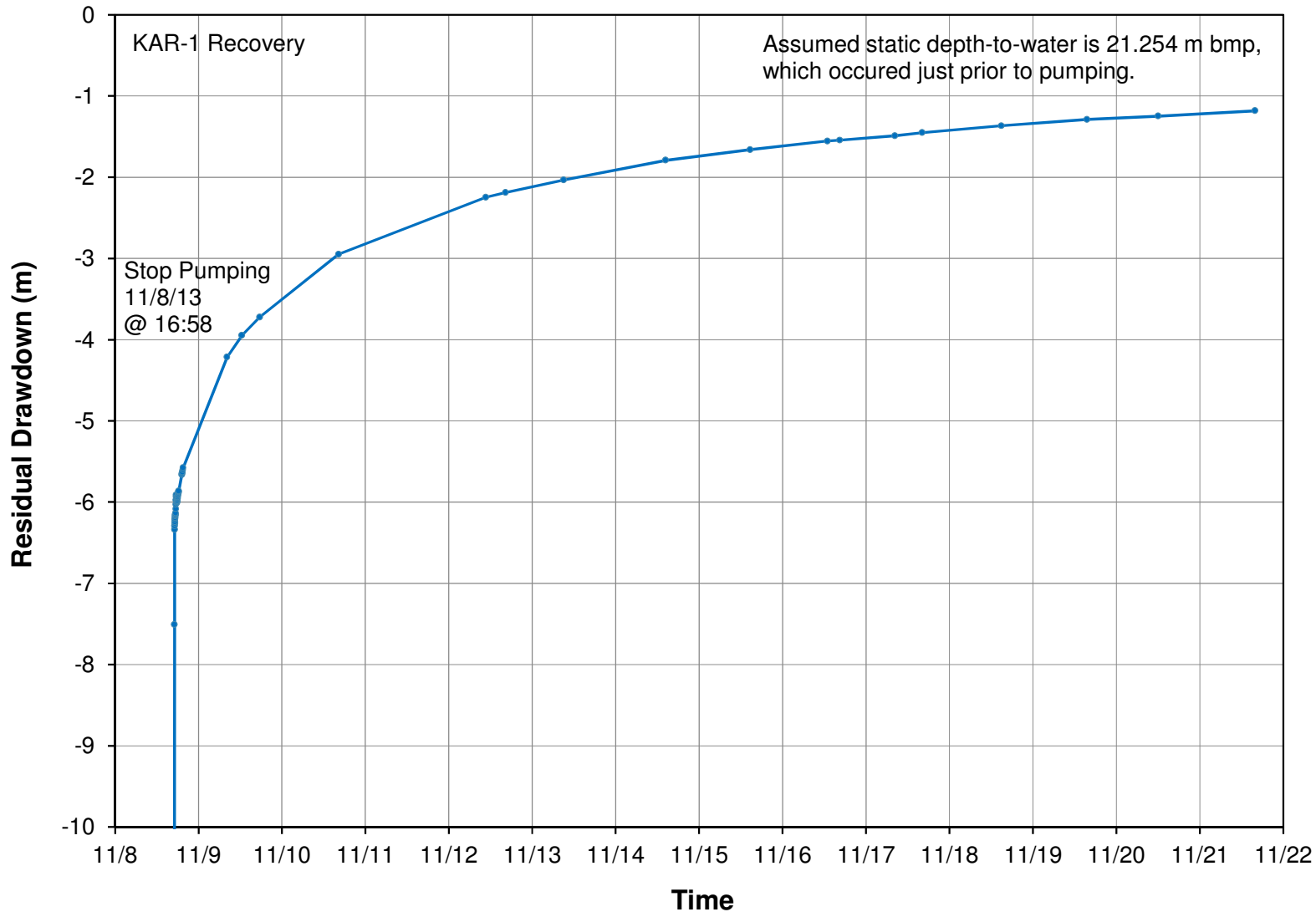
PROJECT:	TASK:	**Figure 8** **Observation Well Responses During and After KAR-1 Pumping Test**	PREPARED FOR: Alexco Resource Corp
INTERRA logic			



PROJECT: INSERT # TASK: #	**Figure 9** **Water Level Hydrograph for KAR-1 Pumping Well**	PREPARED FOR: Alexco Resource Corp



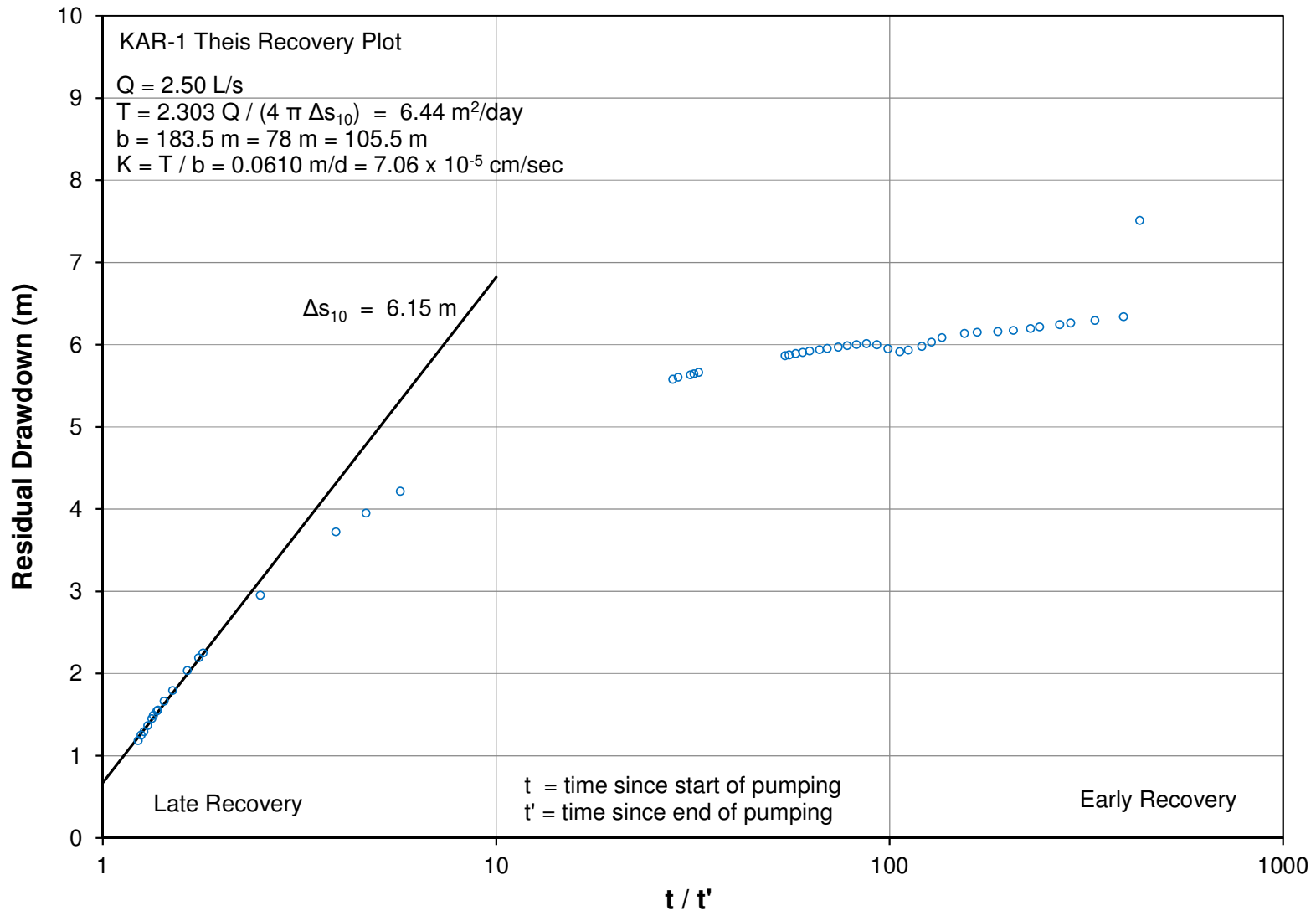
PROJECT: INSERT # TASK: #	**Figure 10** **Jacob Plot for KAR-1 Pumping Well**	PREPARED FOR: Alexco Resource Corp



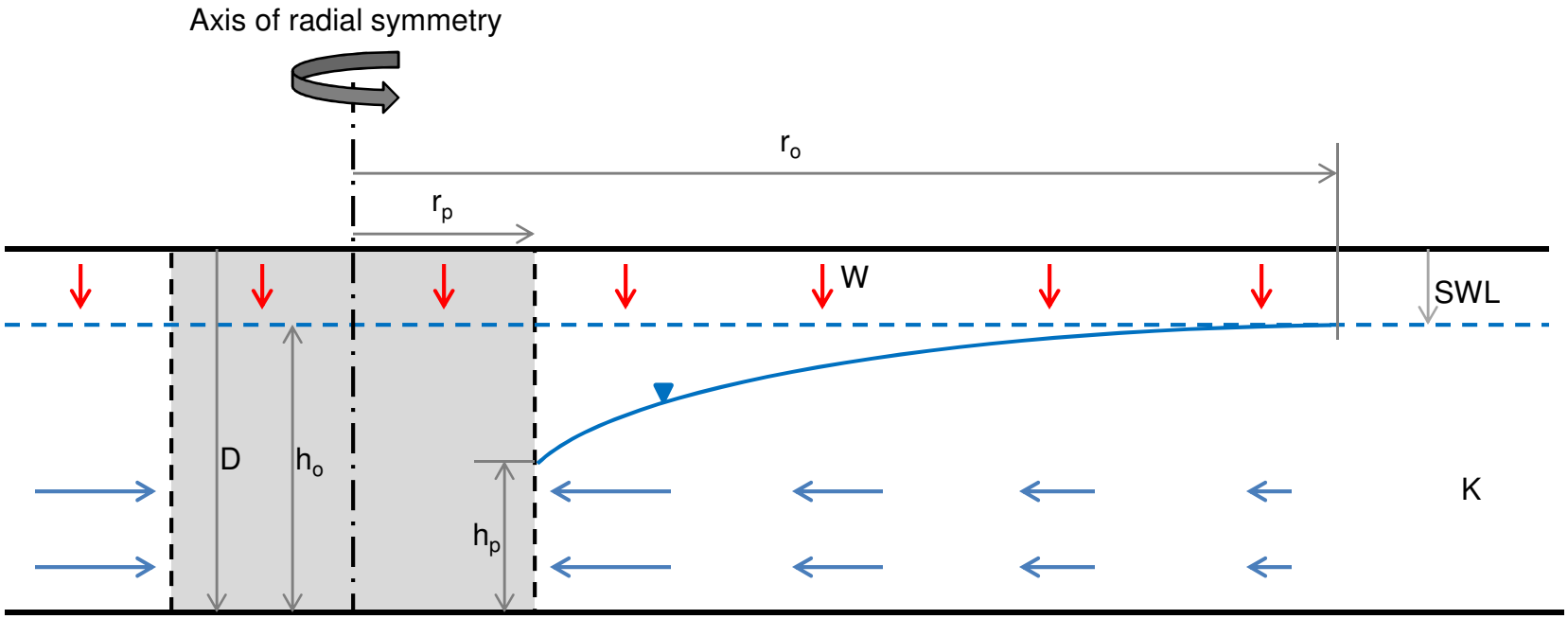
PROJECT: INSERT #	TASK: #
INTERRA logic	

Figure 11
Recovery Hydrograph for KAR-1 Pumping Well

PREPARED FOR:
Alexco Resource Corp



PROJECT: INSERT #	TASK: #	**Figure 12** **Theis Recovery Plot for KAR-1 Pumping Well**	PREPARED FOR: Alexco Resource Corp
INTERRA logic			



Dewatered mine workings

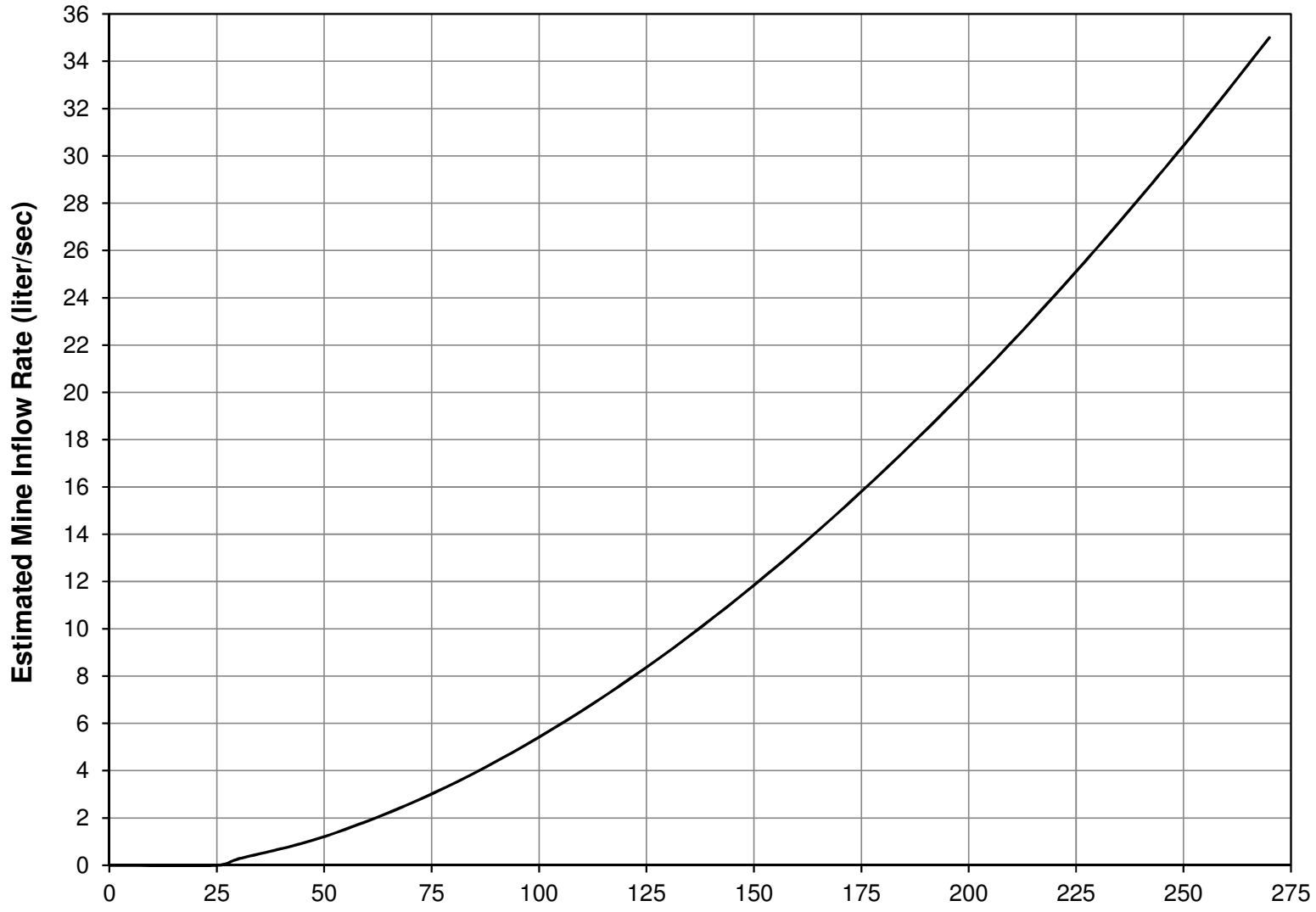
Groundwater flow

Net infiltration (recharge)

Water table

r_p = radial extent of mine workings
r_o = radial extend of infiltration captured by mine
SWL = static water level (bgs)
D = depth of mine workings (bgs)
h_o = initial saturated thickness
h_p = saturated thickness at mine boundary
K = bulk hydraulic conductivity of rockmass
W = net infiltration (recharge) flux

PROJECT:	TASK:	**Figure 13** **Mine Inflow Model**	PREPARED FOR: Alexco Resource Corp
INTERRA logic			



PROJECT:	TASK:	**Figure 14** **Estimated Mine Inflow Rate versus Depth of Workings**	PREPARED FOR: Alexco Resource Corp
INTERRA logic			

A TETRA TECH COMPANY

December 6, 2013

ISSUED FOR USE
EBA FILE: W14103303
Via Email: kwoloshyn@alexcoresource.com

Alexco Resource Corp.
3 – 151 Industrial Road
Whitehorse, YT Y1A 2V3

Attention: Kai Woloshyn – Environmental Manager

Subject: Dry Stacked Tailings Facility – Phase II Expansion
Keno Hill District Mill Site, Yukon

1.0 INTRODUCTION

Alexco Resource Corp. (Alexco) retained EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA) to complete a geotechnical investigation and provide a preliminary design for expansion of the existing Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site, Yukon.

This report presents some background information related to the DSTF, a summary of the subsurface conditions encountered during the DSTF Phase II Expansion preliminary geotechnical investigation, and the preliminary design for the DSTF Phase II Expansion. For additional conditions regarding the use of this report, please refer to EBA's General Conditions in Appendix A.

2.0 BACKGROUND

EBA conducted geotechnical investigations on the subject site in 2009 and 2010 to determine the subsurface soil conditions for design of the DSTF. EBA submitted the current DSTF detailed design in 2011 and has been monitoring construction and performance of the facility since. Recommendations for the DSTF Phase II Expansion presented in this letter are based on subsurface soil conditions encountered during the DSTF Phase II Expansion preliminary geotechnical investigation and the following DSTF documentation:

- "DSTF Instrumentation and Construction Monitoring" (EBA Memos, June 2011 – November 2013)
- "Dry Stacked Tailings Facility – Risk Assessment Stability Model Update Letter" (EBA Letter, February 2013)
- "Dry Stacked Tailings Facility – Detailed Design" (EBA Report, May 2011)
- "Dry Stacked Tailings Facility – Operation, Maintenance, and Surveillance Manual" (EBA Report, September 2010)
- "Dry Stacked Tailings Facility – Runoff Diversion Specifications" (EBA Report, September 2010)
- "Dry Stacked Tailings Facility – Preliminary Engineering Design and Management Plan" (EBA Report, January 2010)

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Whitehorse, YT Y1A 0H7 CANADA
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3.0 GEOTECHNICAL INVESTIGATION

EBA completed a preliminary geotechnical investigation for the DSTF Phase II Expansion consisting of twelve testpits excavated to varying depths within the proposed expansion footprint. The investigation was completed on September 11, 2013 using a Hitachi 270 excavator supplied by Alexco. EBA's representative on site was Mr. Justin Pigage, P.Eng.

The approximate testpit locations are shown on Figure 1. Disturbed samples collected from the testpit walls and excavator bucket were collected and returned to EBA's Whitehorse laboratory for index property testing. A summary of the test results is shown on the testpit logs in Appendix B. The UTM (NAD 83 datum) coordinates noted on the testpit logs were obtained using a handheld GPS unit accurate to within 5 m.

3.1 Surface Conditions

The proposed DSTF Phase II Expansion area lies immediately south of the existing facility and is bound by the Keno City Dump and access road to the north and east, the Duncan Creek Road to the south, and the Keno Hill District Mill to the west. The proposed footprint is shown on Figure 1. The ground surface within the proposed footprint generally slopes down from east to west at approximately 10 to 15%. Vegetation in the area consists of moss cover and small spruce trees and willow shrubs. The existing Bellekeno Haul Road alignment crosses the proposed footprint in an east-west direction.

3.2 Subsurface Conditions

The subsurface conditions within the proposed DSTF Phase II Expansion footprint observed during the preliminary geotechnical investigation consist of ice-rich frozen silt till or unfrozen silty sand and gravel. The ice-rich silt till was observed in testpits excavated throughout the proposed footprint except for the south western extent (TP40 – TP43) in which the unfrozen silty sand and gravel was encountered. The thickness of the ice-rich frozen silt till is unknown as excavation of this material was not practical with the supplied equipment. The unfrozen silty sand and gravel along the south western extent extends at least 4.5 m (maximum reach of equipment) below the existing ground surface. Detailed testpit logs are included in Appendix B.

3.3 Groundwater

No groundwater was encountered during the preliminary geotechnical investigation.

3.4 Permafrost

Permafrost was encountered in the silt till throughout most of the proposed DSTF Phase II Expansion area. The frozen silt till contains a combination of randomly oriented ice inclusions, and non-visible excess ice. Observations in the field indicate an overall ice content of approximately 5 to 25% by volume.

3.5 Bedrock

Bedrock was not encountered during the preliminary geotechnical investigation. Limited bedrock depth information was provided by Alexco indicating between 10 and 40 m of overburden within the proposed expansion footprint.

4.0 DSTF PHASE II EXPANSION PRELIMINARY DESIGN

The preliminary design for the DSTF Phase II Expansion is based on the design of the existing facility, laboratory and field data collected from site, and the performance of the current DSTF. Visual inspections and compaction test results confirm the DSTF is being constructed and operated as specified in the design. Slope indicator and ground temperature data indicate there is no lateral movement of the foundation soils and that they have remained frozen. The following sections summarize design assumptions specific to the DSTF Phase II Expansion, the geometry of the expansion, and the stability modelling completed.

Prior to detailed design and construction of the DSTF Phase II Expansion, a detailed geotechnical drill investigation will be required to confirm subsurface assumptions in this preliminary design.

4.1 Design Assumptions

4.1.1 Subsurface Conditions

The preliminary geotechnical investigation consisted of shallow testpits terminated due to refusal in frozen ice-rich silt, at an average depth of about 0.5 m below the existing ground surface. Moisture content testing on samples collected from the shallow testpits indicate properties similar to the frozen ice-rich silt till encountered during design of the existing DSTF.

Alexco provided 57 bedrock contact locations recorded during previous drilling activities around the proposed expansion footprint. EBA used this bedrock contact information to create an approximate bedrock surface.

For the purpose of the DSTF Phase II Expansion preliminary design, EBA has assumed the frozen ice-rich silt till encountered in the shallow testpits extends down to bedrock. This is considered a conservative assumption because the ice-content in the subsurface soils likely decreases with depth (as is the case under the existing DSTF).

4.1.2 Ice-Rich Frozen Silt Strength Properties

The DSTF design relies on a conservative approach for determining the shear strength of the frozen ice-rich silt of assuming an internal angle of friction equal to zero, and relying solely on the cohesive properties of the frozen soil.

The existing DSTF was designed using a relationship between shear strength and ground temperature (Johnston 1981). This relationship was chosen because it is considered very conservative and limited ground temperature data for the DSTF was available at the time of design.

The DSTF Phase II Expansion is designed using a similar relationship (Weaver and Morgenstern 1981). This relationship was chosen because EBA has been collecting site specific ground temperature data since 2009, furthering our understanding of the condition of the foundation soils.

The frozen ice-rich silt has been assigned a long term shear strength value of 70 kPa for the purpose of the preliminary design.

4.1.3 DSTF Phase II Expansion Foundation

The foundation for the existing DSTF consists of a gravel drainage blanket, geosynthetic clay liner (GCL), and geocomposite drain. It was assumed that 10% of the porewater in the DSTF would drain from the facility after tailings placement. The GCL and geocomposite drain were included to provide containment and a pathway for this assumed excess porewater to safely drain from the toe of the facility.

No seepage water has been observed in the geocomposite drain. In August 2012, a piezometer was installed in the completed lower bench of the DSTF to determine if any free water exists within the tailings. No water from tailings porewater has been observed in the piezometer.

The GCL and geocomposite drain have been removed from the foundation design of the DSTF Phase II Expansion. To date there has been no porewater buildup or seepage observed in the DSTF, therefore the GCL and geocomposite drain are not necessary for stability of the facility.

4.2 DSTF Phase II Expansion Geometry

The location and geometry of the DSTF Phase II Expansion are shown on Figure 1. The two sections used to conduct the slope stability assessment are shown on Figure 2. Slopes and bench elevations were carried over from the existing DSTF where possible. The approximate total storage within the expansion is 295,000 m^3 (including a 22,000 m^3 toe structure).

The toe structure is required to obtain the recommended factor of safety against deep rotational failures through the ice-rich silt foundation soils. It provides mass to counter the driving weight of the tailings placed further upslope. The toe structure can be constructed of waste rock or compacted tailings, both materials were analysed in the stability assessment. The toe structure must be fully constructed before placing tailings above the 936 m bench.

4.3 DSTF Phase II Expansion Stability Assessment

The stability of the DSTF Phase II Expansion was determined using Geostudio 2007 – Slope/W module, which is a computer program that uses limit equilibrium theory to compute the factor of safety of slopes. The slopes were analyzed in several different conditions, including short term (during construction) and long term (after closure) in both static and pseudo-static scenarios.

Minimum factors of safety are suggested by the BC Mine Waste Rock Pile Research Committee (Piteau 1991). The results of the stability assessment for two sections in the DSTF Phase II Expansion were compared with the recommended minimums. A summary of the stability results is presented in the following sections.

4.3.1 Fully Frozen Case

This scenario is intended to model the condition where the tailings have been placed and the underlying soils have remained frozen (the current state of the DSTF). A summary of the computed factors of safety and the recommended minimums for this scenario are presented below in Table 1. Detailed slope stability results are presented in Appendix C.

Table 1: DSTF Phase II Expansion Slope Stability Results– Fully Frozen Case

Stability Conditions	Suggested Minimum Factor of Safety (Piteau 1991)	Calculated Factor of Safety Phase II Expansion	
		Section A-A'	Section B-B'
Stability of Surface			
Short-term (during construction – static)	1.0	1.4	2.6
Long-term (after construction – static)	1.1	1.1	1.7
Deep Seated Stability			
Short-term (during construction – static)	1.3	1.9	2.4
Short-term (during construction – pseudo-static)	1.0	1.3	1.6
Long-term (after closure – static)	1.3	1.3	2.5
Long-term (after closure – pseudo-static)	1.0	1.3	1.7

4.3.2 Fully Thawed Case

This scenario is intended to model the anticipated long-term condition where the tailings are placed and the underlying soils have fully thawed and consolidated. A summary of the factors of safety and the recommended minimums for this scenario are presented below in Table 2. Detailed slope stability results are presented in Appendix D.

Table 2: DSTF Phase II Expansion Slope Stability Results– Fully Thawed Case

Stability Conditions	Suggested Minimum Factor of Safety (Piteau 1991)	Calculated Factor of Safety Phase II Expansion	
		Section A-A'	Section B-B'
Stability of Surface			
Short-term (during construction – static)	1.0	N/A[1]	
Long-term (after construction – static)	1.1	1.3	1.7
Deep Seated Stability			
Short-term (during construction – static)	1.3	N/A[1]	
Short-term (during construction – pseudo-static)	1.0	N/A[1]	
Long-term (after closure – static)	1.3	2.0	2.6
Long-term (after closure – pseudo-static)	1.0	1.4	1.7

[1]Foundation will not be fully thawed during construction of the facility.

5.0 ADDITIONAL RECOMMENDATIONS

The DSTF Phase II Expansion preliminary design presents a physically stable geometry for the purpose permitting. There are several components associated with a more detailed design that have not been included in the DSTF Phase II Expansion preliminary design. The following subjects should be addressed during the detailed design of the DSTF Phase II Expansion:

- **Surface water management** – The surface water structures (berms and ditches) currently in place around the DSTF can likely be extended to provide surface water management for the expansion. The detailed design of the DSTF Phase II Expansion should provide recommendations for these structures.
- **Construction schedule** – Construction of the DSTF Phase II Expansion will likely occur over several years. Recommendations with respect to timelines for clearing and placing foundation materials and tailings should be considered as part of the detailed design. A construction plan should be developed to limit the potential for permafrost degradation in the sensitive foundation soils beneath the expansion.
- **Closure** – A 0.5 m loose gravel cover material was included in the long term stability assessment of the DSTF Phase II Expansion. However, a detailed closure plan and schedule was not included in this preliminary design and should be addressed in the detailed design.
- **Future underground workings** – EBA understands Alexco intends to develop a resource beneath the proposed expansion footprint. When the underground development plans are finalized, they should be evaluated with respect to the DSTF design and the safe operation of both.

This DSTF Phase II Expansion preliminary design was completed based on subsurface information gathered from several shallow testpits within the proposed footprint, and depth to bedrock information provided by Alexco. Prior to detailed design and construction of the DSTF Phase II Expansion, a geotechnical drill investigation to confirm the assumptions in this preliminary design is necessary.

EBA recommends the drill investigation consist of at least a dozen holes advanced to bedrock within the footprint of the proposed expansion. The boreholes should be advanced with a drill capable of recovering undisturbed frozen overburden samples for the purpose of laboratory based strength testing. Instrumentation consisting of several slope indicator and ground temperature cable installations to monitor performance of the proposed expansion should be completed during the investigation. EBA would be pleased to provide a proposal to complete the investigation, if requested.

6.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Alexco Resource Corp. and their agents. EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Alexco Resource Corp., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement. EBA's General Conditions are provided in Appendix A of this report.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
EBA Engineering Consultants Ltd.

Justin Pigage, P.Eng.
Geotechnical Engineer, Arctic Region
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jpigage@eba.ca

J. Richard Trimble, P.Eng., FEC
Principal Consultant, Arctic Region
Direct Line: 867.668.9216
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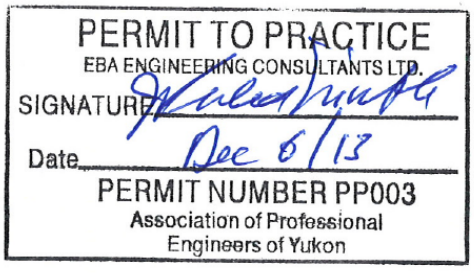


REFERENCES

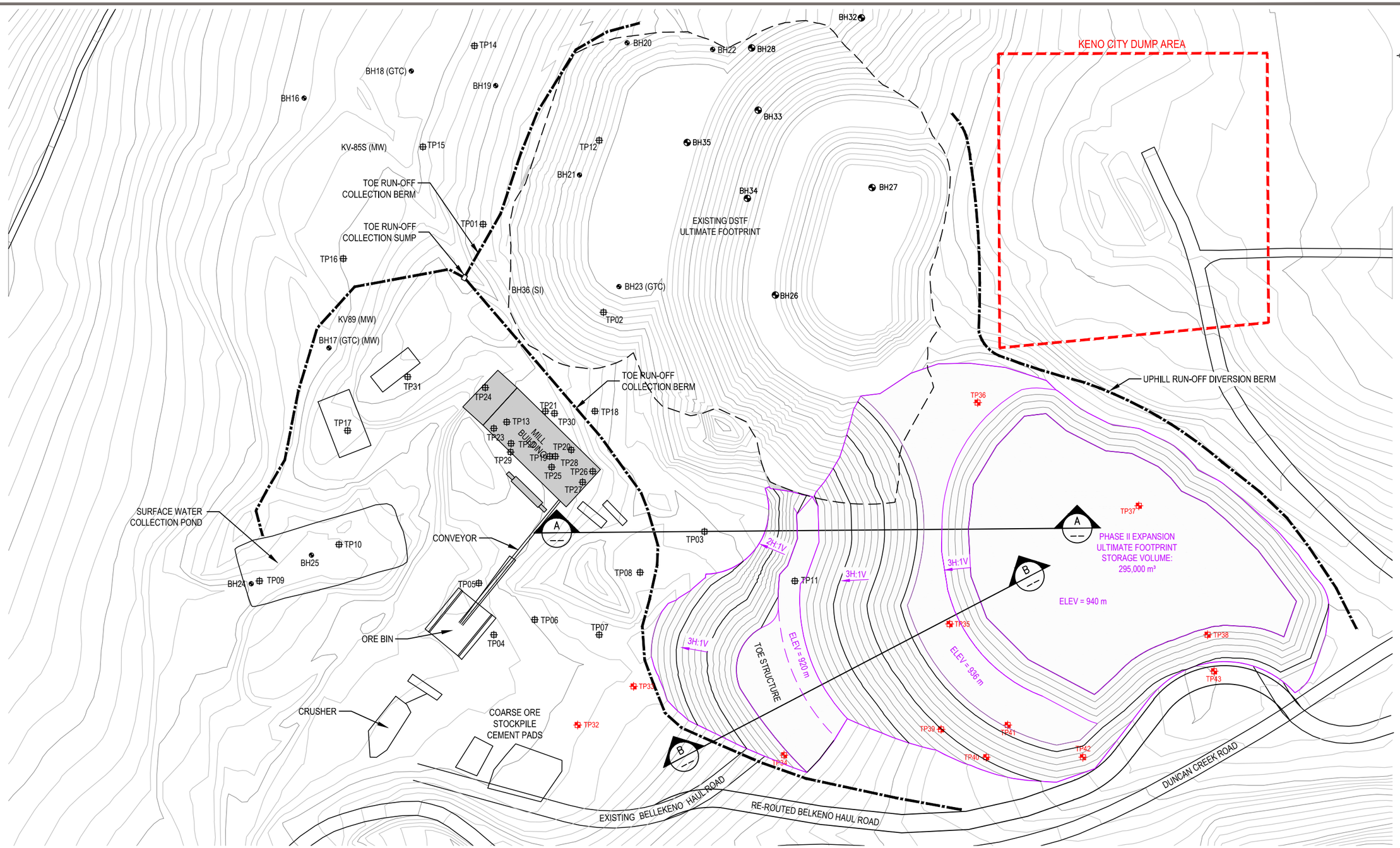
Johnston G.H., 1981. *Permafrost Engineering Design and Construction.* Hunter Rose Company Ltd., Toronto, Ontario, Canada.

Piteau Associates Engineering Ltd. 1991. "Investigation and Design of Mine Dumps – Interim Guidelines." Prepared for British Columbia Mine Waste Rock Pile Research Committee, May 1991.

Weaver J.S. and Morgenstern N.R., 1981. "Pile Design in Permafrost." Canadian Geotechnical Journal Vol 18 (1981): 357-370.

FIGURES

Figure 1 Site Plan Showing Proposed Expansion Footprint
Figure 2 DSTF Sections



LEGEND:

- TESTPIT LOCATION (PREVIOUSLY ADVANCED)
- BOREHOLE LOCATION (PREVIOUSLY ADVANCED)
- TESTPIT LOCATION (PHASE II EXPANSION)

0 100

Scale: 1 : 1750 (metres)

CLIENT

ALEXCO

A TETRA TECH COMPANY

DRY-STACKED TAILINGS FACILITY EXPANSION - PHASE II
KENO HILL DISTRICT MILL SITE, YUKON

SITE PLAN SHOWING PROPOSED EXPANSION FOOTPRINT

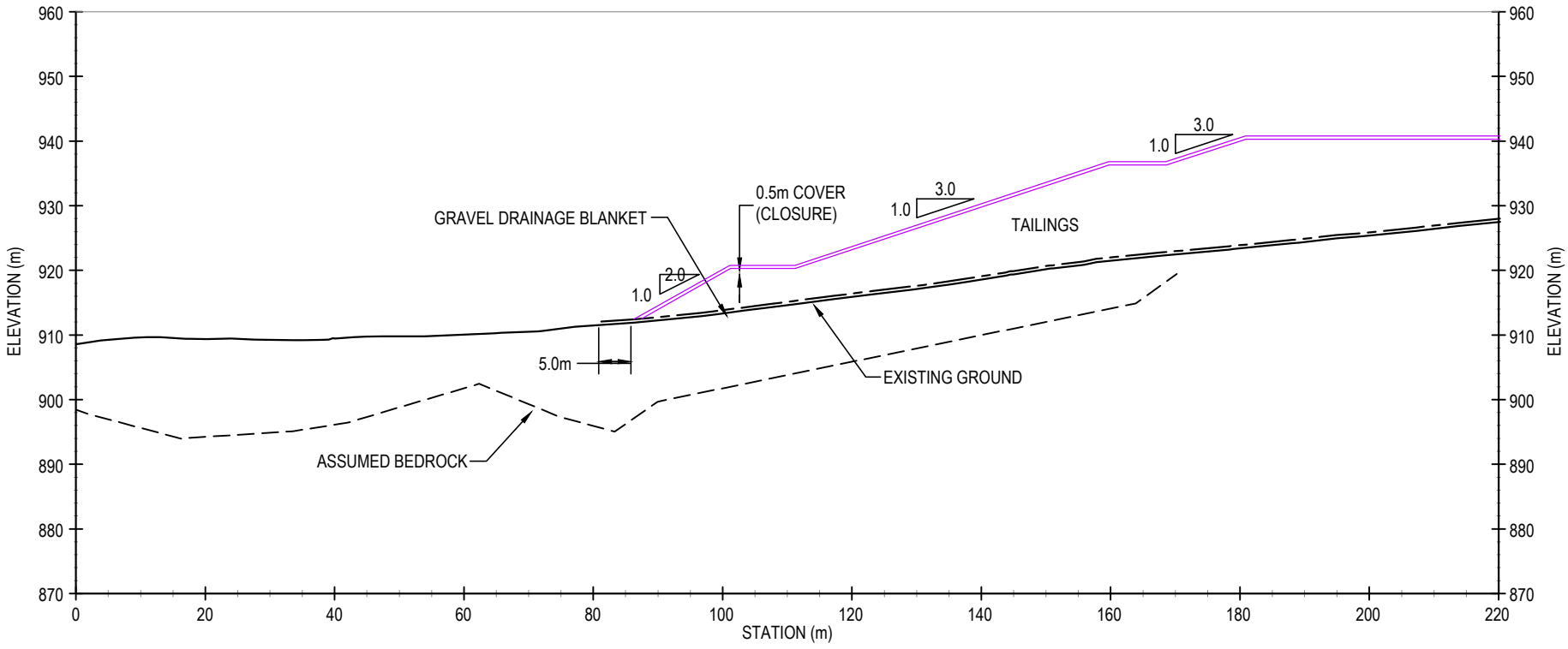
PROJECT NO.	DWN	CKD	REV
W1□103303-01	CB	JTP	0

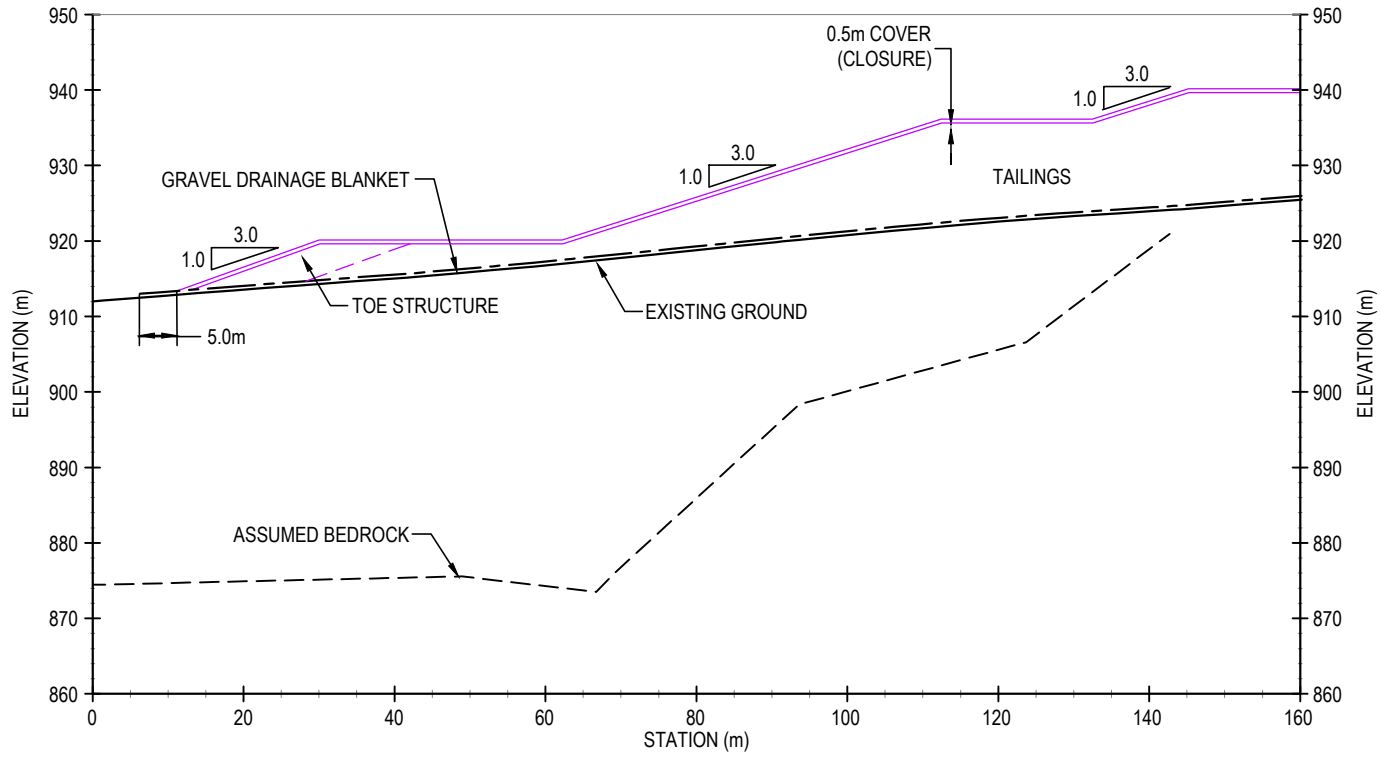
OFFICE: EBA-WHSE

DATE: N□□□m□□r 1□, 2013

Figure 1

O:\Whitehorse\Data\2012\drawings\Keno\W1410312 2-01 Keno DSTSF Re-design\DSTF Expansion Options\W1410312 2-01 DSTF Expansion Option 5.dwg [FIGURE 11 November 14, 2013 - 4:01:09 pm (BY: BUCHAN, CAMERON)





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Scale: 1: 1000 (metres)

CLIENT
ALEXCO

A TETRA TECH COMPANY

DRY-STACKED TAILINGS FACILITY EXPANSION - PHASE II
KENO HILL DISTRICT MILL SITE, YUKON

DSTF SECTIONS

PROJECT NO.	DWN	CKD	REV
W1□103303-01	CB	JTP	0

OFFICE: EBA-WHSE
DATE: N□□□m□□r 1□, 2013

Figure 2

APPENDIX A
EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B
TESTPIT LOGS

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP32
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086670N; 483945E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics		FROZEN, Nbe			0
	END OF TESTPIT @ 0.3 m (refusal in permafrost)					
1						5
2						
3						10
4						
5						16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 0.3m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP33
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086688N; 783971E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics		FROZEN, Nbe			0
	END OF TESTPIT @ 0.4 m (refusal in permafrost)					
1						5
2						
3						10
4						
5						16

eba A TETRA TECH COMPANY

LOGGED BY: JTP	COMPLETION DEPTH: 0.4m
REVIEWED BY: CPC	COMPLETE: 9/11/2013
DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP34
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086656N; 484041E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics			FROZEN, Nbe			0
	SILT - some gravel, some sand, non-plastic, olive grey, cobbles throughout			FROZEN, Vr, Vc, 5%			
1			SA01		●		5
	END OF TESTPIT @ 1.0 m (refusal in permafrost)						
2							
3							10
4							
							15
5							16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 1m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP35
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086717N; 484118E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics			FROZEN, Nbe			0
	SILT - some gravel, some sand, non-plastic, olive grey, cobbles throughout			FROZEN, Vr, Vc, 25%			
			SA02		●		
	END OF TESTPIT @ 0.6 m (refusal in permafrost)						
1							5
2							
3							10
4							
							15
5							16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 0.6m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP36
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086820N; 484131E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics		FROZEN, Nbe			0
	SILT - some gravel, some sand, non-plastic, olive grey, cobbles throughout		FROZEN, Vr, Vc, 25%			
	END OF TESTPIT @ 0.5 m (refusal in permafrost)					
1						5
2						
3						10
4						
						15
5						16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 0.5m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP37
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086772N; 484206E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics		FROZEN, Nbe			0
	SILT - some gravel, some sand, non-plastic, olive grey, cobbles throughout		FROZEN, Vr, Vc, 25%			
	END OF TESTPIT @ 0.5 m (refusal in permafrost)					
1						5
2						
3						10
4						
						15
5						16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 0.5m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP38
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086712N; 484238E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics			FROZEN, Nbe			0
	SILT - some gravel, trace sand, non-plastic, olive grey, cobbles and boulders throughout		SA03	FROZEN, Vr, Vc, 10%	●		
	END OF TESTPIT @ 0.4 m (refusal in permafrost)						
1							5
2							
3							10
4							
							15
5							16

eba A TETRA TECH COMPANY

LOGGED BY: JTP	COMPLETION DEPTH: 0.4m
REVIEWED BY: CPC	COMPLETE: 9/11/2013
DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP39
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086668N; 484114E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT - woody, roots, organics			FROZEN, Nbe			0
	SILT - some gravel, trace sand, non-plastic, olive grey, cobbles throughout			FROZEN, Vr, Vc, 10%			
			SA04		●		
	END OF TESTPIT @ 0.6 m (refusal in permafrost)						
1							5
2							
3							10
4							
							15
5							16

eba A TETRA TECH COMPANY

LOGGED BY: JTP	COMPLETION DEPTH: 0.6m
REVIEWED BY: CPC	COMPLETE: 9/11/2013
DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP40
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086655N; 484135E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	ORGANIC COVER						0
	SILT - some gravel, trace sand, firm (est.), damp, non-plastic, olive grey, cobbles throughout						
1			SA05				
	SAND and GRAVEL - trace silt, well graded, medium grained, sub-rounded, loose (est.), damp, brown, cobbles throughout						5
2			SA06				
3							10
4							
	END OF TESTPIT @ 4.5 m (machine extent)						15
5							16

eba A TETRA TECH COMPANY

LOGGED BY: JTP	COMPLETION DEPTH: 4.5m
REVIEWED BY: CPC	COMPLETE: 9/11/2013
DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP41
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086670N; 484145E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	ORGANIC COVER						0
	SILT - some gravel, trace sand, firm (est.), damp, non-plastic, olive grey, cobbles throughout						
1							
							5
2			SA07		●		
	SAND and GRAVEL - trace silt, well graded, medium grained, sub-rounded, loose (est.), damp, brown, cobbles throughout						
3							10
4			SA08		●		
	END OF TESTPIT @ 4.5 m (machine extent)						15
5							16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 4.5m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP42
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086655N; 484180E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	ORGANIC COVER					0
	SILT - sandy, some gravel, firm (est.), damp, non-plastic, olive grey, cobbles throughout					
1						
	- becomes some sand, some gravel, cobbles and boulders throughout					5
2						
3	END OF TESTPIT @ 3.0 m (desired depth)					10
4						
						15
5						16

eba A TETRA TECH COMPANY	LOGGED BY: JTP	COMPLETION DEPTH: 3m
	REVIEWED BY: CPC	COMPLETE: 9/11/2013
	DRAWING NO:	Page 1 of 1

Dry Stack Tailings Facility Phase II Expansion	CLIENT: Alexco Keno Hill Mining Corp	TESTPIT NO: W14103303-TP43
Keno Hill District Mill Site	EXCAVATOR: Hitachi 270 Excavator	PROJECT NO: W14103303-01
Keno City, YT	7086695N; 484241E; Zone 8	

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

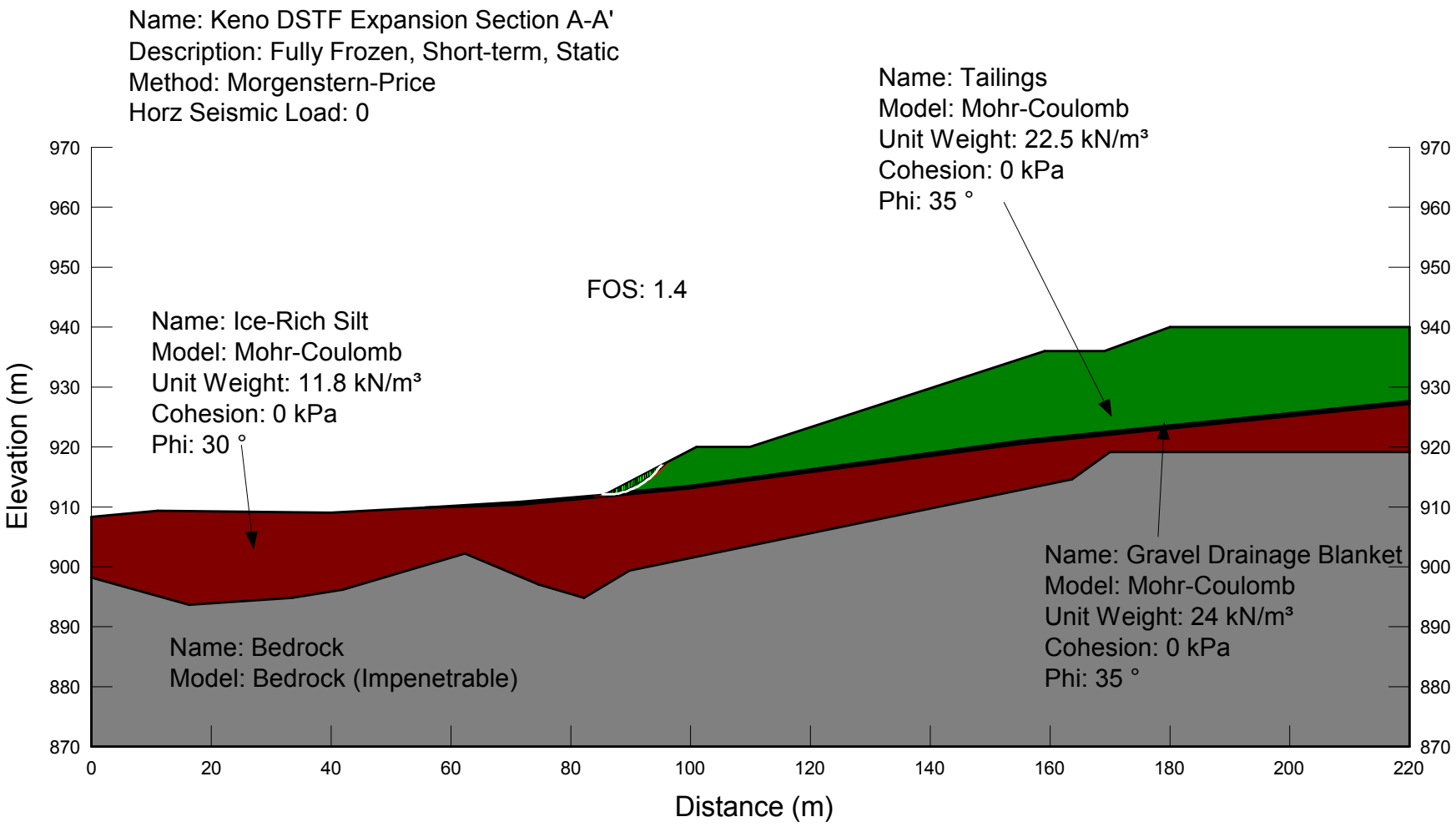
Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	ORGANIC COVER						0
	SAND and GRAVEL - silty, well graded, medium grained, sub-rounded, compact (est.), damp, brown, cobbles throughout						
1							5
2			SA09		●		
3	END OF TESTPIT @ 3.0 m (desired depth)						10
4							15
5							16

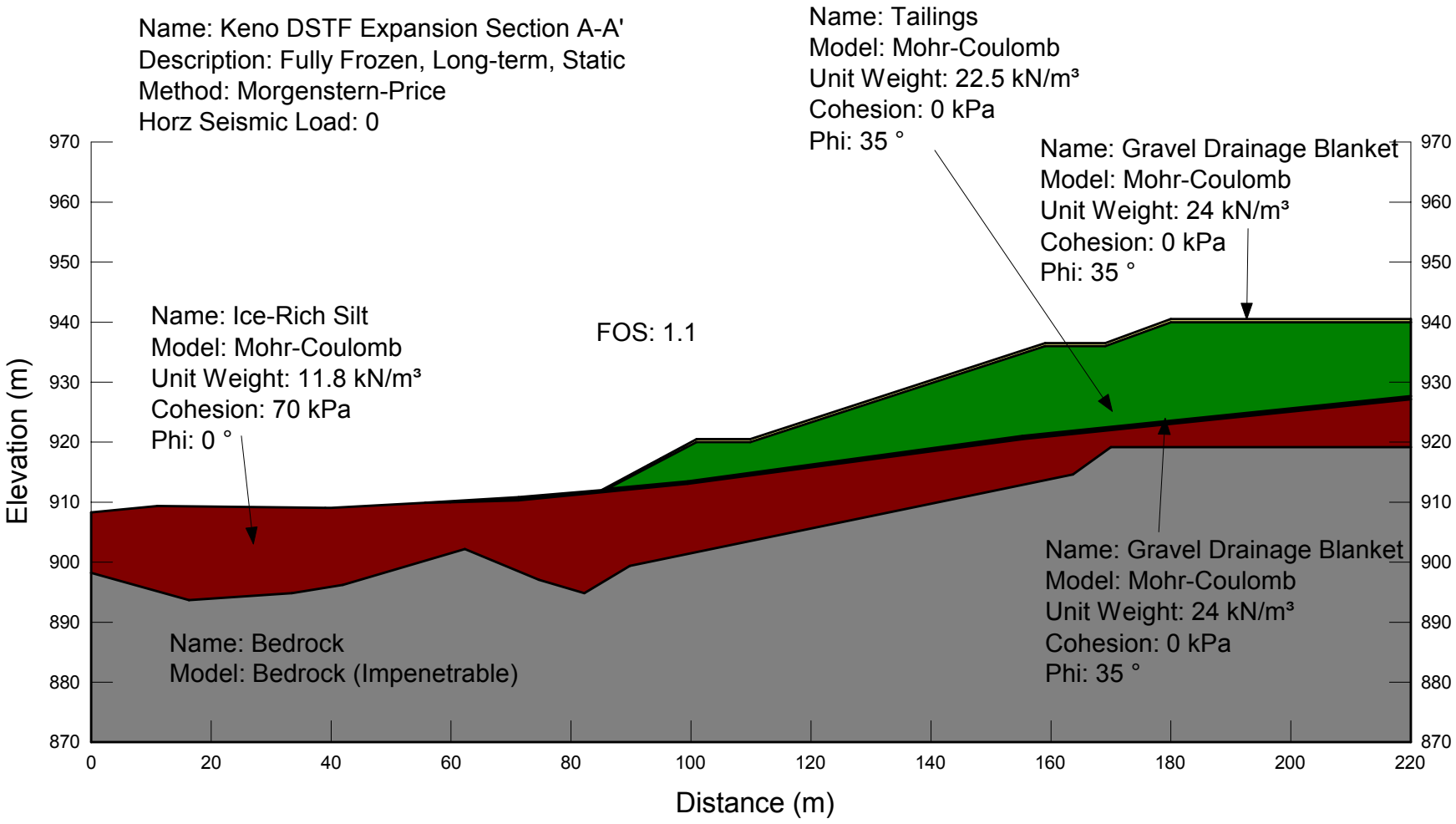
eba A TETRA TECH COMPANY

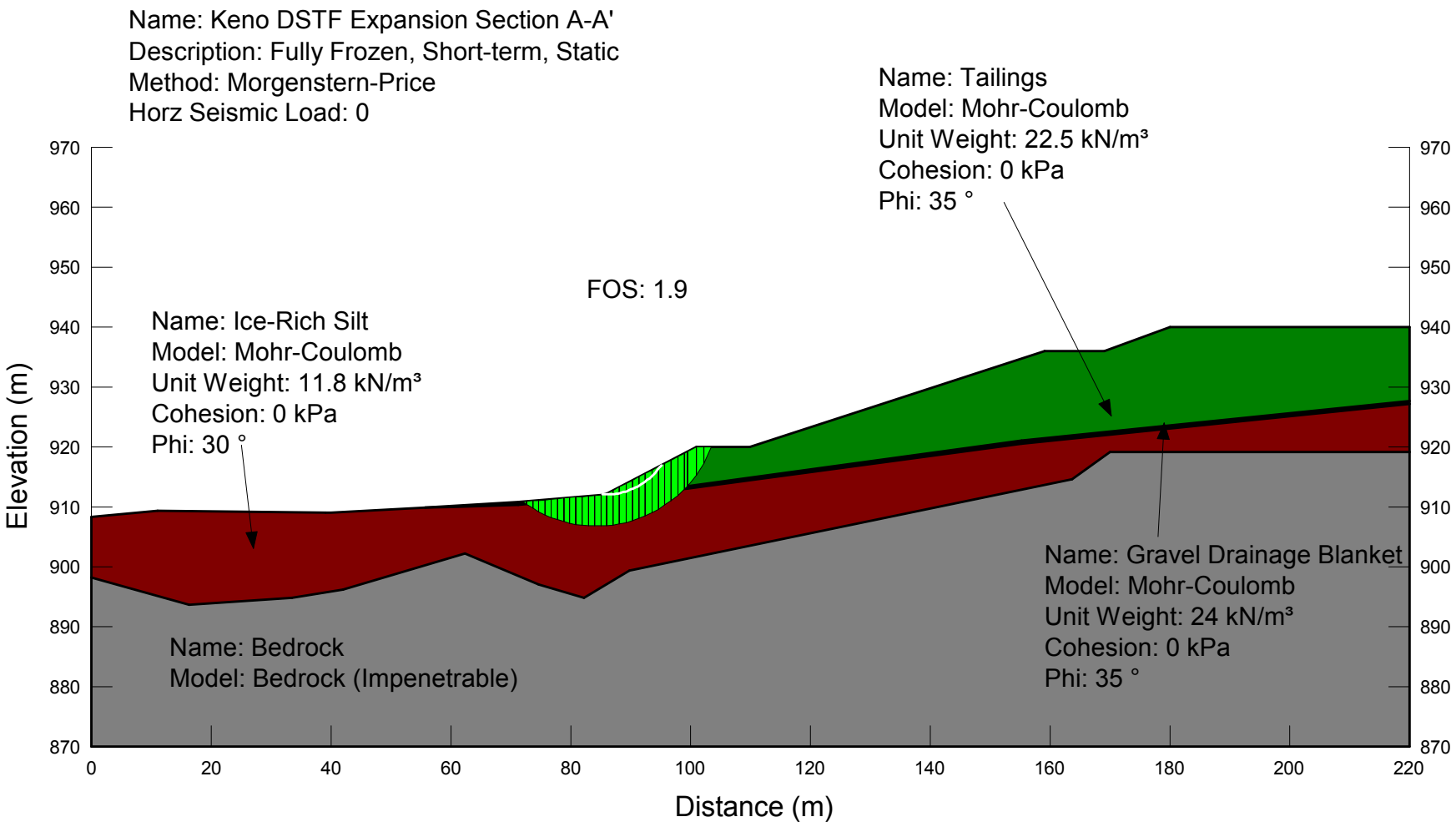
LOGGED BY: JTP	COMPLETION DEPTH: 3m
REVIEWED BY: CPC	COMPLETE: 9/11/2013
DRAWING NO:	Page 1 of 1

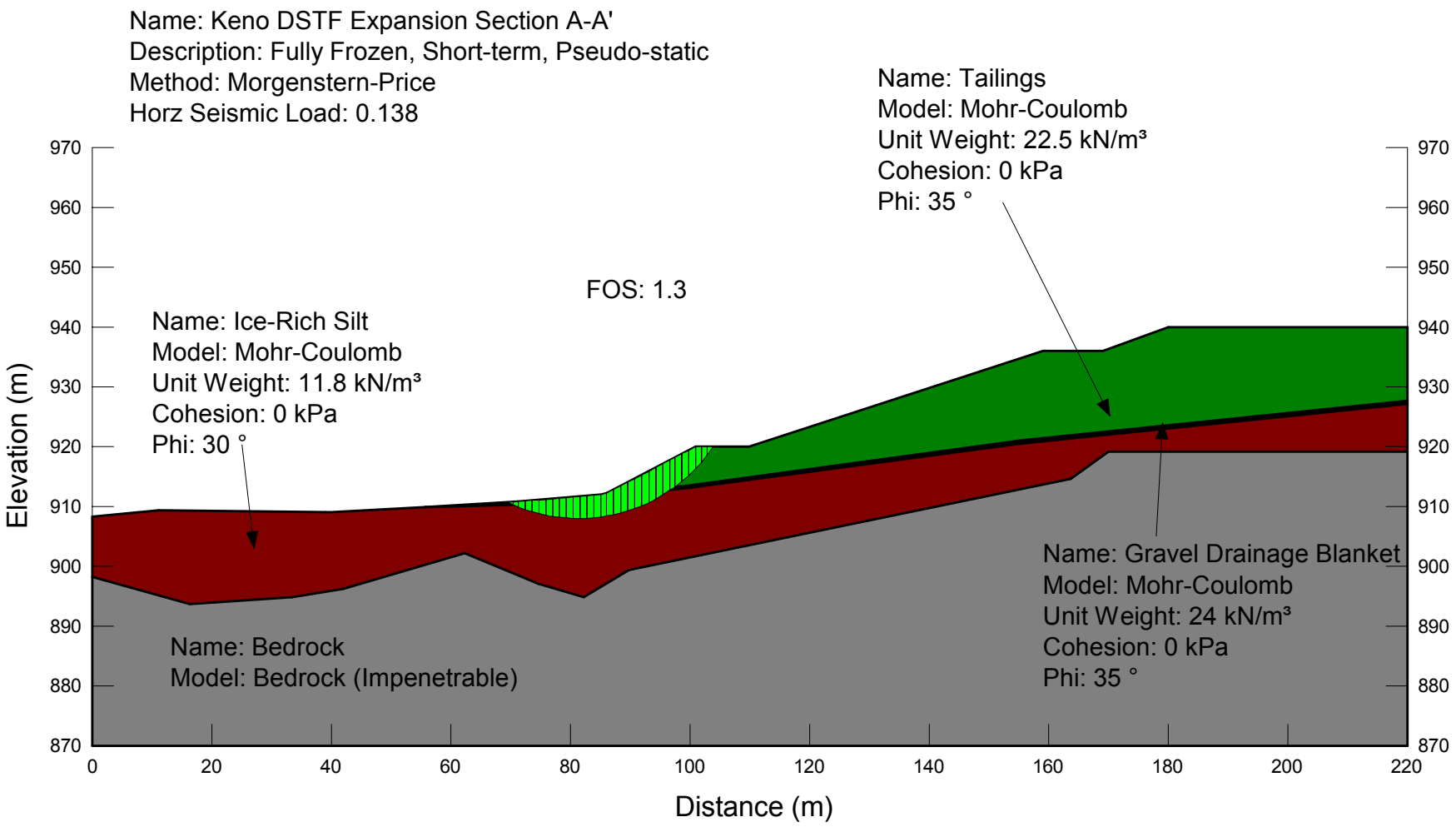
APPENDIX C

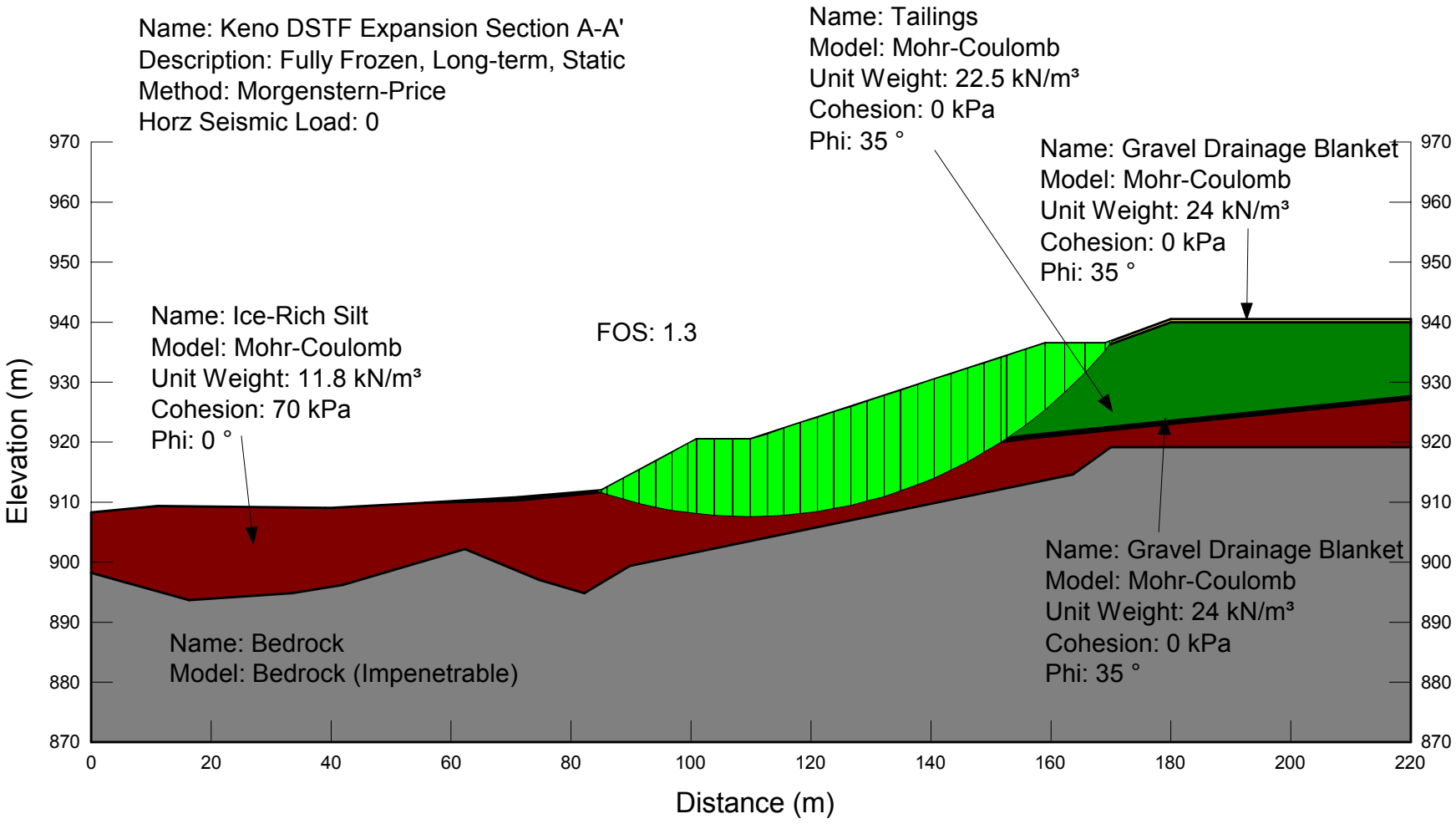
SLOPE STABILITY RESULTS – FULLY FROZEN

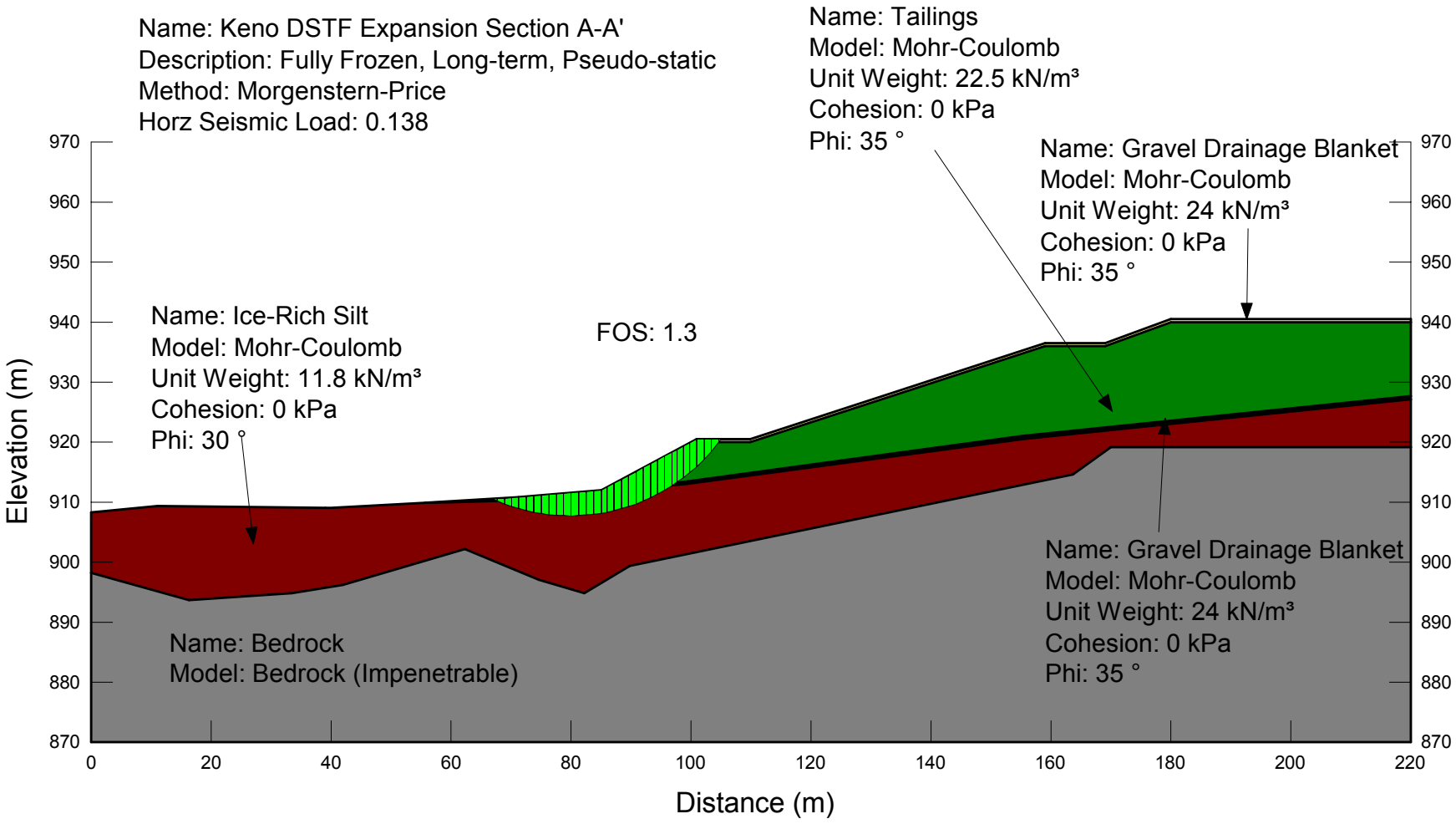

Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Short-term, Static
Method: Morgenstern-Price
Horz Seismic Load: 0
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
FOS: 1.4
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 0 kPa
Phi: 30 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220
Distance (m)

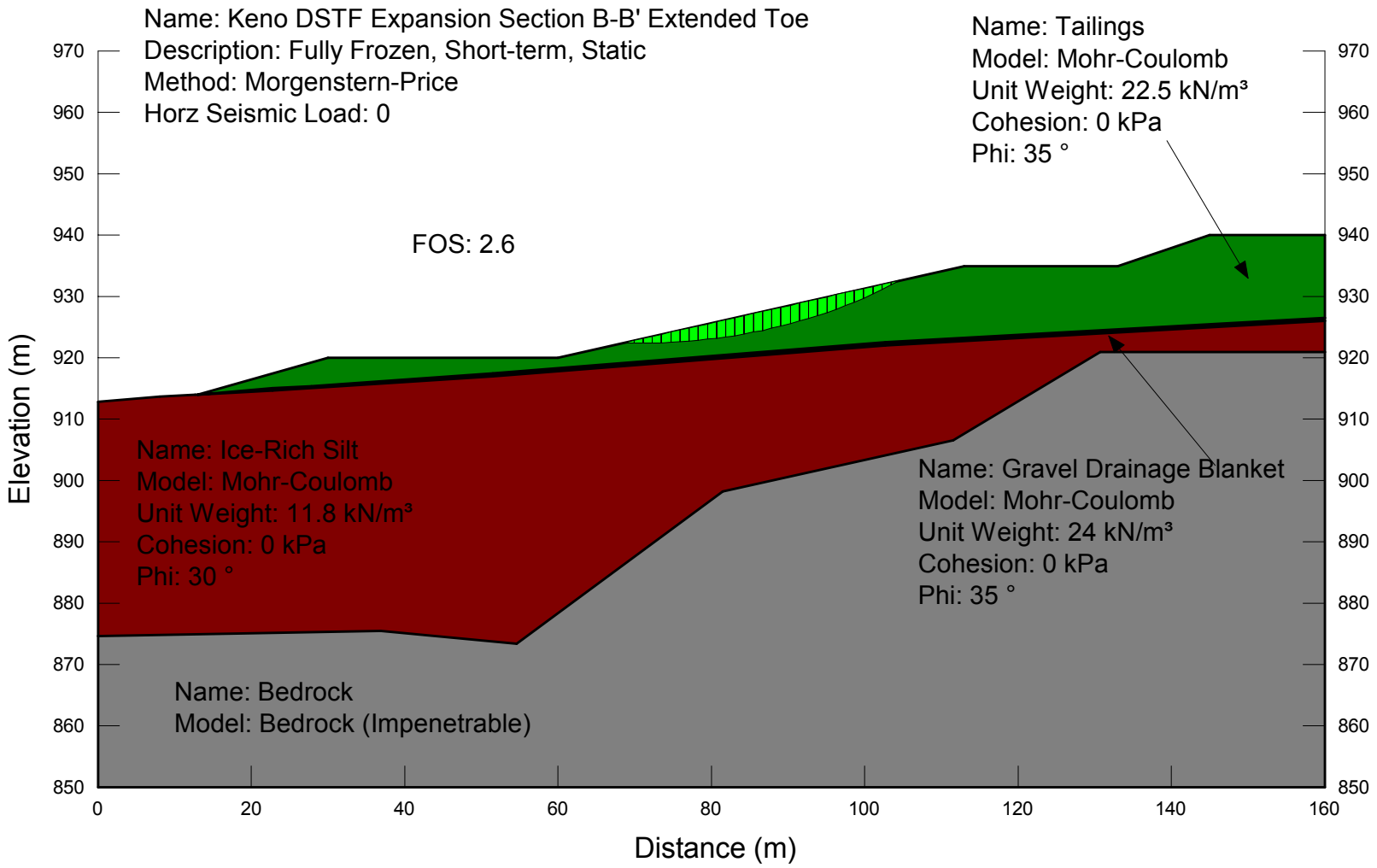

Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Long-term, Static
Method: Morgenstern-Price
Horz Seismic Load: 0
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 70 kPa
Phi: 0 °
FOS: 1.1
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220
Distance (m)


Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Short-term, Static
Method: Morgenstern-Price
Horz Seismic Load: 0
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
FOS: 1.9
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 0 kPa
Phi: 30 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
Distance (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220


Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Short-term, Pseudo-static
Method: Morgenstern-Price
Horz Seismic Load: 0.138
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
FOS: 1.3
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 0 kPa
Phi: 30 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220
Distance (m)


Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Long-term, Static
Method: Morgenstern-Price
Horz Seismic Load: 0
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 70 kPa
Phi: 0 °
FOS: 1.3
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220
Distance (m)


Name: Keno DSTF Expansion Section A-A'
Description: Fully Frozen, Long-term, Pseudo-static
Method: Morgenstern-Price
Horz Seismic Load: 0.138
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 0 kPa
Phi: 30 °
FOS: 1.3
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
960
950
940
930
920
910
900
890
880
870
0
20
40
60
80
100
120
140
160
180
200
220
Distance (m)


Name: Keno DSTF Expansion Section B-B' Extended Toe
Description: Fully Frozen, Short-term, Static
Method: Morgenstern-Price
Horz Seismic Load: 0
Name: Tailings
Model: Mohr-Coulomb
Unit Weight: 22.5 kN/m³
Cohesion: 0 kPa
Phi: 35 °
FOS: 2.6
Name: Ice-Rich Silt
Model: Mohr-Coulomb
Unit Weight: 11.8 kN/m³
Cohesion: 0 kPa
Phi: 30 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
970
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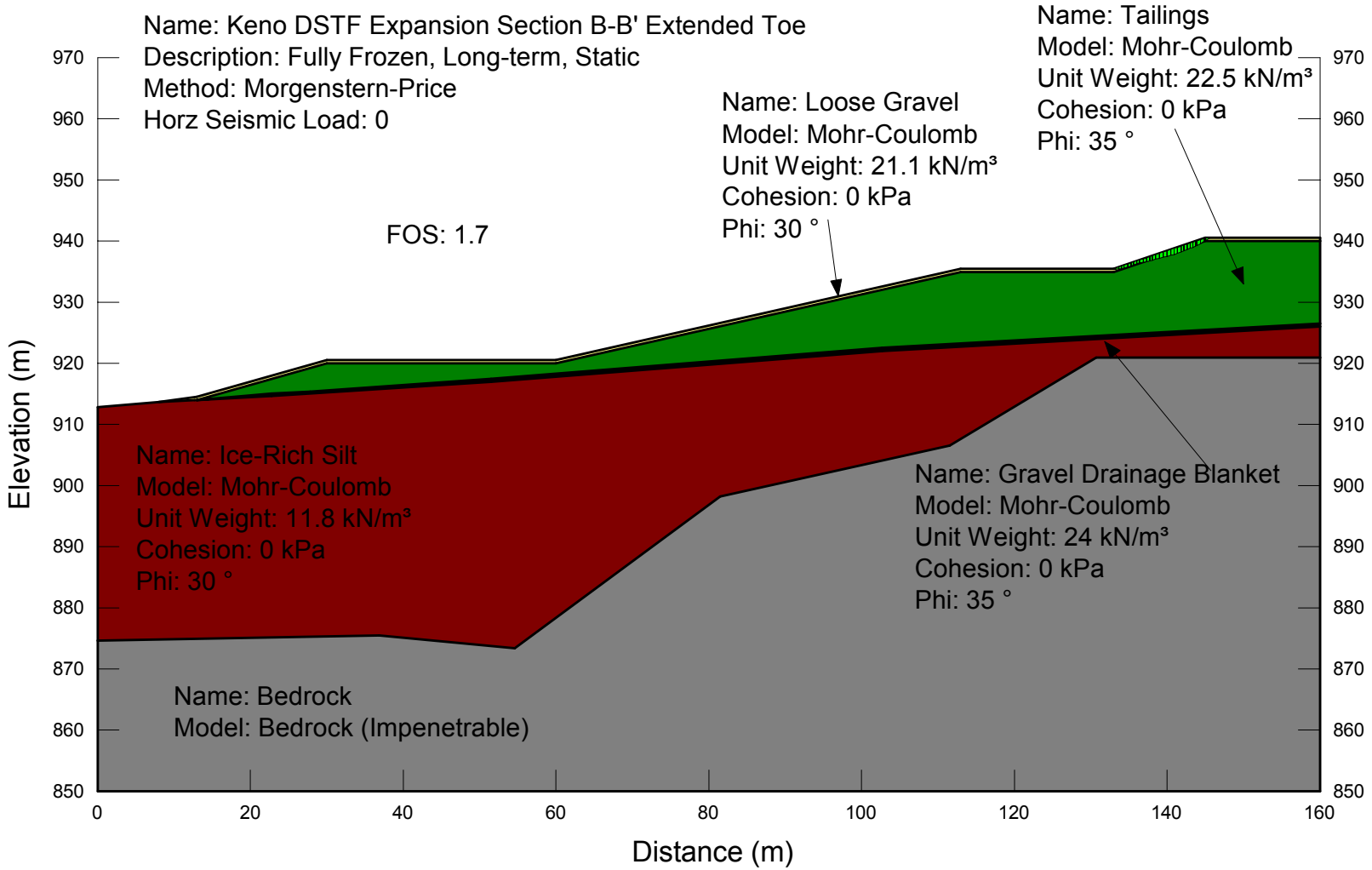
Distance (m)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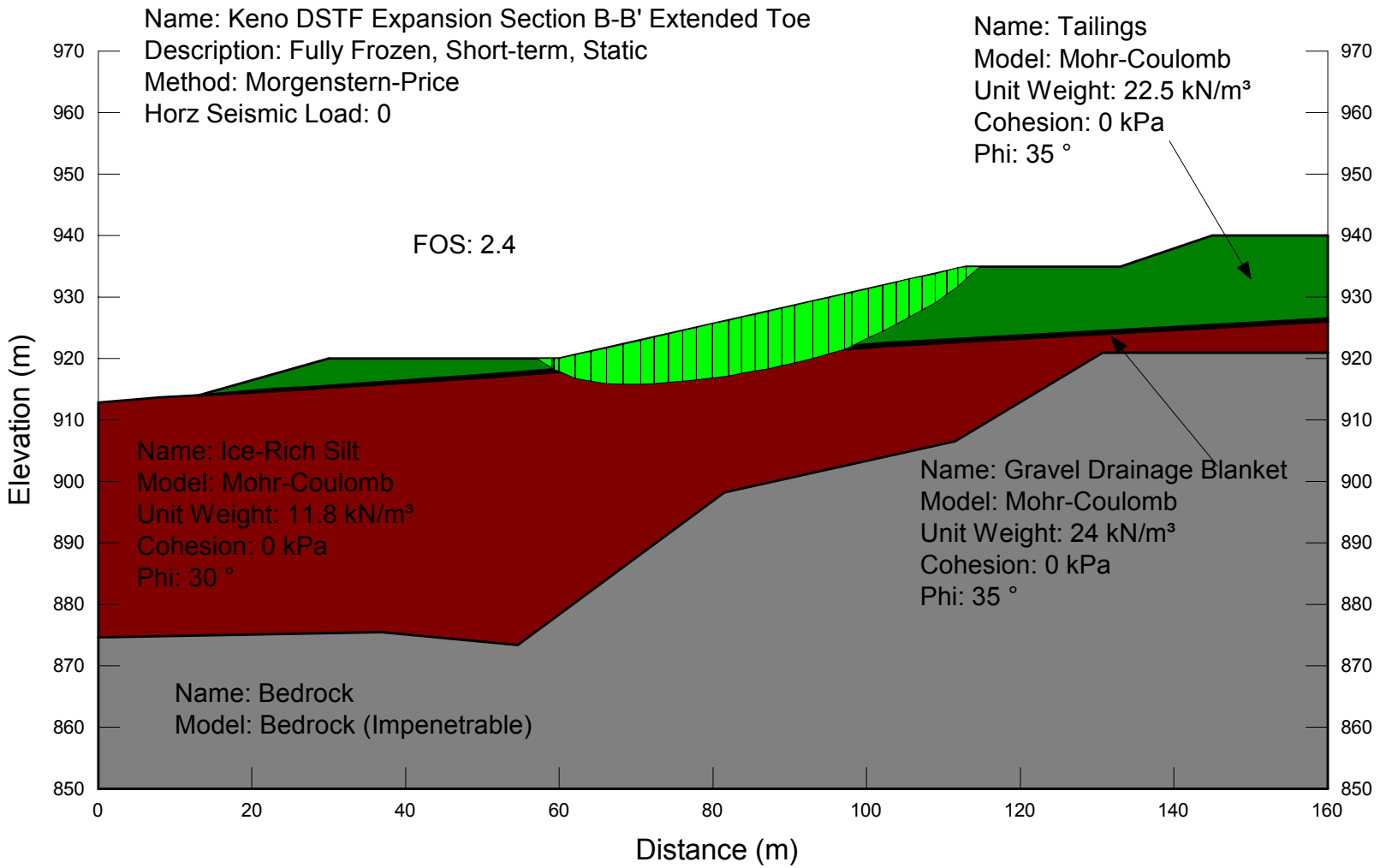
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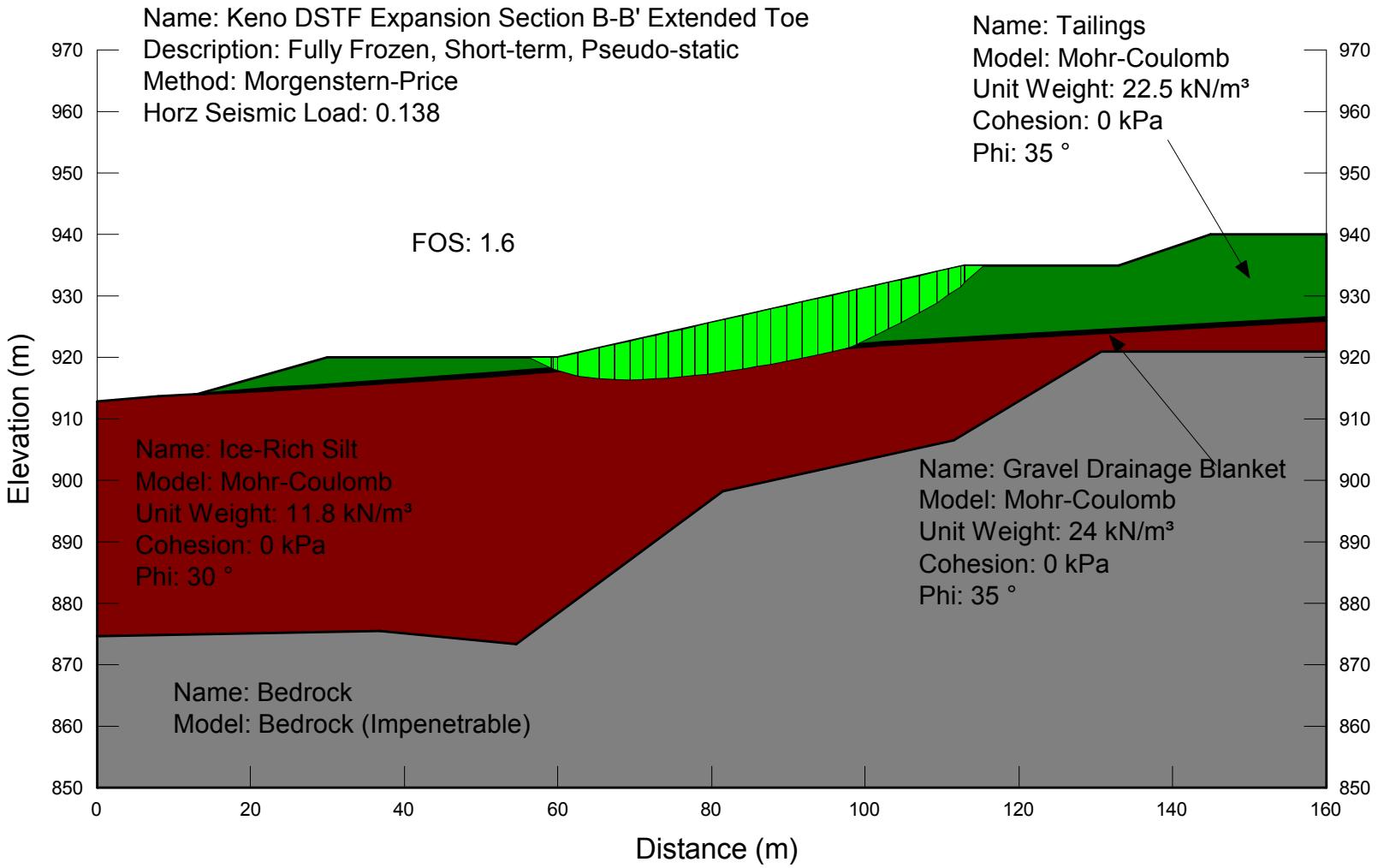
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Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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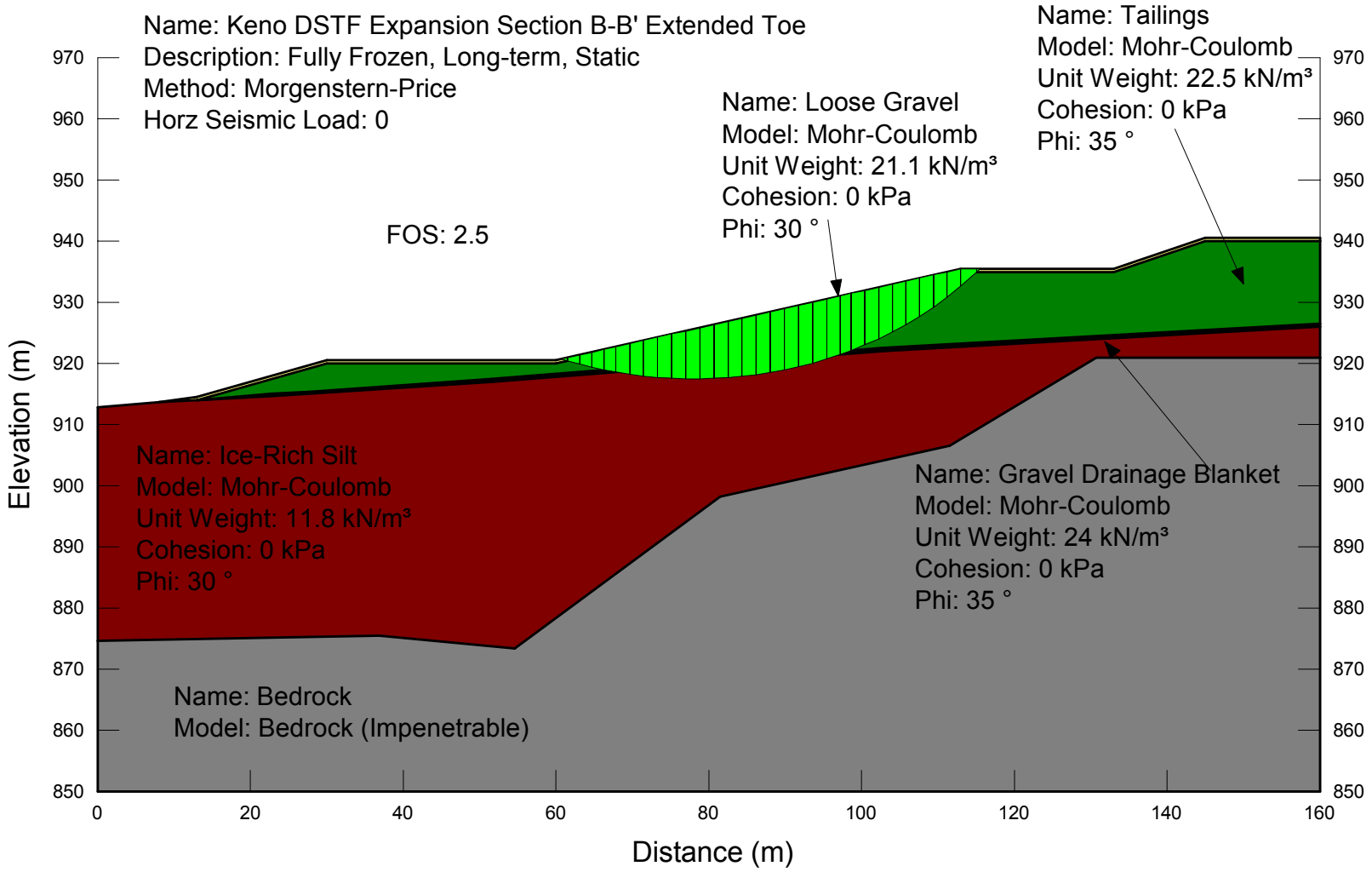
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Cohesion: 0 kPa
Phi: 30 °
Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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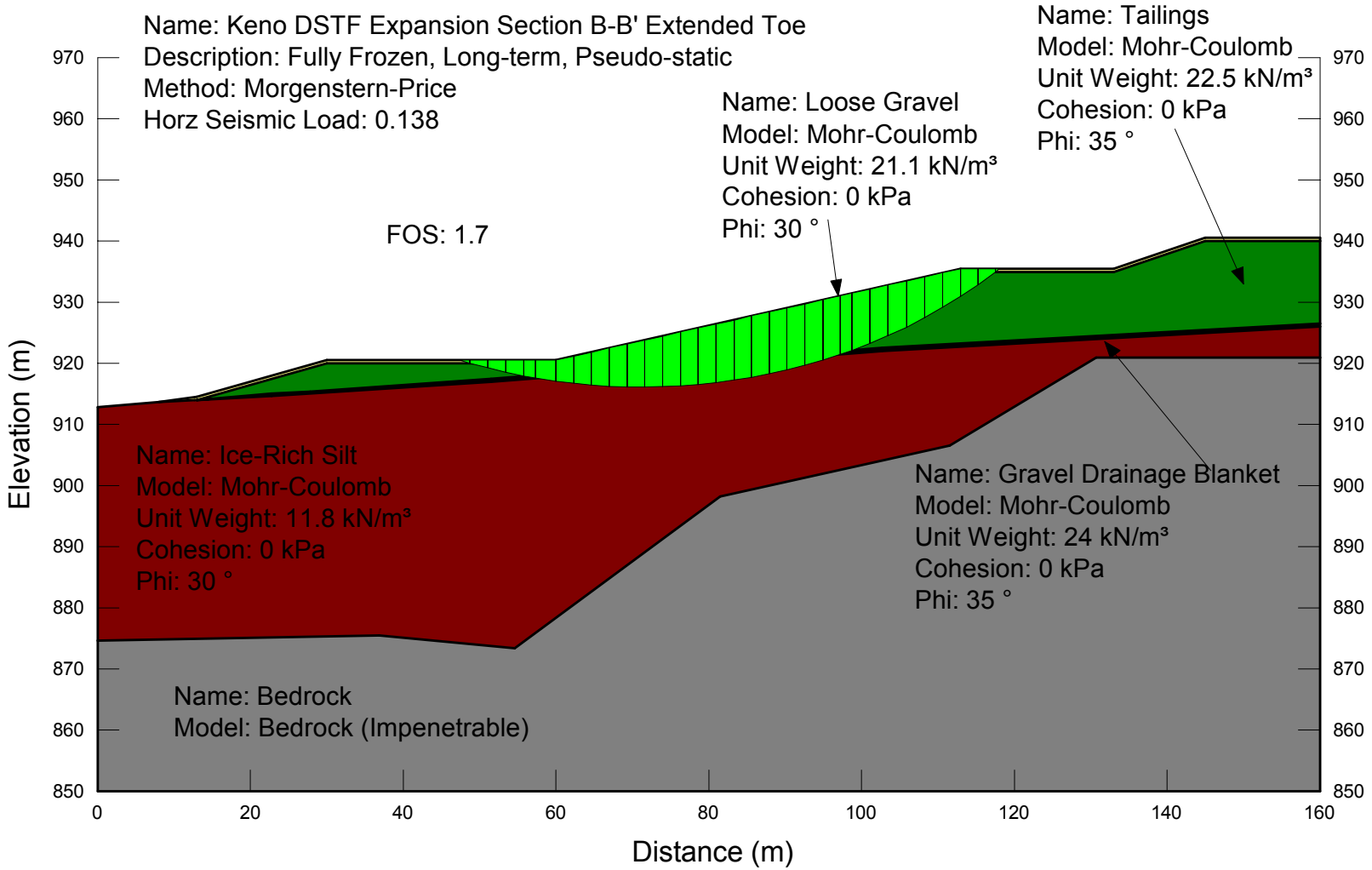
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Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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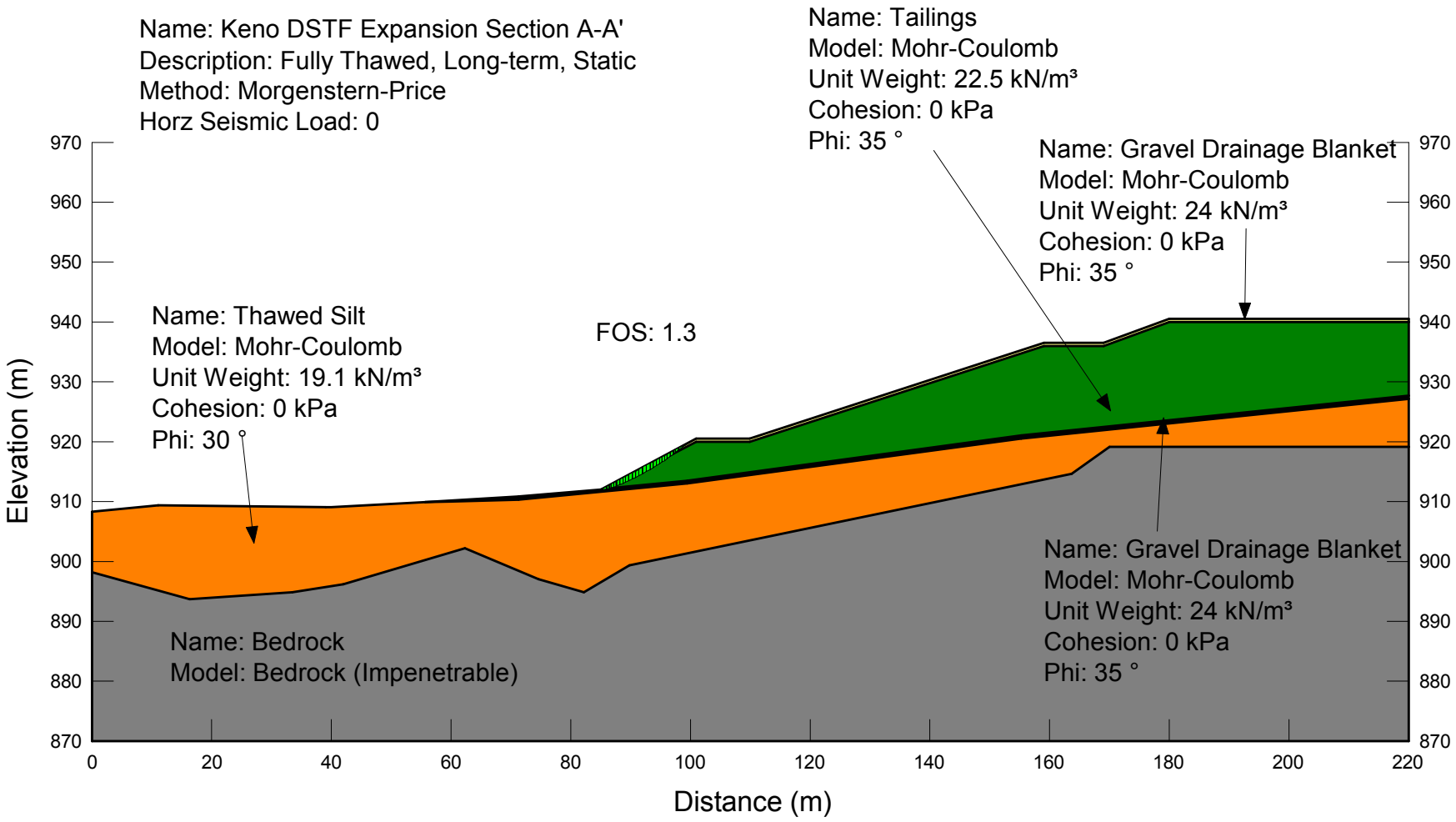
Distance (m)

APPENDIX D

SLOPE STABILITY RESULTS – FULLY THAWED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Cohesion: 0 kPa
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Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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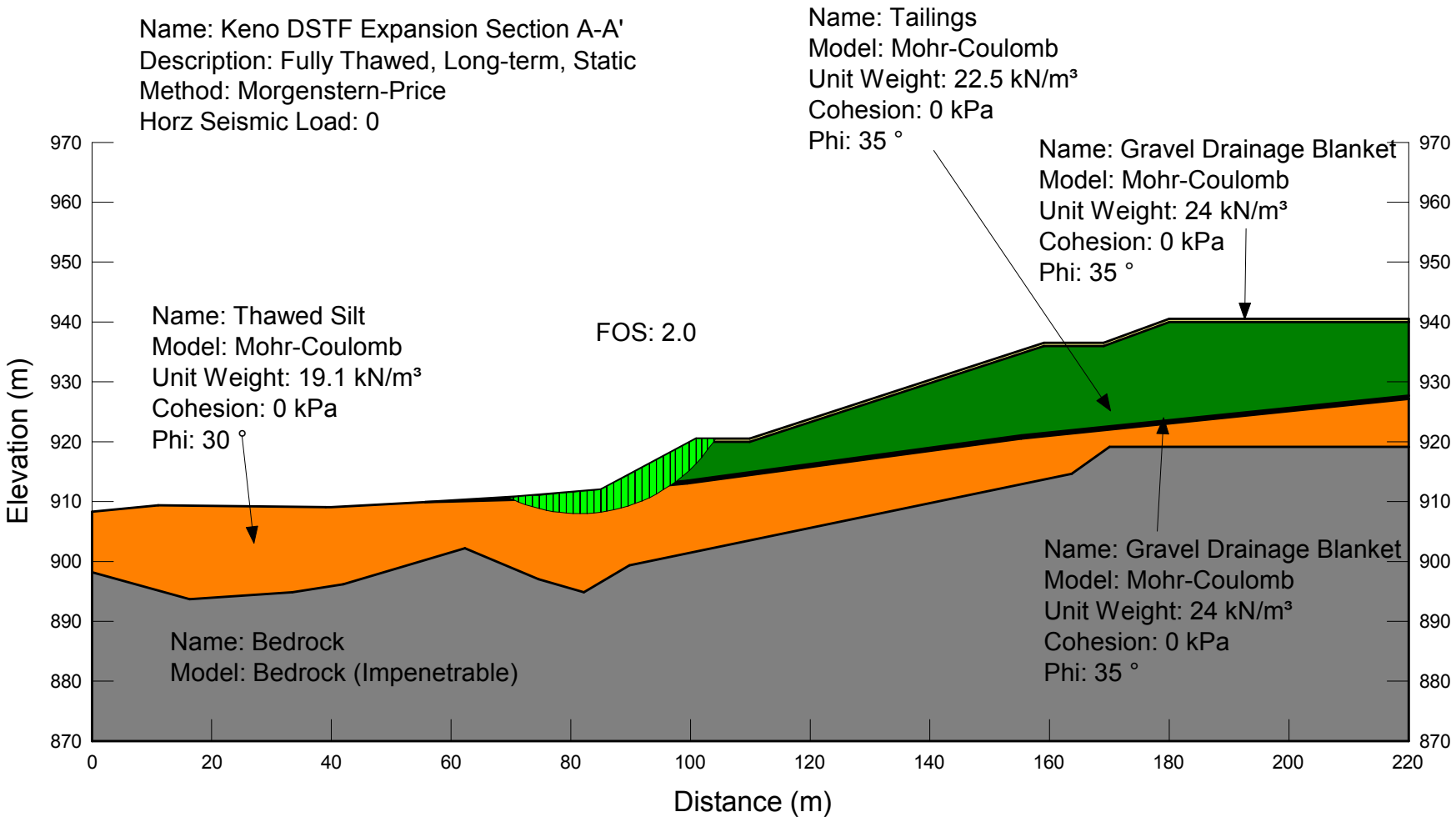
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Unit Weight: 24 kN/m³
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Phi: 35 °
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Elevation (m)
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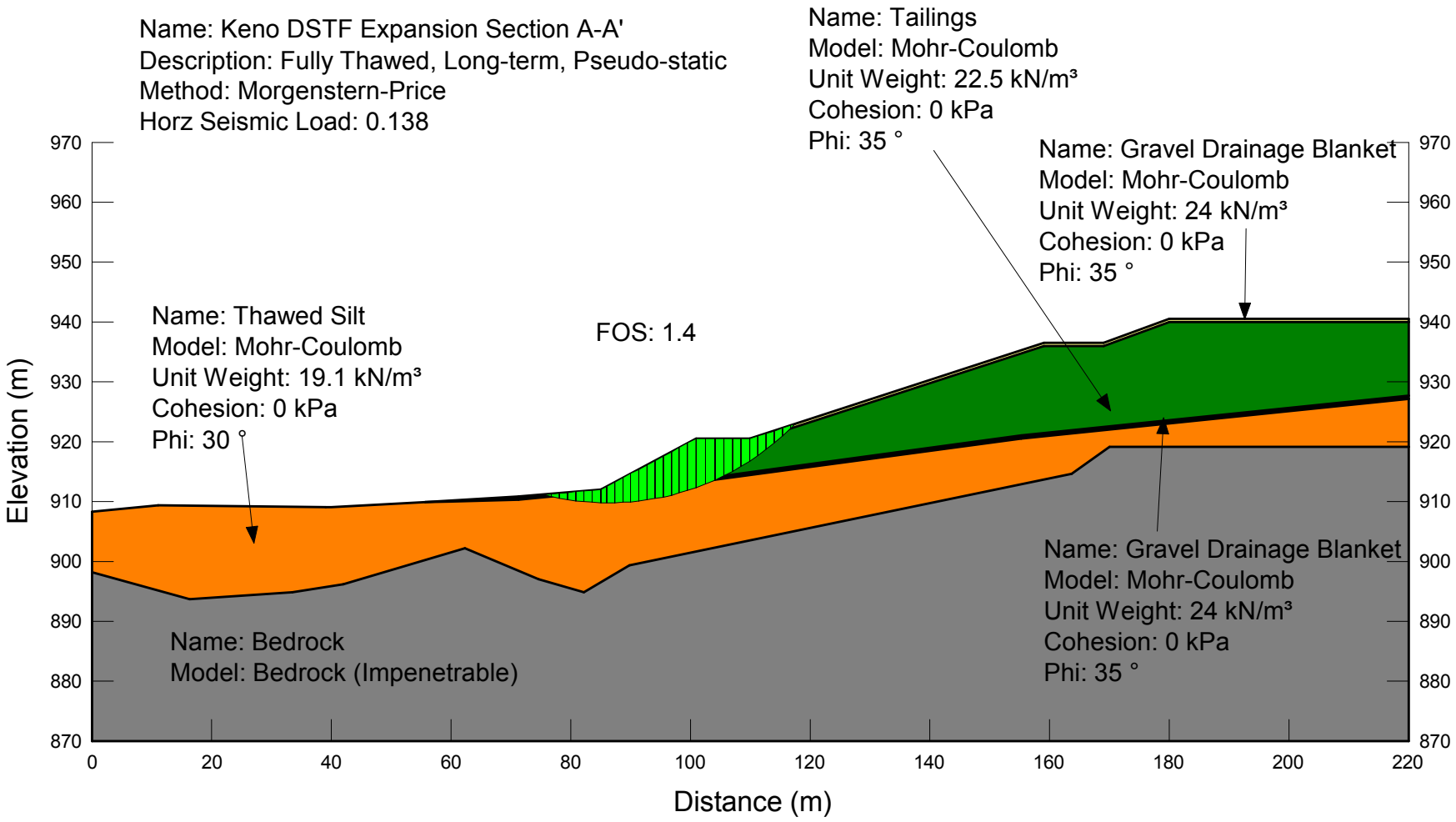
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Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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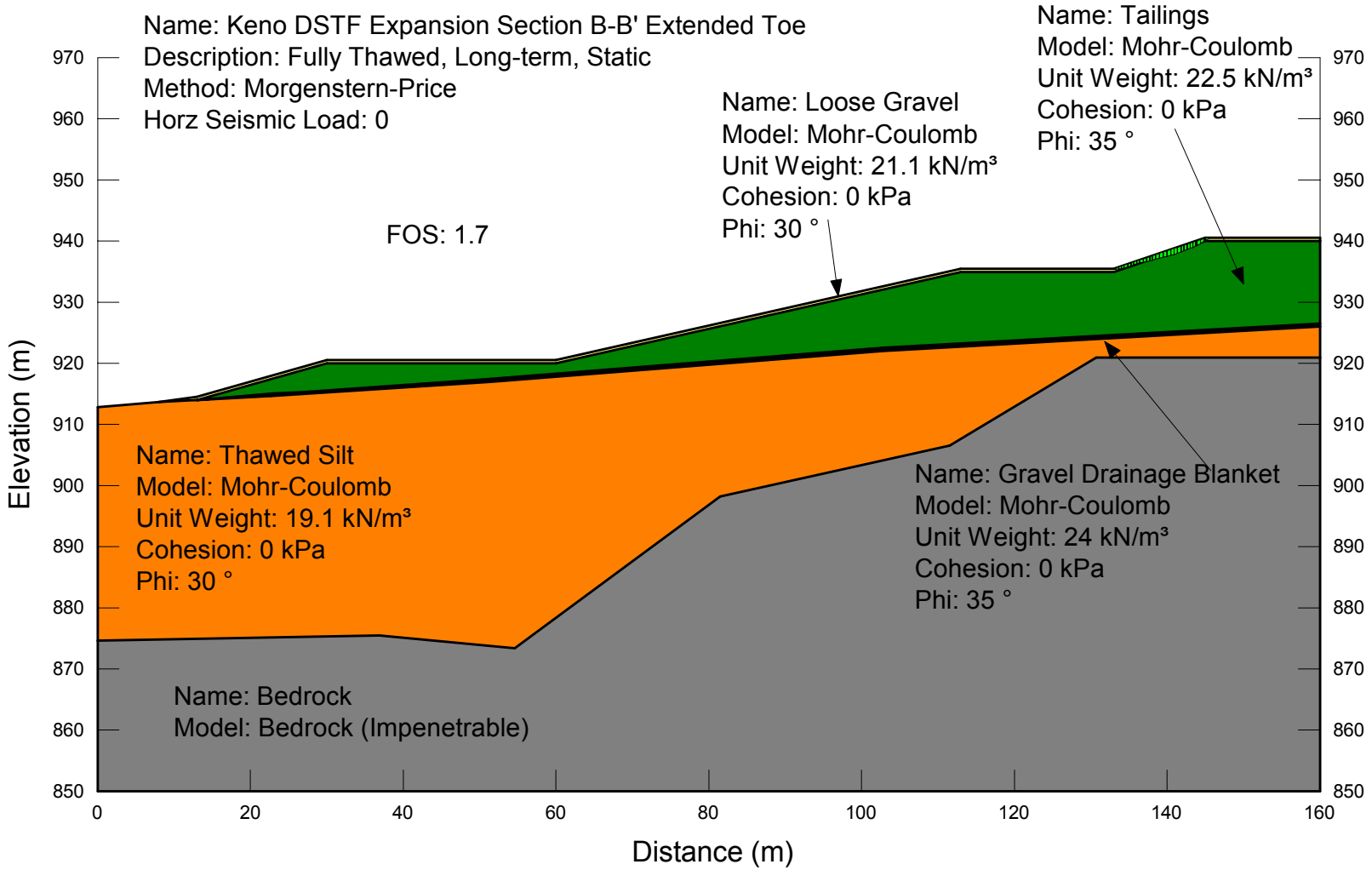
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Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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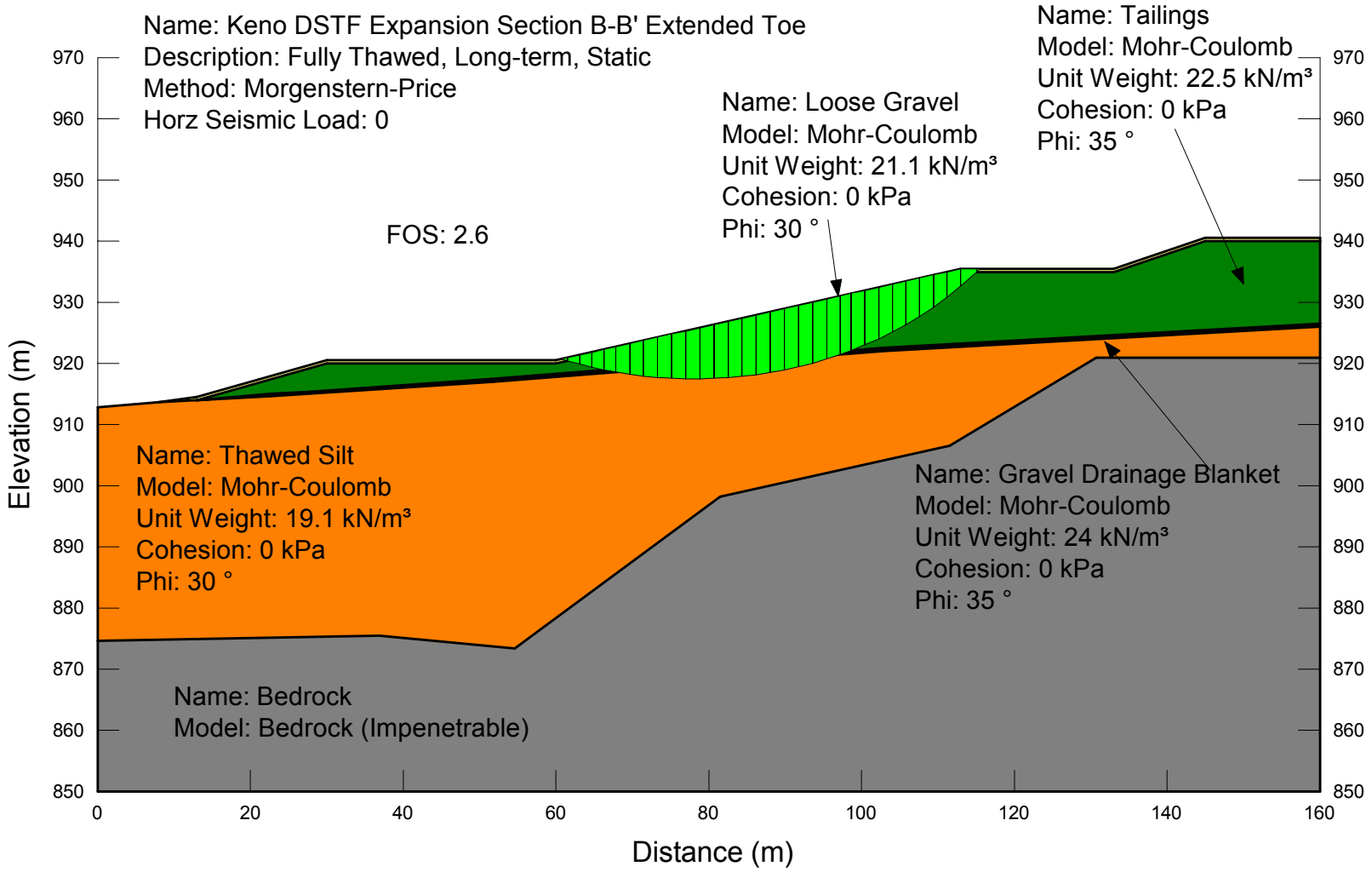
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Name: Gravel Drainage Blanket
Model: Mohr-Coulomb
Unit Weight: 24 kN/m³
Cohesion: 0 kPa
Phi: 35 °
Name: Bedrock
Model: Bedrock (Impenetrable)
Elevation (m)
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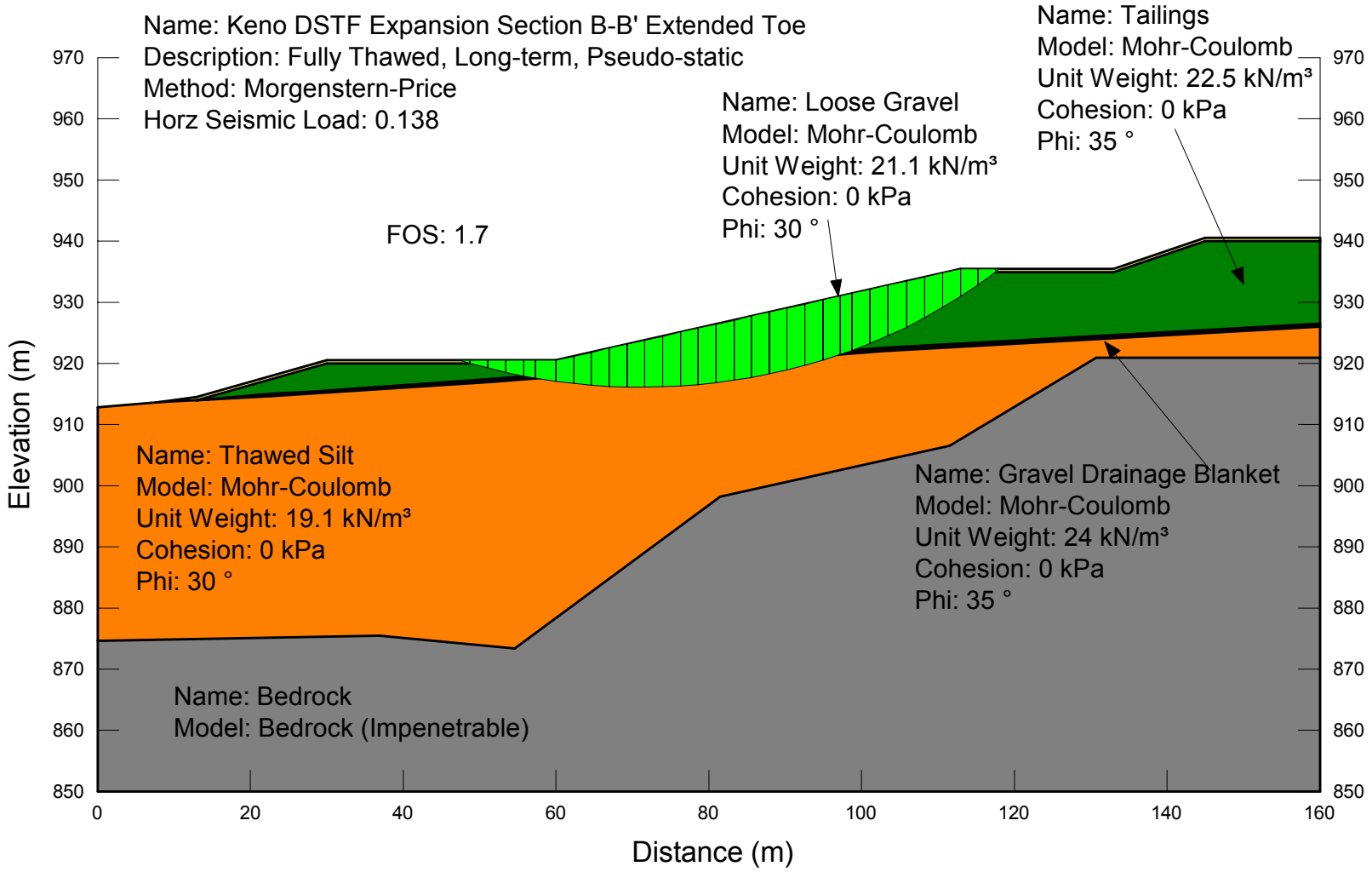
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Bellekeno Mine - Dry Stack Failure Modes and Effects Analysis
Final Draft

Prepared for

Alexco Resource Corp.

Prepared by

SRK Consulting (Canada) Inc.
1CA009.006
July 2013

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Final Draft

July 2013

Prepared for

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Vancouver, B.C. V6C 1S4
Canada

Tel: +1 604 633 4388
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Canada

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Web: www.srk.com

Project No: 1CA009.006

File Name: BellekenoMine_DryStackFMEA_Report_1CA009.006_dvz_ccs_20130703_FNL DRAFT.docx

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Appendix A: Introductory PowerPoint Presentations

1 Introduction

Alexco Resource Corp. entered into a contract with SRK Consulting (Canada) Inc. to perform a Failure Modes and Effects Analysis (FMEA) for the Ken District Mill Dry Stack Tailings Facility. Alexco owns and operates the Bellekeno Mine (silver, lead and zinc) in the Keno Hill Silver District of the central Yukon.

Based on concerns raised by technical staff and consultants of Na-cho Nyak Dun regarding the suitability and long-term stability of the DSTF and ice rich permafrost in foundation soils, Alexco commissioned the FMEA workshop to address these concerns using an objective risk-based approach. Following some preparatory work, the FMEA for the DSTF was completed in a workshop on September 24, 2012 at the Whitehorse, Yukon office of Alexco. This report describes the approach to the project and the results.

2 Objective

The overall objective of the FMEA for the Bellekeno Dry Stack Tailings Facility is to evaluate the risks associated with the presence of permafrost in the foundation materials adjacent to the dry stack facility. The objectives of the workshop were to evaluate the likelihood of occurrence and consequences associated with a series of failure modes for the dry stack at the site and to identify high concern issues.

3 The Boundaries of the Risk Assessment

The physical boundaries of the FMEA were the immediate surroundings of the dry stack, however; surface water impacts on facilities downstream of the facility, e.g. Christal Lake, were included. The temporal boundaries included operations as well as long-term considerations, assumed to be about 50 years.

4 FMEA Process

4.1 Preparation

Preparation for the workshop included the following activities:

- Review of site information;
- Identification of workshop participants; and
- Circulation of failure likelihood and severity of consequence descriptions for review by the participants.

4.2 Workshop

The FMEA workshop was held on September 24, 2012 at the Alexco's office in Whitehorse, Yukon. The workshop participants and their affiliations were:

- Brad Thrall, Alexco Resource Corp.;
- Richard Trimble, EBA, a Tetra Tech Company;
- Justin Pigage, EBA, a Tetra Tech Company;
- Kim Winnicky, consultant to First Nation of Na-cho Nyak Dun (NND);
- Bill Slater, consultant to First Nation of Na-cho Nyak Dun (NND);
- Rob McIntyre, Alexco Resource Corp.; and
- Dirk van Zyl, SRK Consulting (Canada) Inc. (facilitator).

As an introduction to the workshop, EBA made a presentation of site conditions. The presentation is provided in Appendix A.

Failure modes were identified, described and discussed during the workshop. A participant described the failure mode and its effect (or manifestation of the failure mode). During this discussion, descriptions were added in the FMEA table for the columns labelled ID, Failure Mode and Consequence Type.

There was open discussion amongst the workshop participants to review and agree on the description of the failure mode and its effects, i.e. reach consensus on the description in the FMEA table for the columns above. Based on this discussion, initial suggestions for the following columns in the FMEA table were made: Likelihood (using the descriptions in Table 1 as guidance) and Consequence Severity (using the descriptions in Table 2 as guidance).

Participants discussed the initial ratings with a view to obtaining consensus on the likelihood, severity, and notes for further consideration. The Risk Rating Descriptive Column was completed using the Risk Matrix in Table 3.

5 FMEA Results

In total, 15 failure modes were identified and discussed at the workshop. The FMEA outcome for the workshop is presented in Table 4.

The cells in Table 4 describing the risks are shaded using the colors in the attached Risk Table (Table 3). The colors indicate the various risks posed by a combination of the likelihood of a failure occurring and the consequence severity of the failure mode if it should occur. For example, dark orange to red correspond to high to very high risk failure modes while the green colors correspond to a low risk failure mode. None of the failure modes identified in the workshop received a high or very high risk rating.

Twelve of the fifteen failure modes identified resulted in a low risk rating (refer to Table 4). Two resulted in medium risk and one in a moderately high risk rating. The failure modes resulting in medium risk ratings are:

- Large differential settlement in the long-term (~50 years) leading to tailings exposure on the surface from compromised covers (environmental consequence).
- Large precipitation event erodes through the surface cover, exposes the tailings resulting in transport of tailings into natural environment (special considerations consequence).

The moderately high risk rating was linked to large differential settlement in the long-term (~50 years) leading to tailings exposure on the surface from compromised cover (special considerations consequence).

The special considerations consequences were identified as being of specific concern to the NND and comments are provided in Table 4 for the further evaluation and mitigation of these, as well as the medium risk associated with the environmental consequences.

Table 1: Likelihood Terminology

Likelihood	Descriptor 2	Frequency Descriptor	Probability of occurrence over twenty years	Probability of occurrence in any one year
Almost Certain	Happens often	High frequency (more than once every 5 years)	98%	17.8%
Likely	Could easily happen	Event does occur, has a history, once every 15 years	75%	6.7%
Possible	Could happen and has happened elsewhere	Occurs once every 40 years	40%	2.5%
Unlikely	Hasn't happened yet but could	Occurs once every 200 years	10%	0.5%
Very Unlikely	Conceivable, but only in extreme circumstances	Occurs once every 1000 years	2%	0.1%

Table 2: Consequence Severity Matrix

Consequence Categories	Low	Minor	Moderate	Major	Critical
1. Environmental Impact	No impact.	Minor localized or short-term impacts.	Significant impact on valued ecosystem component.	Significant impact on valued ecosystem component and medium-term impairment of ecosystem function.	Serious long-term impairment of ecosystem function.
2. Special Considerations	Some disturbance but no impact to traditional land use.	Minor or perceived impact to traditional land use.	Some mitigable impact to traditional land use.	Significant temporary impact to traditional land use.	Significant permanent impact on traditional land use.
3. Legal Obligations	Informal advice from a regulatory agency.	Technical/Administrative non-compliance with permit, approval or regulatory requirement. Warning letter issued.	Breach of regulations, permits, or approvals (e.g. 1 day violation of discharge limits). Order or direction issued.	Substantive breach of regulations, permits or approvals (e.g. multi-day violation of discharge limits). Prosecution.	Major breach of regulation – wilful violation. Court order issued.
4. Consequence Costs	< $100,000	$100,000 - $500,000	$500,000 - $2.5 Million	$2.5-$10 Million	>$10 Million
5. Community/ Media Reputation	Local concerns, but no local complaints or adverse press coverage.	Public concern restricted to local complaints or local adverse press coverage.	Heightened concern by local community, criticism by NGOs or adverse local /regional media attention.	Significant adverse national public, NGO or media attention.	Serious public outcry/demonstrations or adverse International NGO attention or media coverage.
6. Human Health and Safety	Low-level short-term subjective symptoms. No measurable physical effect. No medical treatment.	Objective but reversible disability/impairment and/or medical treatment injuries requiring hospitalization.	Moderate irreversible disability or impairment to one or more people.	Single fatality and /or severe irreversible disability or impairment to one or more people.	Multiple fatalities.

Table 3: Risk Matrix

Likelihood	Consequence Severity				
	Low	Minor	Moderate	Major	Critical
Almost Certain	Moderate	Moderately High	High	Very High	Very High
Likely	Moderate	Moderate	Moderately High	High	Very High
Possible	Low	Moderate	Moderately High	High	High
Unlikely	Low	Low	Moderate	Moderately High	Moderately High
Very Unlikely	Low	Low	Low	Moderate	Moderately High

Table 4: FMEA Results for Bellekeno Dry Stack Tailings

ID	Failure Mode	Consequence Type	Severity	Likelihood	Risk Rating Descriptive	NOTES
1	Large differential settlement in the long-term (~50 years) leading to tailings exposure on surface from compromised cover.	Env. Imp.	Minor	Likely	Moderate	Check for other examples in the district for settling. Look at additional modeling with real data.
2	Large differential settlement in the long-term (~50 years) leading to tailings exposure on surface from compromised cover.	Spec. Cons.	Moderate	Likely	Moderately High	Check for other examples in the district for settling. Look at additional modeling with real data. Cover maintenance.
3	Large differential settlement in the long-term (~50 years) leading to breach of liner/drainage blanket/containment system resulting in contamination of localized GW from tailings porewater.	Env. Imp.	Minor	Unlikely	Low	
4	Large differential settlement in the long-term (~50 years) leading to breach of liner/drainage blanket/containment system resulting in upwelling of GW/melt water into the tailings resulting in slope instability	Env. Imp.	Minor	Very Unlikely	Low	
5	Large differential settlement in the long-term (~50 years) leading to breach of liner/drainage blanket/containment system resulting in contamination of surface water (i.e. Christal Lake)	Env. Imp.	Minor	Very Unlikely	Low	Took into account present state of Christal Lake.
6	Large precipitation event erodes through surface cover, exposes tailings resulting in transport of tailings into natural environment	Env. Imp.	Minor	Unlikely	Low	
7	Large precipitation event erodes through surface cover, exposes tailings resulting in transport of tailings into natural environment	Spec. Cons.	Moderate	Unlikely	Moderate	Mitigate by cleaning up the tailings released during the large precipitation event.
8	Poor cover performance (vegetation, other) leads to increased infiltration and increased pore water transport resulting in metals migration	Env. Imp.	Minor	Unlikely	Low	
9	Metals uptake in soil cover vegetation leads to introduction into food chain and human health impacts	Human H&S	Low	Unlikely	Low	Used guidance from Env. Impact to rate.
10	Metals uptake in soil cover vegetation leads to introduction into food chain and human health impacts	Spec. Cons.	Minor	Unlikely	Low	
11	Earthquake larger than design event leads to slope failure resulting in exposure of tailings long-term	Env. Imp.	Minor	Very Unlikely	Low	
12	Earthquake larger than design event leads to slope failure resulting in exposure of tailings long-term	Spec. Cons.	Moderate	Very Unlikely	Low	
13	Modeling has underestimated the foundation pore pressures leading to slope failure and exposure of tailings long-term	Env. Imp.	Minor	Very Unlikely	Low	
14	Failure to follow OMS manual leads to stack not performing to design, resulting in environmental impacts	Env. Imp.	Minor	Unlikely	Low	OMS in place, 3rd party QA/QC every 6 weeks.
15	Dust migration from DSTF leads to (i.e. temporary closure, construction, not following OMS) environmental impacts	Env. Imp.	Minor	Unlikely	Low	OMS in place, 3rd party QA/QC every 6 weeks.

This final draft report, "Bellekeno Mine - Failure Modes and Effects Analysis", was prepared by SRK Consulting (Canada) Inc.

Dirk van Zyl

Dirk van Zyl, Ph.D., P.E
Principal Consultant (Associate)

and reviewed by

Cam Scott, P.Eng.
Principal Consultant

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

Appendix A: Introductory PowerPoint Presentations

DSTF Risk Assessment

ALEXCO

- Introductions
- Participants
- Objectives
- Risk Assessment Process Overview
- DSTF Overview
- DSTF Risk Assessment

Keno District Timeline

- **2005** Company Founded
- **2006** Acquired Keno Hill Silver District, Care maintenance change over
- **2007** District wide closure plan studies begins
- **2008** Advanced exploration/development Bellekeno
- **2009** QML Granted - Bellekeno Construction Begins
- **2010** Comprehensive Cooperation Agreement with FNNND
- **2010** Water License Granted – mill/DSTF commissioned
- **2011** Commercial Production – Bellekeno mine/mill
- **2012** Lucky Queen/ Onek new mine development, YESAB/QML

Dry Stack Tailings Technology

ALEXCO

- **Advantages**
  - Reduced makeup water – increased recycle
  - Progressive reclamation enhanced
  - Decreased footprint from higher compaction, stack heights
  - Higher geotechnical stability if constructed appropriately
  - Pore water seepage significantly reduced – groundwater contamination eliminated if operated appropriately

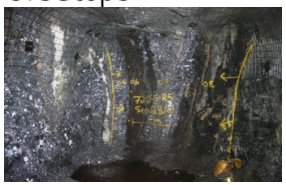
Dry Stack Tailings Technology

- **Disadvantages**
  - Increased capital and operating costs
  - Increased process bottlenecks – decreased operating flexibility
  - Potential dust migration due to lower moisture content

Mill Area Layout

Mill Process Flowsheet

Underground Ore Stope



Drill/Blast Ore

Load Ore

Ore Haulage

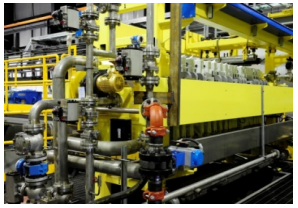
ing

Crushing

Grinding

Classification

Thickening/Filtration

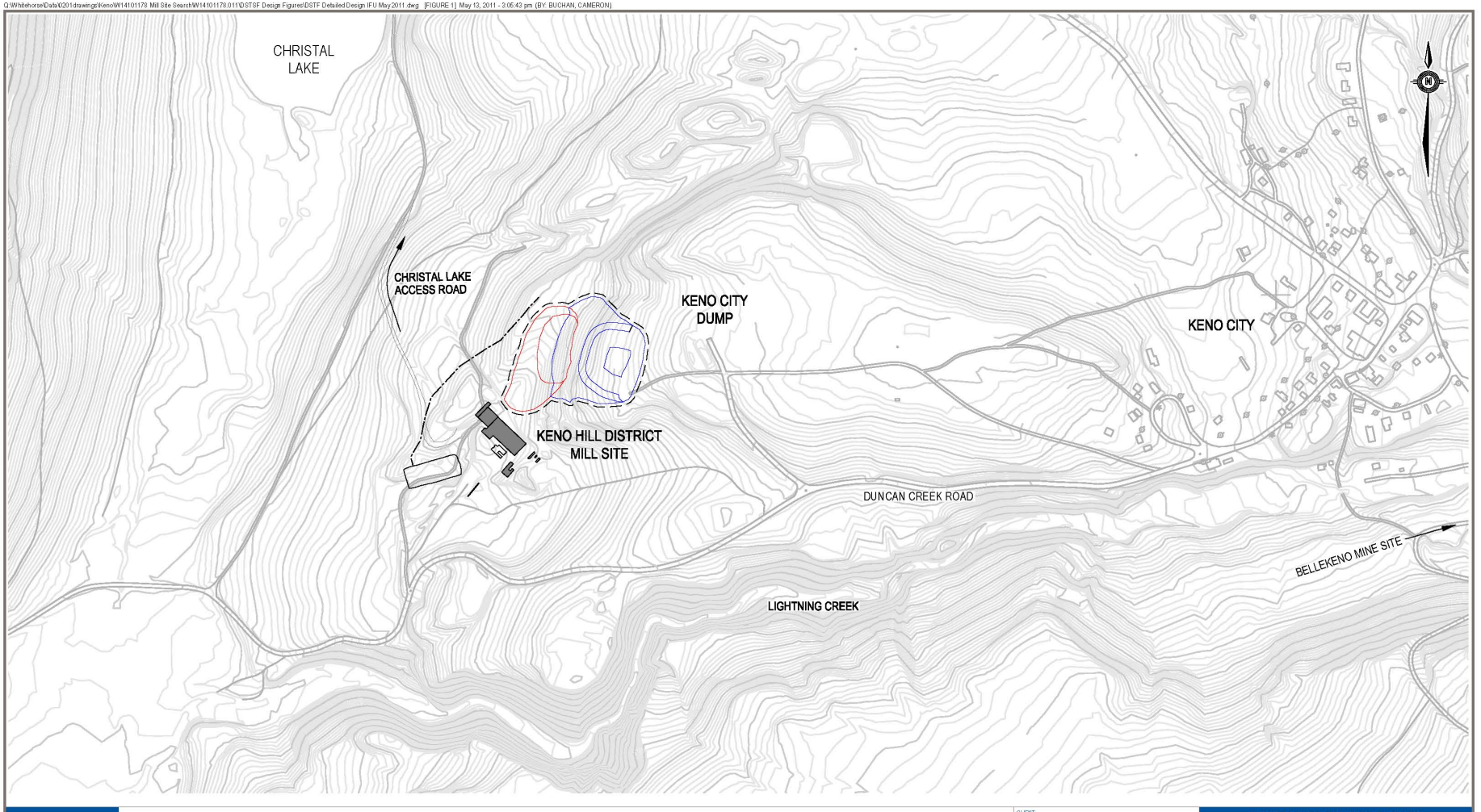


Concentrate Storage

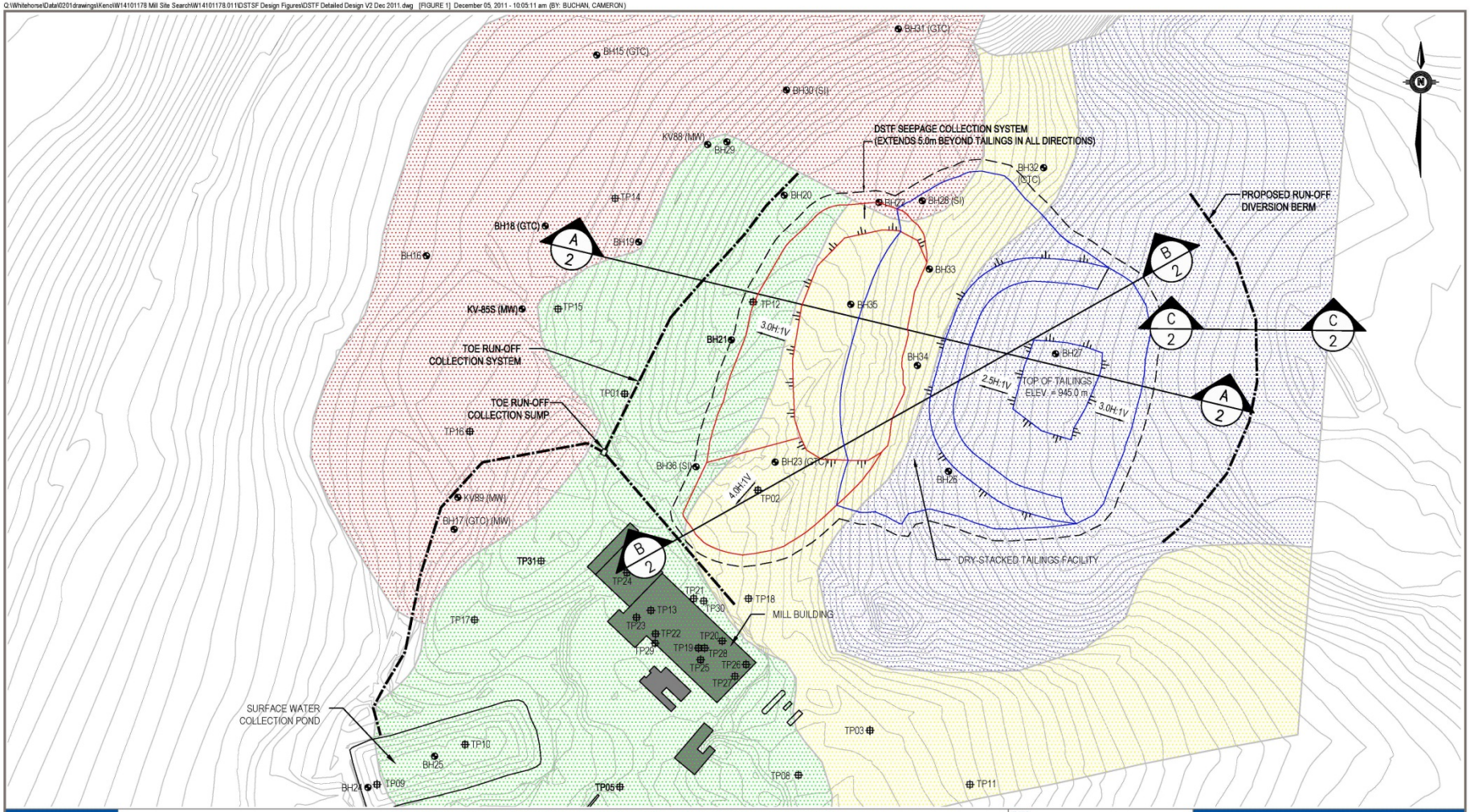
Concentrate Shipment (Ag, Pb, Zn)

Dry Stack Tailings Storage

DSTF Design


Q:\Whitehorse\Data\2012drawings\Keno\W14101178 Mill Site Search\W14101178.011\DSTSF Design Figures\DSTF Detailed Design IFU May 2011.dwg [FIGURE 1] May 13, 2011 - 2:05:43 pm (BY: BUCHAN, CAMERON)
CHRISTAL LAKE
CHRISTAL LAKE ACCESS ROAD
KENO CITY DUMP
KENO CITY
KENO HILL DISTRICT MILL SITE
DUNCAN CREEK ROAD
BELLEKENO MINE SITE
LIGHTNING CREEK
N
LEGEND
STATUS
ISSUED FOR USE
0
250
Scale: 1: 5 000 (metres)
CLIENT
ALEXCO
DRY STACKED TAILINGS FACILITY
KENO HILL DISTRICT MILL SITE, YUKON
SITE LOCATION PLAN
PROJECT NO.
W14101178.011
DWN
CB
CKD
JTP
REV
0

DSTF Design


Q:\Whitehorse\Data\0201drawings\Keno\W14101178 Mill Site Search\W14101178.011\DSTSF Design Figures\DSTF Detailed Design V2 Dec 2011.dwg [FIGURE 1] December 05, 2011 - 10:05:11 am (BY: BUCHAN, CAMERON)
BH31 (GTC)
BH15 (GTC)
BH30 (SI)
KV88 (MW)
BH29
DSTF SEEPAGE COLLECTION SYSTEM
(EXTENDS 5.0m BEYOND TAILINGS IN ALL DIRECTIONS)
BH32 (GTC)
BH20
BH22
BH28 (SI)
PROPOSED RUN-OFF DIVERSION BERM
TP14
BH18 (GTC)
BH19
BH16
BH33
TP12
BH35
KV-85S (MW)
TP15
3.0H:1V
BH21
TOE RUN-OFF COLLECTION SYSTEM
BH34
BH27
2.5H:1V
TOP OF TAILINGS ELEV. = 945.0 m
3.0H:1V
TP01
TOE RUN-OFF COLLECTION SUMP
TP16
BH36 (SI)
BH23 (GTC)
BH26
4.0H:1V
TP02
KV89 (MW)
BH17 (GTC) (MW)
DRY-STACKED TAILINGS FACILITY
TP31
TP24
TP21
TP18
TP13
TP30
MILL BUILDING
TP17
TP23
TP22
TP20
TP19
TP28
TP29
TP25
TP26
TP27
SURFACE WATER COLLECTION POND
TP03
TP10
BH25
BH24
TP09
TP05
TP08
TP11
LEGEND
- BOREHOLE LOCATION (CONFIRMATORY DRILLING)
- TESTPIT LOCATION
- GRAVEL
- MASSIVE ICE
- ICE RICH SILT TILL
- SHALLOW BEDROCK
STATUS
ISSUED FOR USE
0
50
Scale: 1: 1 500 (metres)
CLIENT
ALEXCO
DRY STACKED TAILINGS FACILITY
KENO HILL DISTRICT MILL SITE, YUKON
SITE PLAN SHOWING BOREHOLE LOCATIONS AND ASSUMED SUBSURFACE CONDITIONS
eba
A TETRA TECH COMPANY
PROJECT NO.
W14101178.011
DWN
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CKD
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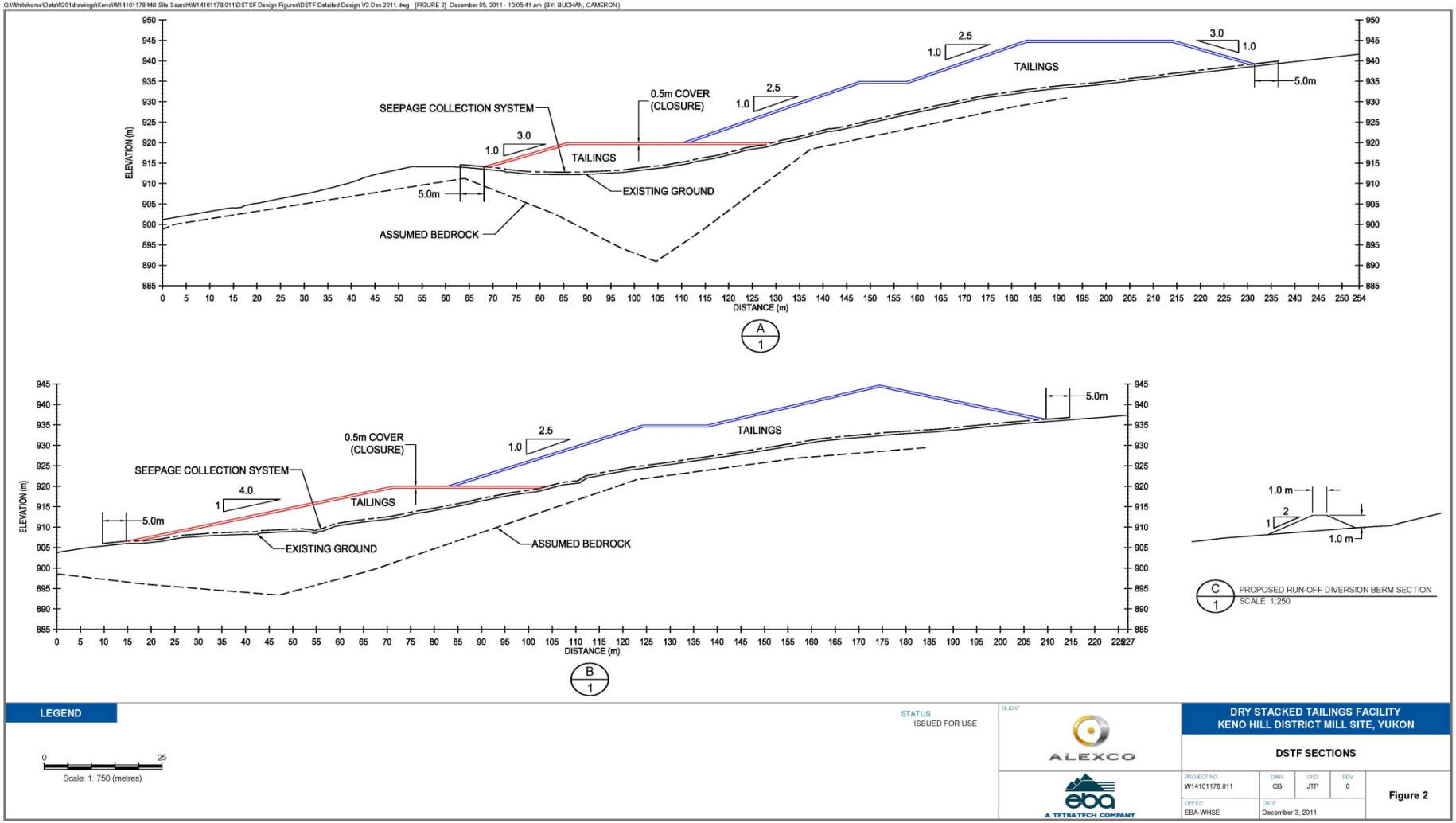
OFFICE
EBA-WHSE
DATE
December 3, 2011
Figure 1

DSTF Design


Q:\Whitehorse\Data\0201drawings\Keno\W14101178 Mill Site Search\W14101178.011\DSTSF Design Figures\DSTF Detailed Design V2 Dec 2011.dwg [FIGURE 2] December 05, 2011 - 10:05:41 am (BY: BUCHAN, CAMERON)
ELEVATION (m)
DISTANCE (m)
SEEPAGE COLLECTION SYSTEM
0.5m COVER (CLOSURE)
TAILINGS
EXISTING GROUND
ASSUMED BEDROCK
5.0m
2.5
1.0
3.0
1.0
4.0
1
A
1
B
1
C
1
PROPOSED RUN-OFF DIVERSION BERM SECTION
SCALE 1:250
1.0 m
2
1
1.0 m
LEGEND
0
25
Scale: 1: 750 (metres)
STATUS
ISSUED FOR USE
CLIENT
ALEXCO
eba
A TETRA TECH COMPANY
DRY STACKED TAILINGS FACILITY
KENO HILL DISTRICT MILL SITE, YUKON
DSTF SECTIONS
PROJECT NO.
W14101178.011
DWN
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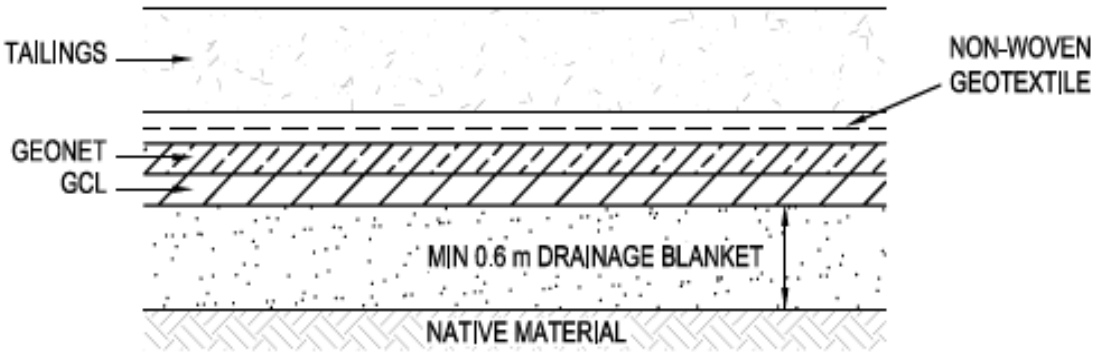
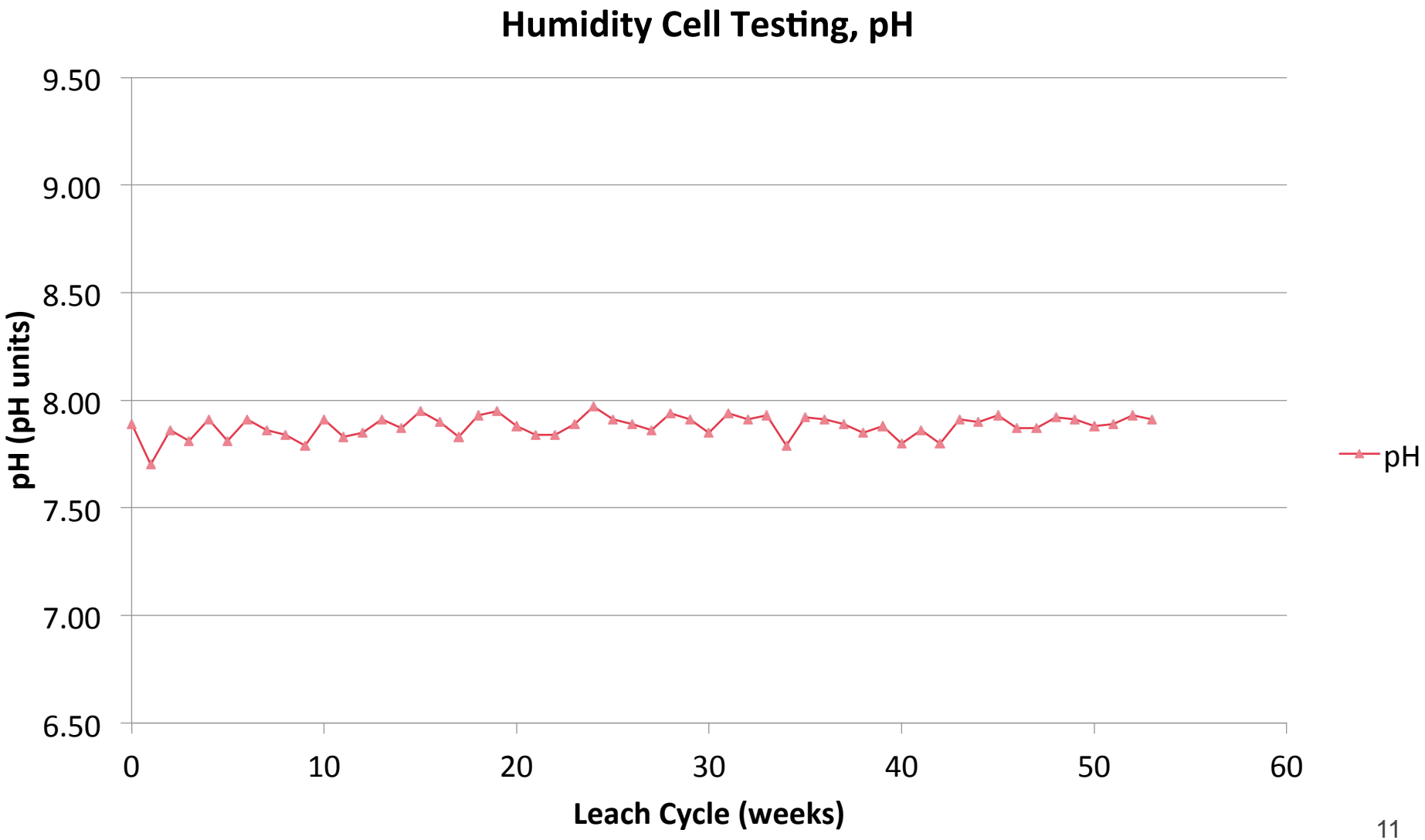
OFFICE
EBA-WHSE
DATE
December 3, 2011
Figure 2

DSTF Design

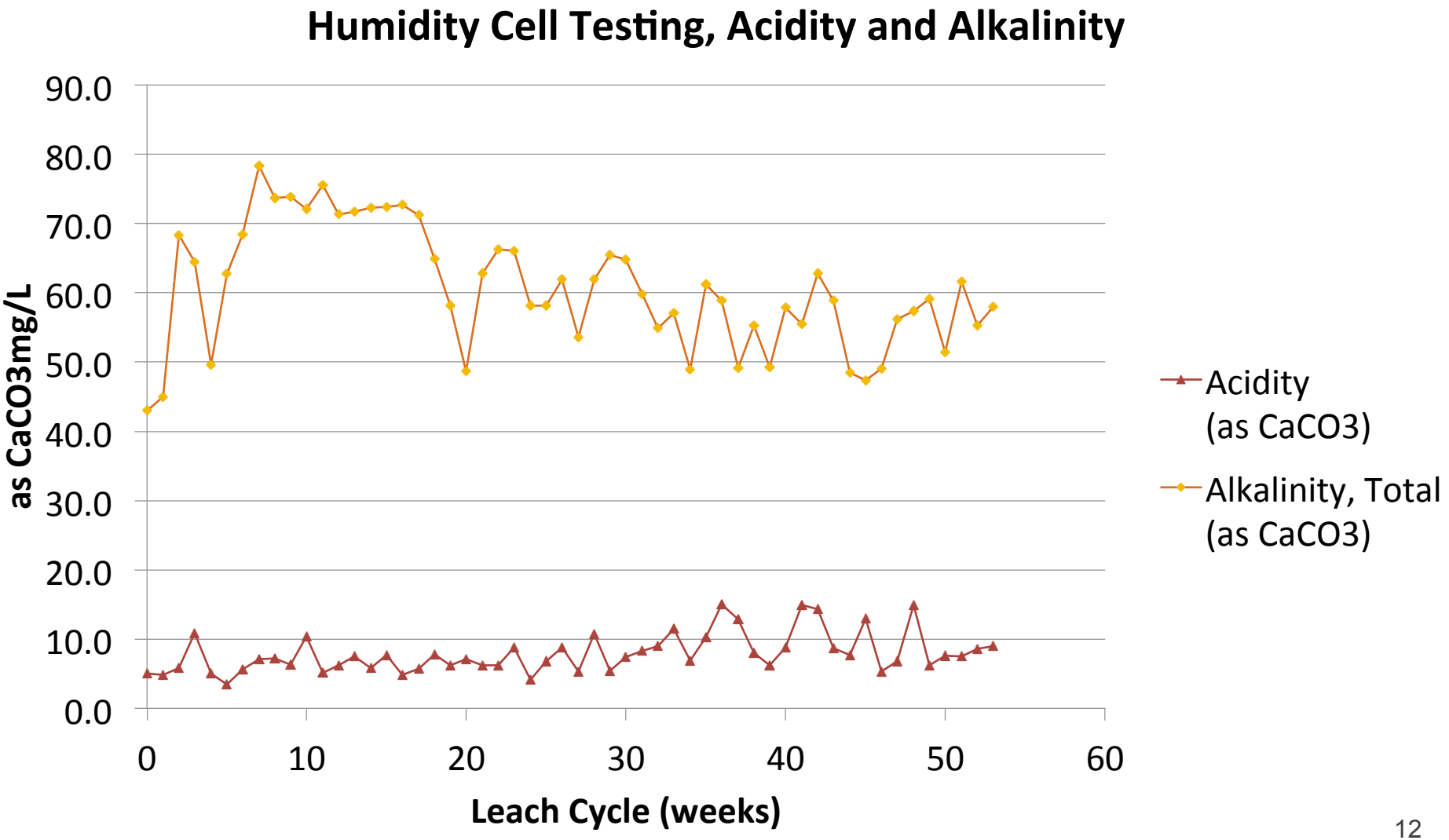


SEEPAGE COLLECTION SYSTEM DETAIL

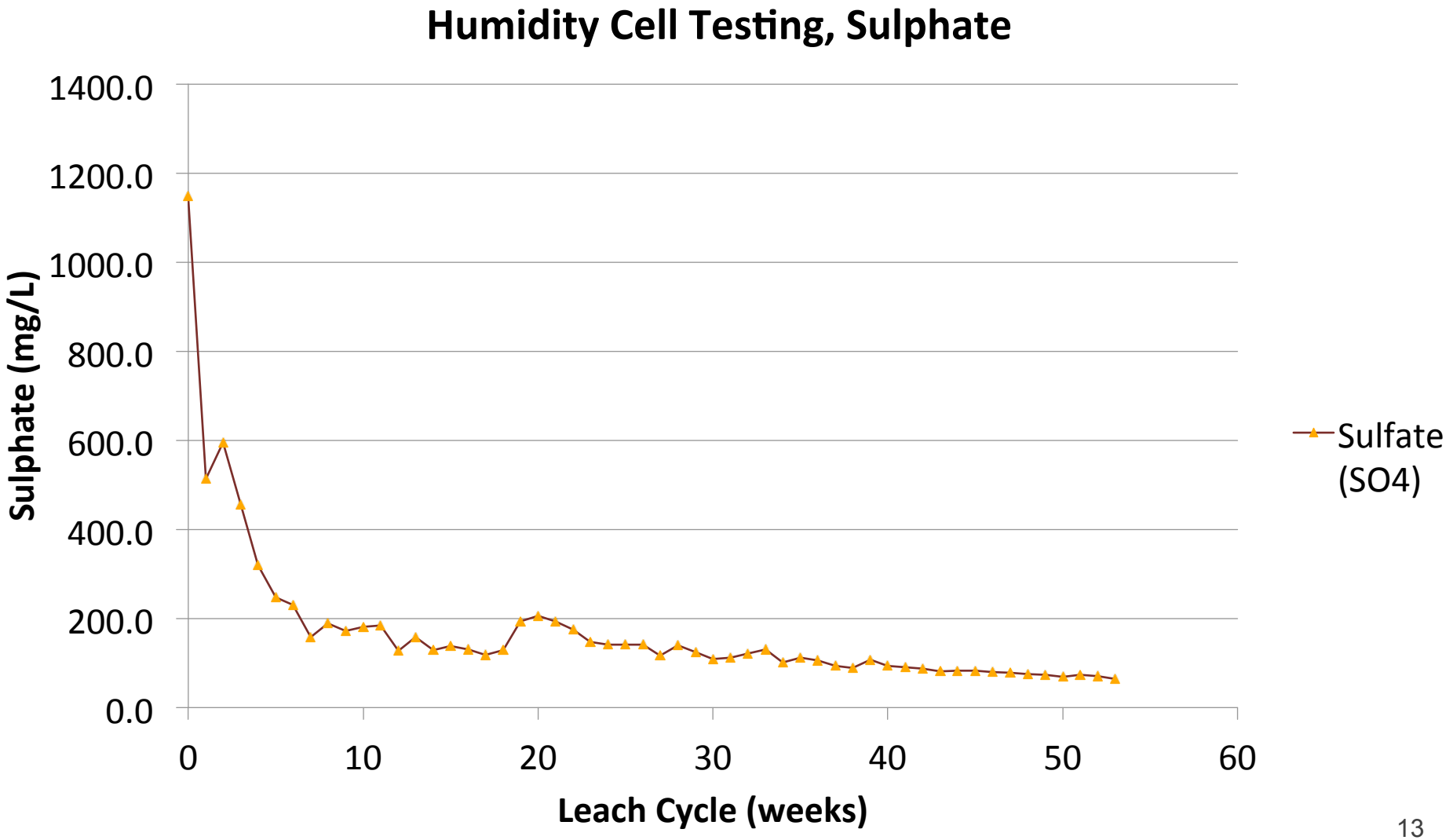
DSTF Performance



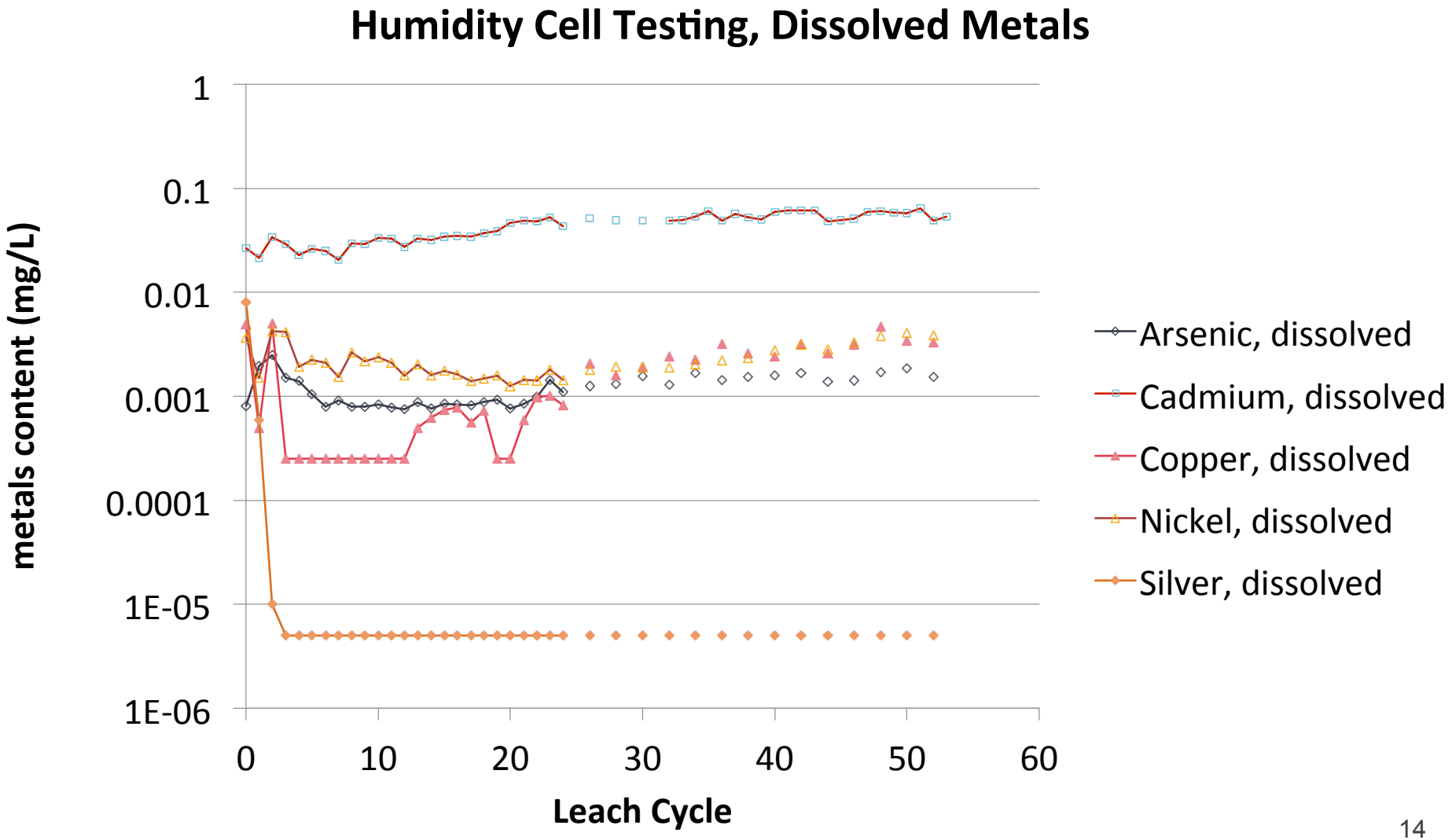
DSTF Performance



DSTF Performance



DSTF Performance



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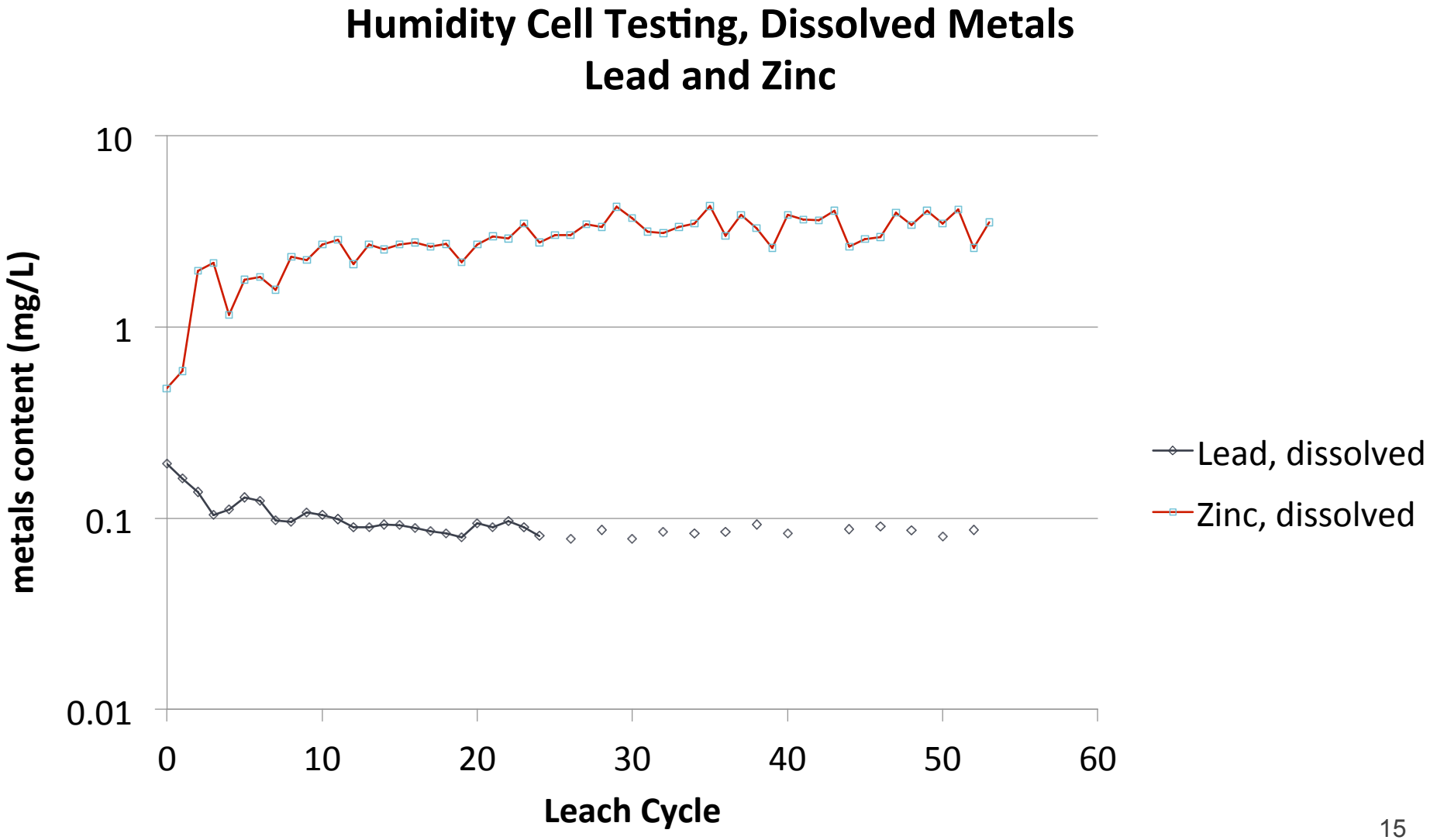
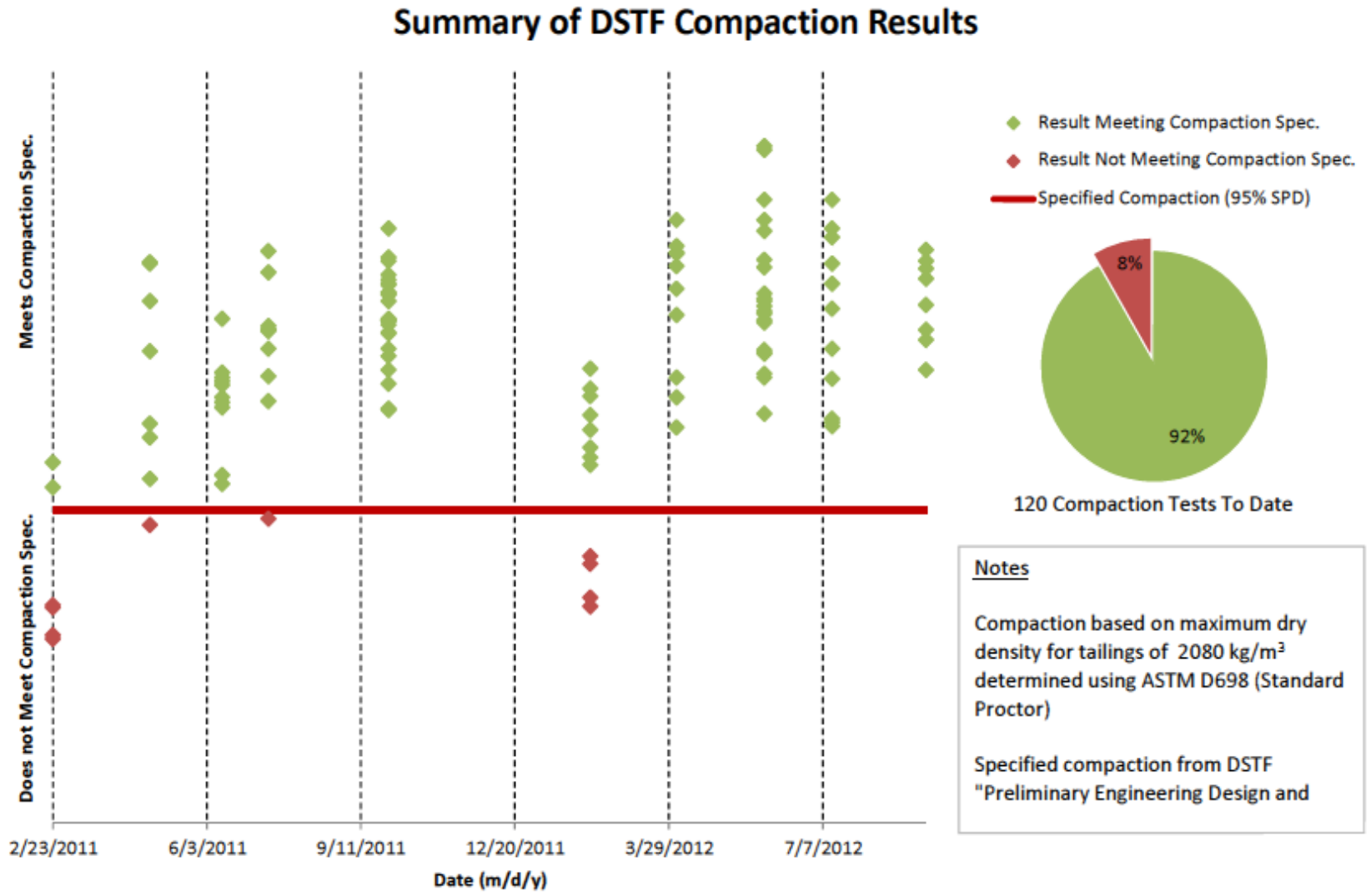
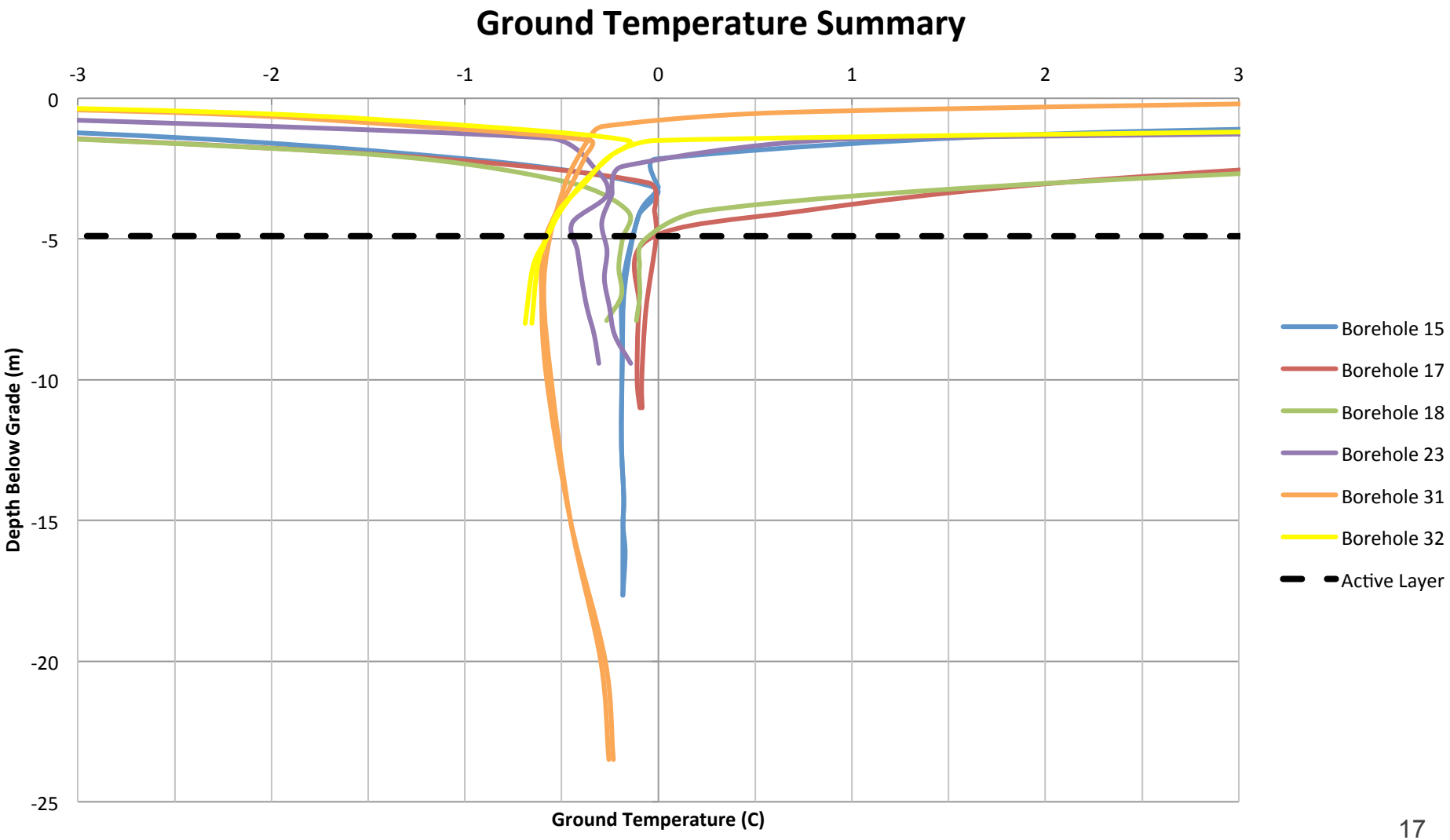


DSTF Performance - Compaction



DSTF Performance - Temperature



DSTF Progressive Reclamation

DSTF Progressive Reclamation

DSTF Progressive Reclamation

ALEXCO

TRAFFIC MANAGEMENT PLAN

KENO HILL SILVER DISTRICT MINING OPERATIONS

November 2013

ALEXCO KENO HILL MINING CORP.

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1 INTRODUCTION

The Traffic Management Plan describes procedures and protocols for site access, traffic routing and management, and company policy with respect to vehicle and employee transportation during the Keno Hill Silver District (KHSD) Mining Operations, as authorized by QML-0009 and its amendments. The previous Traffic Management Plan, which addressed traffic associated with the Bellekeno, Lucky Queen and Onek Mine(s), was approved on March 19, 2013. The updated Traffic Management Plan also addresses mine-related traffic associated with the development and production of the Flame & Moth deposit.

Public, employee and contractor safety is the primary goal of this plan. Alexco recognizes that the project area has a short but busy tourism season. The safety of tourists, who may lack local familiarity, are a special consideration during the summer season.

Road construction details are presented in the Road Construction Plans submitted under QML-0009.

2 SITE ACCESS – GENERAL

In the interest of site security and public safety, access to operational areas related to mining in the KHSD will be restricted to authorized site personnel through the usage of signs and gates where appropriate. Facilities that potentially present danger to persons or wildlife such as the electrical substation and settling ponds will be fenced or barricaded as appropriate to prevent access.

All mine traffic on haul routes will be radio controlled. Signage will be installed at appropriate locations in order to warn the public of haul routes.

In the event that temporary closure occurs, access to mine and mill sites will be further restricted through the use of fences and gates as appropriate. Access to adits, shafts, raises and all openings to underground workings will be securely blocked by means of a temporary but robust barrier. Buildings and ancillary facilities will be locked and secured. The Decommissioning and Reclamation Plan prepared under QML-0009 contains additional details on site access controls during closure and post closure.

A number of additional general measures related to site access, road management and public safety and construction events notification are presented here:

- Private employee off-road vehicles will be prohibited on the mine access roads and at the mine site.
- Existing trails and disturbed areas will be used where possible to minimize the addition of new linear corridors and there will be no unnecessary disturbance to the organic mat and soils.
- Snow clearing equipment will be available on site to maintain the mine access roads.
- Snow plows on the access road will create breaks in the snow berm every 0.5 km to allow for wildlife to escape from the access road.

- Signage posted near all construction sites.
- Weekly events notice to be updated and posted when general activities change within the district at three locations (Post Office in Keno City, Post Office in Elsa, and Keno City Snack Bar).
- 40 km/hr speed limit within or near the town;
- No use of engine retarder brakes within 1 km of the center of Keno City;
- Review of highway access, signage and sign placement with YG Highways & Public Works;
- In accordance with the Occupational Health and Safety Regulations for public roads, use of flashing devices on all vehicles/machinery and equipment that will cross, travel on or may otherwise pose a risk to users of public roads.

3 EMPLOYEE TRANSPORTATION

To the extent possible employees will use project bussing and pool transportation from Mayo/Elsa to the mine and mill site, thereby reducing overall vehicle traffic. Fleet vehicles will be utilized by staff as necessary.

4 SPEED LIMITS

Speed limits will be enforced for mine traffic and posted along the access and site roads (maximum 40 km/hr, reduced to 20 km/hr at blind corners and bridge crossings). Mine traffic on the mine and mill access roads will be radio controlled for safety and speed control.

Employees and contractors will be educated on safety including traffic protocols and speed limits during mandatory orientation. Routine traffic inspections and/or speed indicator signs will be used to encourage safe and responsible driving and ensure that Alexco's traffic and safety protocol are adhered to.

Alexco will investigate and take appropriate modification of policy and/or disciplinary action in the event of any traffic incidents or complaints.

5 COMMUNICATIONS AND NOTIFICATION PROTOCOLS

Mine traffic along all haul and access roads, including the Silver Trail Highway to/from Flat Creek Camp are radio-controlled. Road location/travel direction signs (e.g. BKR 7 Up, road abbreviation/kilometre marker/direction) are installed at various locations along all of the mine access roads. Employees, contractors and supply vehicles identify their location and travel direction as they travel the mine access and haul roads to alert any oncoming traffic. This system is integral to the safe operation of the mine access roads and is one of the primary reasons public access is prohibited on the active mine areas. The two channels used for traffic notification and routine onsite communication, which are publicly accessible, are:

- Alexco Channel 3 (Receive TX 157.61; Transmit RX 151.97)
- Alexco Channel 4 (Receive TX 154.1; Transmit RX 154.1)

Alexco anticipates that any road maintenance/upgrades will require only single-lane temporary closures. Signage waning of construction activities on the roadway will be placed at appropriate distances from the construction site, in consultation with Highways & Public Works. For significant upgrade/maintenance events (those requiring more than one day to complete), written notification will be distributed to Keno City residents and Highways & Public Works will be notified. Routine road maintenance (grader/snow plow) of the mine access roads including the Wernecke Road will occur on a routine basis as road conditions dictate. The Wernecke Road is used for access to a local residence and maintenance of this road will be made in an effort to accommodate recreational access by local residences but the primary objective is for the safety of employees, contractors and residents. During periods when the Lucky Queen mine is not in active development or operations the Wernecke Road will not be maintained.

A public notice is posted at multiple locations in Keno City to communicate to residents any new activities that may be occurring or scheduled. Contact information for AKHM senior management is included in this notice and any concerns regarding road maintenance or traffic management can be forwarded to AKHM management through this notification system.

6 TRAFFIC ROUTING AND VOLUMES – BELLEKENO MINE

Mine traffic associated with the Bellekeno Mine has been redirected around Keno City to ensure that direct ore haulage traffic is routed around the community and potential impact to the local community is minimized. Figure 1 shows the routing of traffic around the community along the "Bellekeno Project Bypass Road", which consists of two portions:

- Bellekeno Project Bypass North consists of the section of former haul road between Duncan Creek road and the Silver Trail Highway to the west of Keno. This portion of the bypass ensures that all mill traffic and concentrate haul will bypass Keno City.
- Bellekeno Project Bypass South is the section of road connecting the Sourdough Trail on the south side of Lightning Creek to the Duncan Creek Road across Lightning Creek.

A portion of the Bellekeno haul road will be re-routed for the proposed dry stack tailings facility shown on Figure 1. There will continue to be occasional light vehicle traffic and vendor delivery within Keno City.

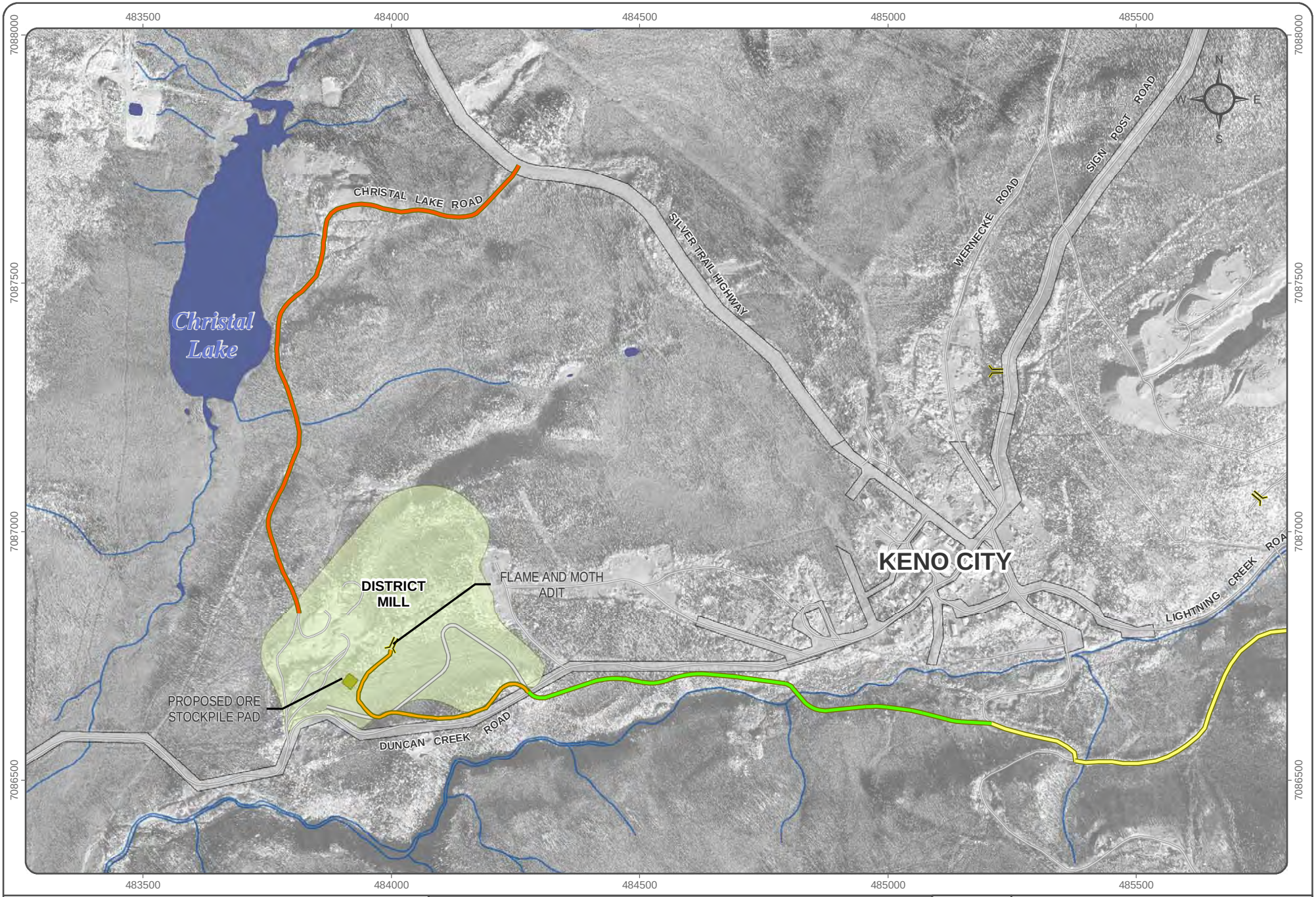
Table 1 summarizes the volume of traffic in the Keno City area for the operations phases related to the Bellekeno mine.

Table 1 Estimated Daily Traffic Count – Operations Phase Bellekeno Mine

		Shift Change	Day Shift	Shift Change	Night Shift
Vehicle Type – One way traffic count	**Travel Direction**	**6 am – 8 am**	**7 am – 7 pm**	**4 pm- 6 pm**	**7 am – 7 pm**
Light Trucks (< 1 ton) and Autos	Elsa to Mine/Mill	4	8	4	6
Buses	Elsa to Mine/Mill	2		2	
Heavy Trucks (>5 tonne) bulk materials	Elsa to Mine/Mill		8		
Ore Trucks (>20 tonne) hauling ore	Mine to Mill		14		
Ore Trucks (>20 tonne) hauling tailings or empty	Mill to Mine		14		
Total round trips per day		**6**	**44**	**6**	**6**

Notes:

1) Warehouse receiving and shopping normally confined to hours between 8 am and 4 pm. This will minimize heavy traffic during shift changes. Normally no heavy truck deliveries on night shift.
2) Bulk materials include fuel, reagents, materials, supplies and concentrate haulage.
3) Above values are considered typical of daily traffic anticipated during operations. Variations up to 50% are possible on any given day.
4) Based on 408 t/d production rate which results in highest ore haulage traffic count.



Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13th and 14th 2006.Site hydrography derived from 2006 aerial imagery obtained from Aero Geometrics, Calgary Alberta

Datum: NAD 83; Map Projection: UTM Zone 8N

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1:10,000 *When printed on 81/2 by 11 inch paper*

0 100 200 300 Meters

- Adit
- Proposed Road
- Bellekeno Project Bypass Road North
- Bellekeno Project Bypass Road South
- Bellekeno Haul Road
- Mill Site Footprint

AKHM ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 1

BELLEKENO PROJECT BYPASS ROAD

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\Traffic\BellekenoProjectBypassRoad_20131120.mxd (Last edited by: jpan;2013-11-22/12:41 PM)

7 TRAFFIC ROUTING AND VOLUMES – ONEK AND LUCKY QUEEN MINES

The Keno City Bypass Road is developed from the Wernecke Road, crossing Sign Post Road, along the historic Onek waste rock storage area, to the Onek 990 Portal, crossing Lightning Creek Road and the Onek Access Bridge across Lightning Creek to the Bellekeno Haul Road (Figure 2). The Bypass Road is approximately 2.1 km long and 6 – 9 m wide to safely accommodate passing vehicles. The road maybe restricted to one-way travel where conditions prevent construction to 9 m wide.

There are stop signs to stop mine traffic at the intersections with Wernecke Road, Sign Post Road and Lightning Creek Road. Signage warning of crossing mine traffic are installed in both directions from the intersection, in accordance with regulatory requirements. Appropriate line-of-sight distances will be maintained to ensure crossing trucks and approaching traffic on the Wernecke Road are able to see each other. The line-of-sight distance requirements of YG Highways & Public Works Transport Branch and the Highway Access/ Works within a Right-of-Way permits will be adhered to in order to ensure public and worker safety.

Signage warning of crossing/turning mine dump trucks (over the highway dump trucks) are installed along Sign Post Road, Lightning Creek Road, Bellekeno Haul Road and Wernecke Road in accordance with the requirements and direction of YG Highways & Public Works Transport Branch officials.

During mine production, heavy truck traffic from Lucky Queen and Onek will be routed along the Keno City Bypass Road to/from the Bellekeno Haul Road. Light truck traffic to/from Lucky Queen will continue to be routed through Keno City during mine operations. Table 2 presents traffic volumes during operations on different sections of the access routing shown on Figure 2.

It is anticipated that up to 16 roundtrips per day of ore haul truck traffic will travel along the Bellekeno Haul Road with Lucky Queen and Onek Mines operating, representing a 60 % increase in haul traffic from current levels.

Table 2 Estimated Traffic Volumes along Key Traffic Management Routes (roundtrips/week)

	Route				
Vehicle Type	**1**	**2**	**3**	**4**	**5[1]**
Light truck	7	28	10	10	80-100
Water truck	-	2	-	-	1
Sewage truck	-	2	-	-	1
Grader/Sand Truck	1	1	-	-	2
Semi trailer loads	-	7	-	-	-
Ore haul truck	-	-	25	-	-
Dump truck	-	-	-	49	28
Total	**8**	**40**	**35**	**59**	**112-132**

Note: [1] Some of this traffic will also have to travel the Silver Trail Highway (Route 1).

The Keno City Bypass Road will be a radio controlled road accessible to mine traffic only. Signs will be installed at the road access points prohibiting public traffic from traveling on it. The maximum speed limit will be 40 km/h, reduced to 20 km/h at blind corners and road crossings.

Alexco will continue to work with tourism and heritage representatives and the community to develop signage to be installed along the Silver Trail Highway to Keno and within Keno that shows a road/trail map of the area indicating the roads that are in active mining use, identifies key tourist features, and lists general safety precautions and traffic management procedures for active roads.

1 - Through Keno <-> 990 Portal
2 - Through Keno <-> Lucky Queen
3 - Ore Haul Lucky Queen <-> Mill
4 - Ore Haul 990 Portal <-> Mill
5 - 990 Portal <-> Bellekeno Access Road (N-AML Waste Rock Disposal Area)
6 - Proposed Re-routing of Bellekeno Haul Road

CHRISTAL LAKE ROAD
Christal Lake
SILVER TRAIL HIGHWAY
IVERNECKE ROAD
SIGN POST ROAD
HISTORIC ONEK 400 LEVEL ADIT
LICENCED P-AML WASTE ROCK STORAGE FACILITY
HISTORIC UNDERGROUND WORKINGS
KENO CITY BYPASS ROAD
ONEK 990 PORTAL
Lightning Creek
LICENSED BELLEKENO MINE N-AML WASTE ROCK DISPOSAL AREA (TO BE CONSTRUCTED)
KENO CITY
LIGHTNING CREEK ROAD
BELLEKENO HAUL ROAD
EXISTING CULVERT
EXISTING BRIDGE (MS10-029)
KENO DISTRICT MILL SITE
PROPOSED ORE STOCKPILE PAD
FLAME AND MOTH ADIT

1:10,000 *(when printed on 11 x17 inch paper)*
Meters
0 100 200 300 400

483500 484000 484500 485000 485500 486000 486500 487000
7088500 7088000 7087500 7087000 7086500

Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13th and 14th 2006.

Site contours and hydrography derived from 2006 aerial imagery obtained from Aero Geometrics, Calgary Alberta.

Datum: NAD 83; Projection: UTM Zone 8N

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As Built, Tailing Stockpile, Sept 2013
Mill Site Footprint
Existing Features
Building/Structure
Highway
Secondary
Contour (5 m interval)
Contour (1 m interval)

AKHM
ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 2

LUCKY QUEEN, ONEK 990 AND BELLEKENO ACCESS ROUTES

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\Traffic\TrafficManagement_20131120.mxd
(Last edited by: jpan;2013-11-22/12:38 PM)

8 TRAFFIC ROUTING AND VOLUMES – FLAME & MOTH MINE

Mine traffic associated with the Flame & Moth mine will use the Christal Lake Road and a short haul road (~175m) to be constructed between the portal and the crusher pad, as shown in Figure 1. The Bellekeno Project Bypass Road North will be re-routed to allow development of the DSTF expansion. As the mine operations at Flame & Moth begin, traffic from other deposits are expected to decrease, and the net level of traffic for the district should remain the same. A decrease in traffic along the Bellekeno Bypass Road is expected during Flame & Moth operations. There will be no additional traffic through Keno City for the Flame and Moth Mine.

Table 3 summarizes the volume of traffic in the Keno City area for the mine development phase at Flame & Moth. These estimates are for traffic in/out of the Christal Lake Road since this is the only access road envisioned for the Flame and Moth Mine.

Table 3 Estimated Traffic During Development – Flame & Moth

Vehicle Type	Average Traffic Volume (roundtrips/week)
Light Truck	50
Water truck	2
Sewage truck	2
Semi trailer loads (mining equipment, building supplies, construction equipment, etc)	7
Grader	1
Total	**62**

During mine production, all heavy and light truck traffic will be routed along the Christal Lake Road. Table 4 presents traffic volumes during operations on the Christal Lake Road and the Flame & Moth haul road.

Table 4 Estimated Daily Traffic Count – Operations Phase Flame & Moth

		Shift Change	Day Shift	Shift Change	Night Shift
Vehicle Type – One way traffic count	**Travel Direction**	**6 am – 8 am**	**7 am – 7 pm**	**4 pm- 6 pm**	**7 am – 7 pm**
Light Trucks (< 1 ton) and Autos	Elsa to Mine/Mill	4	8	4	6
Buses	Elsa to Mine/Mill	2		2	
Heavy Trucks (>5 tonne) bulk materials	Elsa to Mine/Mill		3		
Ore Trucks (>20 tonne) hauling ore	Mine to Crusher		14		
Ore Trucks (>20 tonne) hauling tailings or empty	Crusher to Mine		14		
Total round trips per day		**6**	**44**	**6**	**6**

Notes:

1) Warehouse receiving and shopping normally confined to hours between 8 am and 4 pm. This will minimize heavy traffic during shift changes. Normally no heavy truck deliveries on night shift.
2) Bulk materials include fuel, reagents, materials, supplies and concentrate haulage.
3) Above values are considered typical of daily traffic anticipated during operations. Variations up to 50% are possible on any given day.
4) Based on 408 t/d production rate which results in highest ore haulage traffic count.

EMERGENCY RESPONSE PLAN

KENO HILL SILVER DISTRICT

November 2013

ALEXCO KENO HILL MINING CORP.

This controlled document will be regularly updated to reflect revisions.

- Updated Emergency Management Response Plan (EMRP) documents will be bound and distributed to all authorized personnel.
- All Keno Hill Project personnel must have EMRP training and know where to gain access to the document in the event of an emergency.

Authorized Distribution / Location List:

Alexco Resource Corp. - Keno Hill Property:

- Elsa Exploration/Administration Office
- Bellekeno East Shifters Office
- Lucky Queen and Onek Shifters Office
- Maintenance Shop
- First Aid Room(s)
- General/Site/Department Managers Workspace
- Kitchen Medical Station
- Mine Rescue Shed – Bellekeno East
- Safety Manager/Coordinators Office
- Keno District Mill Office

Alexco Resource Corp. - :

- Access Consulting Group Whitehorse Office
- Alexco Resource Corp. Vancouver Office
- Alexco Resource Corp. Whitehorse Office

Community:

- Mayo Nursing Station
- Mayo RCMP Detachment
- Mayo Fire Department

Government:

- •Occupational Health & Safety - YWCHSB

Primary Partners On-site Contractors:

- First Nation Na-Cho Nyak Dun – Mayo

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1 PURPOSE

This guide sets out the response protocol in the event of a "Serious Incident" as defined in the following section.

It is intended for use as a quick reference handbook for managers and supervisors. Incident reporting and investigating is also outlined.

In an emergency situation it is imperative that due diligence is exercised as well as discretion. The priorities are the protection of LIFE, LIMB and PROPERTY – in that order.

2 DEFINITIONS

2.1 "SERIOUS INCIDENT"

A "Serious Incident" is defined as any occurrence meeting one or more of the following criteria:

1. Any "serious injury" or "serious accident" as defined in OH&S 33(1) (see Section 2.2),
2. Any incident requiring first aid or rescue response to the scene,
3. Any fire requiring discharge of a fire extinguisher,
4. Any release of a hazardous product where there is potential for that product to enter a waterway,
5. Any hazardous product spill of reportable volume, as defined in Section 11.0.

2.2 "SERIOUS INJURY" AND "SERIOUS ACCIDENT" UNDER OH&S ACT

(Excerpt from Occupational Health & Safety Act)

33. (1) In this section,

"Serious Injury" means:

- *a. an injury that results in death,*
- *b. fracture of a major bone, including the skull, the spine, the pelvis, or the thighbone,*
- *c. amputation other than of a finger or toe,*
- *d. loss of sight of an eye,*
- *e. internal bleeding,*
- *f. full thickness (third degree) burns,*
- *g. dysfunction that results from concussion, electrical contact, lack of oxygen, or poisoning, or*
- *h. an injury that results in paralysis (permanent loss of function).*

"Serious Accident" means:

- *a. an uncontrolled explosion,*
- *b. failure of a safety device on a hoist, hoist mechanism, or hoist rope,*

c. collapse or upset of a crane

d. collapse or failure of a load-bearing component of a building or structure regardless of whether the building or structure is complete or under construction,

e. collapse or failure of a temporary support structure,

f. an inrush of water in an underground working,

g. fire or explosion in an underground working,

h. collapse or cave-in, of a trench, excavation wall, underground working, or stockpile,

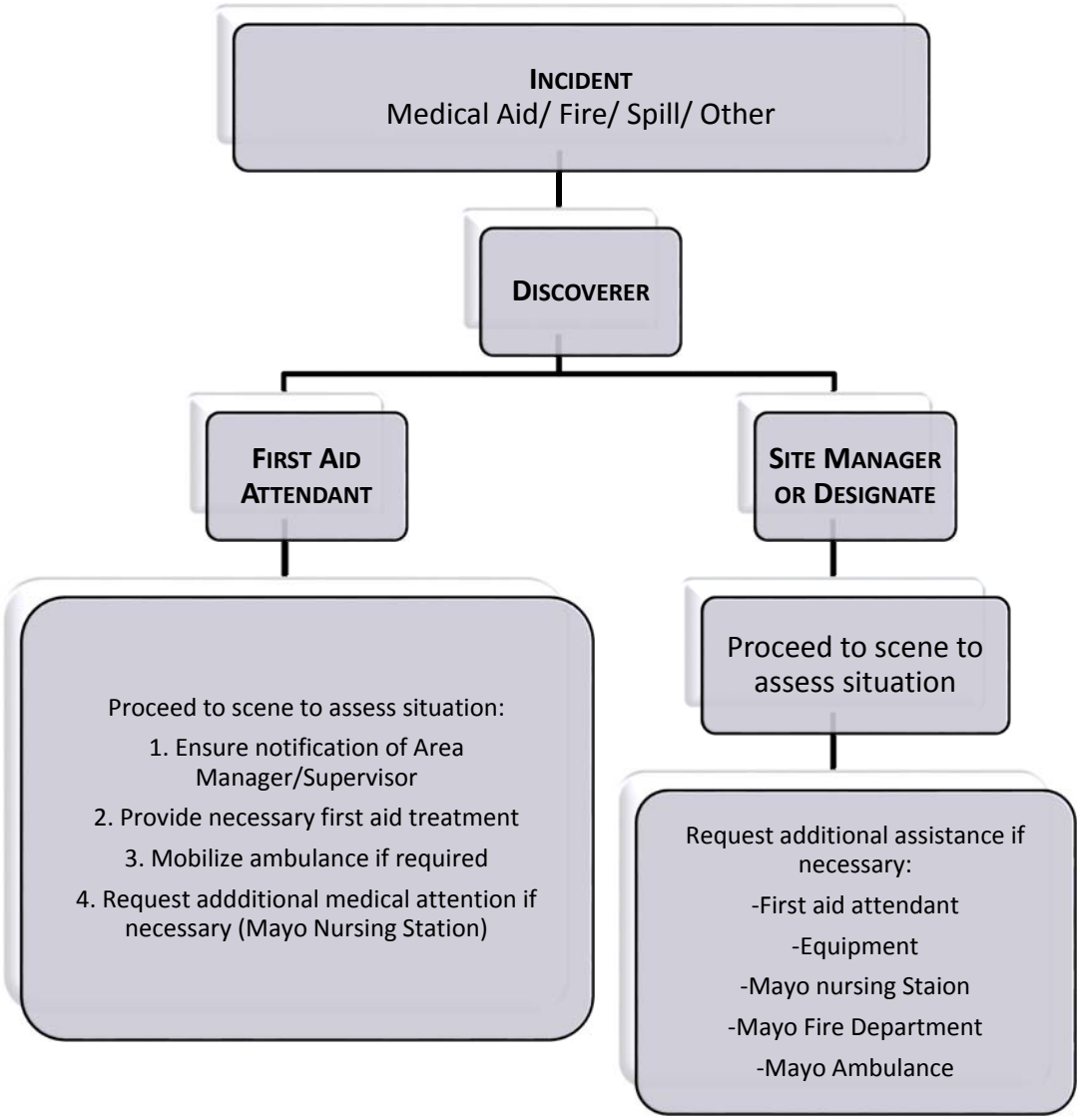
i. accidental release of a controlled product,

j. brake failure on mobile equipment that causes a runaway,

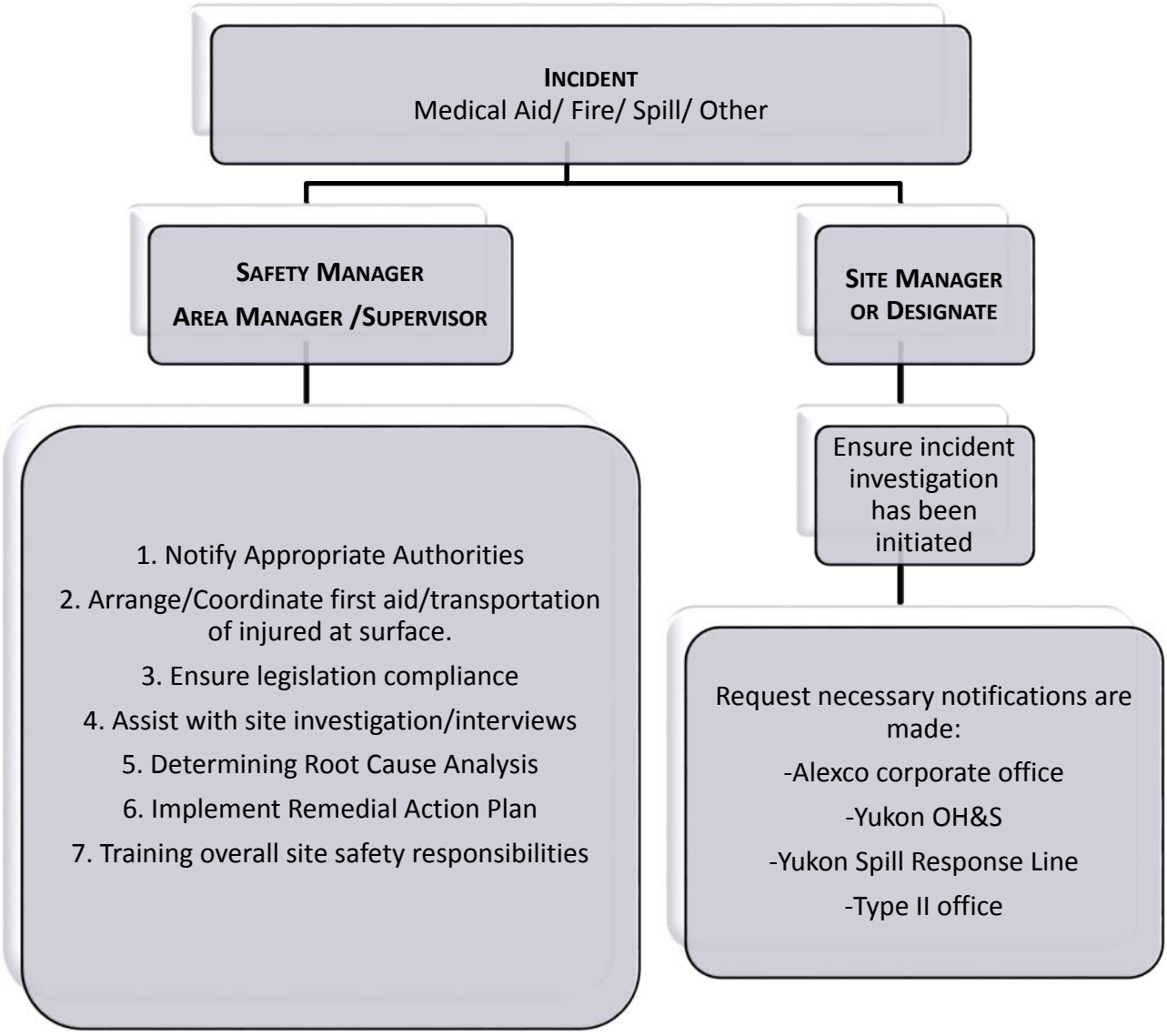
k. any accident that likely would have caused serious injury but for safety precautions, rescue measures, or chance. (As amended by SY 1988, c.22, s. 5; SY 1989, c. 19, s.6)

Reprinted from "Occupational Health and Safety with Mine Safety Regulations."
Yukon Workers' Compensation Health and Safety Board. Department of Justice, Government of the Yukon. 199

3 INITIAL RESPONSE TO SERIOUS INCIDENT – KENO HILL SILVER DISTRICT



4 FOLLOW UP TO SERIOUS INCIDENT – KENO HILL SILVER DISTRICT



5 SERIOUS INCIDENT RESPONSIBILITY MATRIX

See ERP 006 Medical Emergencies On-site

Position	Responsibilities
Area Manager/Supervisor	• Coordinate initial response • E.R.T. and specialized resources mobilization & consultation • Attend and coordinate response for all incidents involving "serious injury" and "serious accident", as defined in Sec. 33, OHS Act • Initial scene control • Responsible for investigation – determine contributing causes and take immediate proactive action • Request additional external resources as necessary • Coordinate recovery and investigative activity • Notify Site Manager • Ensure all government reporting has been completed • Organize and conduct post-incident debriefings • Prepare Incident Report and make recommendations
First Aid Attendant	• Ensure area supervisor has been notified of incident • Provide first aid treatment if necessary • Mobilize ambulance to scene, if required • Stand by to assist as required by scene coordinator
General, Site Manager	• Designate on-call senior personnel during weekends • Receive briefings on incident details • Provide direction as required • Notify regulatory agencies, government and Alexco corporate office of incident • Review Incident Reports • Attend at all incidents involving "serious injury" and "serious accident", as defined in Sec. 33, OHS Act • Verify compliance with standards and government regulatory requirements • Forward necessary reports to regulatory agencies • Fire Chief – assume responsibility for fire investigation
Safety Manager/Coordinator	• Notify appropriate authorities • Arrange/Coordinate first aid/transportation of injured at surface • Ensure legislation compliance • Assist with site investigation/interviews • Determining Root Cause Analysis • Implement Remedial Action Plan • Training overall site safety responsibilities

6 SERIOUS INCIDENT CONTACTS FOR SITE PERSONNEL

KEY POSITIONS –KENO HILL SILVER DISTRICT - CONTACT LIST				
Release information only as instructed by the Incident Controller.				
Alexco Resource Corp - Keno Hill Project PO BOX #7, Elsa, YT.,Y0B 1J0 Lat 63.54 N Long 135.29 W (Elsa)		Phone: MAIN 867 996-2330 Phone: LANDLINE 867 995-3113 Fax: 867- 995-2600		
Name	**Position**	**Home Phone**	**Mobile Phone**	**Work Phone**
Brad Thrall	Chief Operating Officer	360-332-6915	604-250-6501	604-631-4133
Hall, Tim	General Manager Operations	907-790-2245	604-340-5832	867-996-2330 ext. 5901
Johnson, Peter	Site Manager	867-993-5911		867-996-2330 ext. 5905
Kai Woloshyn	Environmental Manager		867-334-3614	867-668-6463 ext. 233
MacMillian, Colette	Yukon Business Services Manager	867-633-2096	867-633-4811	867-633-4811 ext. 225
McOnie, Al	VP Exploration	+64 – 7 549-1194	604-340-5815	867-996-2330 ext. 5904
Schneider, Rob	Care and Maintenance Supervisor	867-660-5544	867-332-5544	867-996-2330 ext. 5910
Grant Ewing	Care and Maintenance Supervisor			867-996-2330 ext. 5910
Nauman, Clynt	Chief Executive Officer	360-371-0176	604-250-3293	604-631-4138
SITE AREA – KENO HILL SILVER DISTRICT – CONTACT LIST				
Site numbers and extensions 867-996-2330				
Bunk A 5925	House #1 5915	Admin Building 5900	Mine Manager Office 778-372-2687	
Bunk B 5920	House #2 5902	Kitchen 5927	Mine Engineering 778-372-2686	
Bunk C 5923	House #3 5916	Mechanics 5914	Shifters Office 778-372-2759	
Bunk D 6000	House #4 5917	First Aid 5921	Mine Safety Office 604-759-4777 Boart Longyear 778-372-2708 Mill Manager Office 778-372-2754	
Radio Frequencies – Keno Hill Silver District – Contact List				
Alexco Channel	**Channel Name**	**Receive TX**	**Transmit RX**	**Tone**
Channel 1	First Aid Emergency First Aid Channel	160.73	165.73	RX & TX = C131.8
Channel 3	Repeater Routine On-site Radio Traffic	157.61	151.97	No Tone
Channel 4	Ladd 1 Routine On-site Radio Traffic	154.1	154.1	No Tone
Channel 5	Ladd 2	158.94	151.94	No Tone

7 EXTERNAL RESOURCE CONTACTS

With the exception of medical aid incidents, external resources will be authorized only by the Senior Project Manager on site or his designate, or those with higher level of responsibility.

Key Persons – External Agency – Contact List			
Release information only as instructed by the Incident Controller.			
Alexco Whitehorse Office	867-633-4881	Roads Highways & Bridges	867-996-2232
Canutec	867-996-6666	Superior Propane	877-873-7467
Environment Spills	867-667-7224	Trans North Helicopter	867-668-2177
Fireweed Helicopter	867-668-5888	Whitehorse Hospital	867-393-8700
Forest Fire	888-798-3473	Wildlife Management	867-996-2162
Marine & Air Search & Rescue	800-567-5111	YEMS	867-667-3333
Mayo Fire Department	867-996-2222	Wolverine Mine	604-638-0921
Mayo Health Centre & Ambulance	867-996-4444	Yukon Energy – Regular Hours	867-393-5355
Minto Mine	604-759-0860	Yukon Energy – Emergency	800-676-2843
Poison Control	888-393-8700	YT Chief Mines Safety Officer	867-667-8739
RCMP	867-996-5555		

8 REPORTABLE SPILL QUANTITIES

Should a spill of reportable quantity occur, under federal and territorial regulations, we are required to immediately notify the 24-hour Yukon Spill Report line: telephone number 867-667-7244.

For the purposes of the water use license:

1. Any quantity of spill is reportable.
2. The Site Manager, Environmental Manager, Care and Maintenance Supervisor or Manager On-Call are responsible for reporting spills.
3. Reportable spills require an Incident Investigation Report to be completed.

This guide will assist in determining what volume of product requires reporting to regulatory agencies.

If a spill is deemed to be of reportable quantity, the area supervisor will immediately notify the Site Manager or Environmental Manager who will in turn ensure that spill reporting is completed by designated personnel.

Reportable Spill Quantities			
TDG Class	**Substance for 24-Hour Spill Line**	**Typical Products on Site**	**Immediately Reportable Quantities**
1	Explosives	ANFO	Any amount spilled outside of blast pattern
2.3 2.3 2.4 6.2 7.0 None	Toxic gas (compressed/non-compressed) Poisonous Gases Corrosive gas (compressed/non-compressed) Infectious substances Radioactive Unknown substance		Any amount
2.3	Non-poisonous Gases		>100 Litres
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable)	Propane Acetylene	Any amount of gas from containers with a capacity From a container > 100L
3.1 3.2 3.3	Flammable liquids	Diesel Gasoline Glycol Hydraulic &/ Engine Oil	>200 Litres From a container larger than 100L
4.1 4.2 4.3	Flammable Solids Spontaneously combustible solids Water reactant (dangerous when wet)		>25 kg
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	Sodium Hydroxide Lime Solution Sodium Nitrate Calcium Hypochlorite Ammonium Nitrate	>50 kg or 50 Litres
5.2 9.2	Organic Peroxides Environmentally hazardous		>1 Litre or 1 kg
6.1 6.2 8.0 9.3	Poisonous substances Infectious substances Corrosive substances Dangerous wastes (waste oil)	 Hydrochloric / Muriatic Waste Oil	>5 Litres or 5 kg Any Amount
9.1	PCB Mixtures of 5 or more ppm	Transformer oil	>0.5 Litre or 0.5 kg
9.1	Miscellaneous dangerous goods		>50 kg
None	Other contaminants (eg crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)		>100 Litres or 100 kg
None	Sour natural gas (eg contains H2S) Sweet natural gas		Uncontrolled release or sustained flow of >10 min

The Bellekeno MLU operating permit dictates that all spills will be reported.

8.1 SPILL RESPONSE EQUIPMENT RESOURCES LIST

	Location	Contact
Spill Response Kit	• Bellekeno East Fuel Tank • Bellekeno East Shop • Bellekeno 625 Adit • Keno District Mill • Lucky Queen Portal Pad Shop • Onek 990 Portal Pad • Bellekeno Haul Road Mine Support Facilities Bench	Area Manager/Supervisor
Oil – Absorbent Pads	• In Spill Kits	Area Manager/Supervisor
Oil – Absorbent Booms	• In Spill Kits	Area Manager/Supervisor

Any contaminated soils will be removed to the land treatment facility in Mayo or a suitable permitted facility within the Keno Project area.

All vehicles carrying hazardous materials will be equipped with a spill kit and personnel will be trained in spill response measures.

See ERP 014 AKHM Spill Report Form

9 MISSING PERSONS ACTION PLAN

Potential exists where persons may become lost on the property. Such incidents can occur under the following circumstance:

- Alexco or Contractor personnel engaged in surface exploration or any other activities (i.e. care and maintenance) are overdue and cannot be located or contacted.

Upon notification that Alexco personnel, or Contractors are unaccounted for on the property you should:

1. Immediately advise the Area Manager/Supervisor and Site Manager who will:
    - Assess and determine the level of response required.
    - Gather all available information about the missing persons including last known location.
    - Advise the RCMP of the circumstances and request further assistance
    - Designate Keno Hill Silver District project employees to stand-by and assist the RCMP in search efforts as directed
2. Stand-by to provide further information and assistance as required.

10 EMERGENCY EQUIPMENT AND EQUIPMENT LOCATIONS

Emergency Equipment	Location	Use is Authorized by:
Ambulance 4x4 Suburban with Stretchers	Elsa Town site Fire hall	Site Manager Area Manager/Supervisor First Aid Attendant
(MMTU) Mobile Medical Treatment Unit 4 x 4 Truck with Stretchers	Bellekeno Mine Site	Site Manager Area Manager/Supervisor First Aid Attendant
AED Automatic External Defibrillator Use when CPR is required	Admin First Aid Room Black and Neon ZOLL – AED Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Oxygen **Airway Adjuncts (OPA)**	MMTV First Aid Jump Kit Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Spinal Precautions Spine Boards & Head Blocks Stiff Collars Spyder Straps KED – Vehicle extrication device	Ambulance MMTV Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Splints Vacuum Splints – Extremity breaks	Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Wound Management **Burn Dressings** Sterile Water Bandages & Dressings	Ambulance MMTV Admin First Aid Room First Aid Jump Kit Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
EPI Pens Anaphylactic Shock / allergies	Ambulance MMTV Admin First Aid Room First Aid Jump Kit Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant

11 EMERGENCY FIRST AID PATIENT ASSESSMENT MODEL

See ERP 006 Medical Emergencies on Site

THE ROLE OF THE FIRST PERSON AT THE SCENE

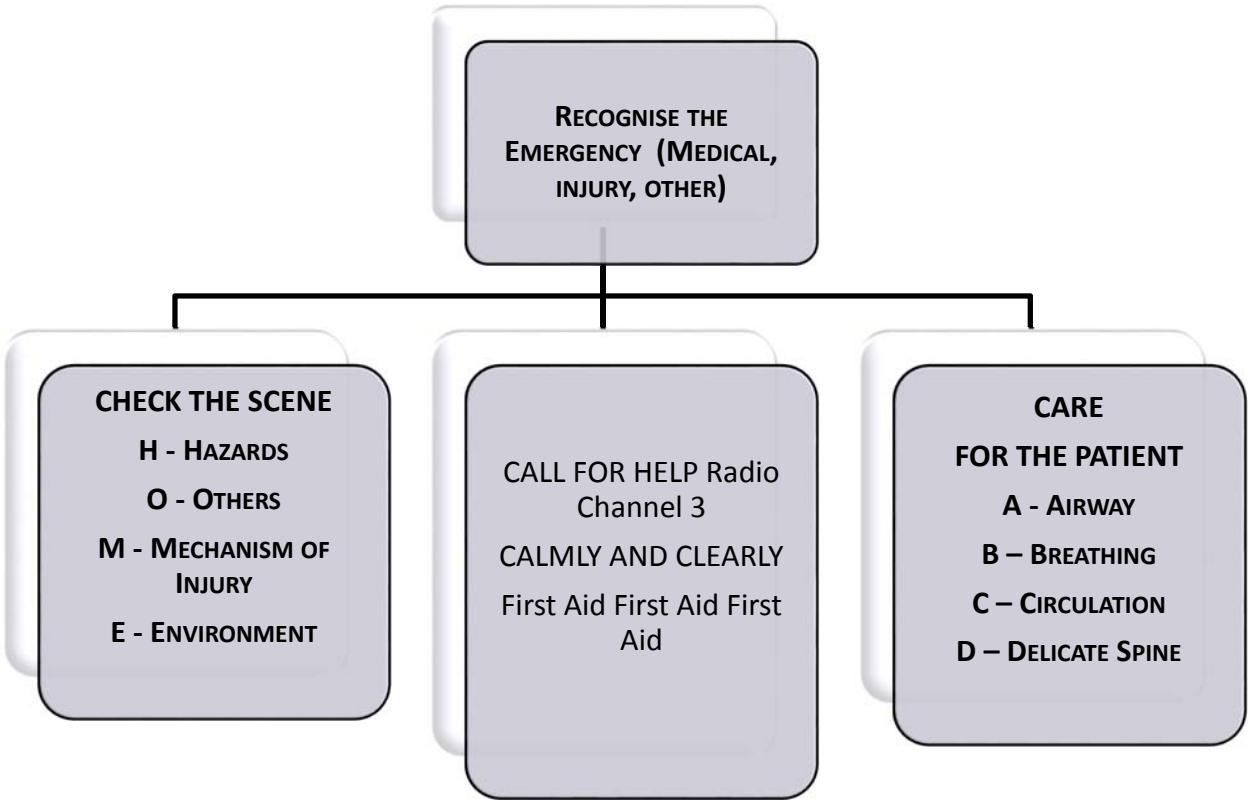
1. CHECK - Recognize the emergency
2. CALL – Activate medical services / first aid to attend the scene
3. CARE - Act according to your skills, knowledge and comfort level

A "medical emergency" is an illness or condition that needs immediate medical attention. For example:

- Anaphylactic shock
- Diabetic emergency
- Heart attack
- Others

An "injury" is damage to the body caused by external force. For example this damage can cause

- Broken bones
- Burns
- Wounds
- Others


RECOGNISE THE EMERGENCY (MEDICAL, INJURY, OTHER)
CHECK THE SCENE
H - HAZARDS
O - OTHERS
M - MECHANISM OF INJURY
E - ENVIRONMENT
CALL FOR HELP Radio Channel 3
CALMLY AND CLEARLY
First Aid First Aid First Aid
CARE
FOR THE PATIENT
A - AIRWAY
B – BREATHING
C – CIRCULATION
D – DELICATE SPINE

12 EMERGENCY CONTACT INFORMATION

As this ERP document is updated, only revised pages will be replaced.

In the event of a "SERIOUS" Incident, injury or accident you must notify:

1. Keno Hill Silver District Department Manager or Alternate
2. Member of the First Aid, Health and Safety Department

12.1 KENO HILL SILVER DISTRICT – EMERGENCY CONTACT NUMBERS

KEY POSITIONS –KENO HILL SILVER DISTRICT - CONTACT LIST				
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Johnson, Peter	Site Manager	867-993-5911		867-996-2330 ext. 5905
Kai Woloshyn	Environmental Manager		867-334-3614	867-668-6463 ext. 233
Melanie Roberts	Senior Geologist Project Manager			604-633-4888 ext. 108
MacMillan, Colette	Yukon Business Services Manager	867-633-2096	867-633-4811	867-633-4811 ext. 225
McOnie, Al	VP Exploration	+64 – 7 549-1194	604-340-5815	867-996-2330 ext. 5904
Schneider, Rob	C & M Supervisor	867-660-5544	867-332-5544	867-996-2330 ext. 5910
Grant Ewing	C & M Supervisor			867-996-2330 ext. 5910
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Bunk C 5923	House #3 5916	Mechanics 5914	Shifters Office 778-372-2759	
Bunk D 6000	House #4 5917	First Aid 5921	Mine Safety Office 604-759-4777 Boart Longyear 778-372-2708 Mill Manager Office 778-372-2754	
Radio Frequencies – Keno Hill Silver District – Contact List				
Alexco Channel	**Channel Name**	**Receive TX**	**Transmit RX**	**Tone**
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Channel 3	Repeater Routine On-site Radio Traffic	157.61	151.97	No Tone
Channel 4	Ladd 1 Routine On-site Radio Traffic	154.1	154.1	No Tone
Channel 5	Ladd 2	158.94	151.94	No Tone

12.2 CO-OPERATIVE MINE RESCUE (CMR) ASSISTANCE

Agency	Name	Home (other)	Other
YT OH&S Mine Inspector	1-800-661-0443		
Procon Mining & Tunnelling		604-291-8295	778-837-4407
Minto MIne	Mark Goebel	604-759-0913 ext 225	safety@skymessage.com
BHP Ekati Mine (NWT)	Rob MacLean or Richard Weishaupt	867-880-2201	867-880-2154

12.3 TERRITORIAL AND FEDERAL CONTACT NUMBERS

Name	Office	
Mayo Ambulance	867-996-4444	Mayo (Volunteer Responders)
Mayo Fire & Rescue	867-996-2222	Mayo (Volunteer Responders)
RCMP	867-996-5555	Mayo
Whitehorse Regional Hospital	867-393-8700	Emergency
Whitehorse Regional Hospital	867-393-8700	Admissions
Yukon Coroner	867-667-5317	Whitehorse
Yukon Dept. of Conservation	867-667-5317	Whitehorse
Yukon Dept. of Fish & Game	867-393-6722	Whitehorse
Yukon Energy	867-996-2387	Mayo
Yukon Energy	1-800-676-2843	After hours Whitehorse
Yukon Occupational Health & Safety	1-800-661-0443	Mine Inspector

APPENDIX A

KENO HILL SILVER DISTRICT EMERGENCY RESPONSE PROTOCOLS

Alexco Resource Corp PO BOX 7 Site #2 Y0B 1J0
Lat 63.54 N Long 135.29 W (Elsa)

Serious emergency home contact numbers
Telephone: MAIN 867 996-2330 LANDLINE 867 995-3113
Fax: 867- 995-2600

Name	Phone	Work	Cellular number
BAIN, Sharlaina Administration	Home: 867 633-5814	5900	Cell: 867 333-0310
BATTISON, Laura Sr Geologist	Home: 250 926-0720	778 372-2686	Cell: 250 203-1850
BENWOOD, Vanessa Environemental Coordinator	Home: 250 816-5275	5909	Cell:
DAVIDSON, Scott Senoir Envirnmental Manager	Home: 867 633-5034	867 668-6463 x239	Cell: 867 334-6002
FEDAK, Ken District Development Manger	Home: 250 428-4112	5930	Cell: 250 997-5143
FUDGE, Tom SRVP Construction/Engineering	Home: 208 755-2836	5907	Cell: 604 340-5855
HALL, Tim VP General Manager Operations	Home: 907 790-2245	5901	Cell: 604 340-5832
HARRINGTON, Jim VP Corporate Development	Home: 303 805-8878	303 862-3929	Cell: 303 808-9101
HILLIER, Dave Site Services Manager	Home: 867 660-4630	5919	Cell: 867 335-2001
JOHNSON, Peter Projects and	Home: 867 993-5911	5905	Cell: 867 334-7484
MACFIE, Annabelle Administration	No home phone	5900	Cell: 867 335-4168
MACMILLAN, Colette Business Manager	Home: 867 633-2096	867 668-6463 X225	Cell: 867 668-6463
MCONIE, Al VP Exploration	Home: +64-7 549-1194	5904	Cell: 604 340-5815
MCPHIE, Ian Industrial Hygienist/Safety	Home: 250 392-9103	5913	Cell: 250 305-9942
MANSELL, Andrea HR Coordinator	Home: 867 993-5911	5911	Cell: 867 334-7484
NAUMAN, Clynt Chief Executive Officer	Home: 360 371-0176	604 631-4138	Cell: 604 250-3293
PETKOVICH, David Senoir Environmental	Home: 867 633-6787	867 633-4881	Cell: 867 334-7297
PENNEY, Katherine Mill Manager	Home: 208 512-3996	778 372-2754	Cell: 206 818-4656
SCHNEIDER, Rob Water Treatment Supervisor	Home: 867 660-5544	5910	Cell: 867 332-5544
SHARP. Scott IT	Home: 867 993-5233	5912	Cell:
SHEMLEY, Paula Industrial	Home: 604 941-8656	5913	Cell: 604 807-0666
SMITH, Scott Mine Manager	Home: 604 941-8656	778 372-2687	Cell: 778 384-9607
STEPHEN, Kirsten HR Recruiter	Home:	867 633-4881 X 4	Cell: 867 335-9761
THRALL, Brad Chief Operating Officer	Home: 360 332-1180	604 631-4133	Cell: 604 250-6501

Agency Assistance numbers

Name	Phone	Cellular number
24 hour emergency line for reporting serious workplace incidents and injuries	867 667-5450	
Alexco Whitehorse office	867 633-4881	
Canutec	613 996-6666	
Environment Spills	867 667-7244	
Fireweed Helicopter	867 668-5888	
Forest Fire	1 888 798-3473	
Marine and Air search and Rescue	1 800 567-5111	
Mayo Fire Department	867 996-2222	
Mayo Nursing Station (Ambulance)	867 996-4444	
Minto Mines Mark Goebel H & S Superintendent	604 759-0860	Cell: 867 333-0590
Poison Control (Whitehorse)	1 888 393-8700	
Procon Mining & Tunnelling Jon Miller	604 291-8292	Cell: 604 341-1449
RCMP	867 996-5555	
Roads, Highways and Bridges (Mayo)	867 996-2232	YT Road Conditions & Safety 1 877 456-7623
Kathleen (Nurse)		Cell: 867 334-5941
Superior Propane	877-873-7467	
Trans North Helicopter	867 668-2177	
Turn in Poachers	1 800 661-0525	
Whitehorse Hospital	867 393-8700	
Wildlife Management	867 996-2162	24 line trouble line 1 800 676-2843
YEMS	867 667-3333	Jeff Simons YT Gov Manager 867 456-8412
Wolverine Mine H & S Superintendent	604 638-0921	
Yukon Energy	867 393-5355	Emergency #800 676-2843
YT Chief Mines Safety Office Robert Scott	867 667-8739	Cell: 867 334-7883
YT Mine Rescue Superintendent Safety Officer	867 456-6530	Cell: 867 332-2669

Vancouver Office Numbers
1150 - 200 Granville Street, Vancouver, BC V6C 1S4
Telephone: 604 633-4888 Fax: 604 633-4887

Name	Direct line		Extension
ASHRAFINIA, Soussan	604 631-4135		135
FARROW, David			107
FUDGE, Tom	604 631-4139		139
Furlano, Katie	303 862-3929		Denver office 122
HARRINGTON, Jim	303 862-3929 Fax: 303 862-3926		Denver office 121
HARRINGTON, Joe	303 862-3929		Denver office 120
HEAD, Alistair	604 631-4132		132
LANCASTER, Eric	303 862-3929		Denver office 123
LEUNG, Jeanne			158
LUNDAY, Tiffany	604 633-4888		141
MA, Kevin	604 631-4131		131
MARSHALL, Andy	604 633-4888		111
MENEGHIN, Derek	604 631-4136		136
NASH, Dawn	604 633-4888		100
NAUMAN, Clynt	604 631-4138		138
ROBERTS, Melanie	604 633-4888		108
ROMAN, Maria	604 633-4888		143
THRALL, Brad	604 631-4133		133
WHITTLE, David	604 631-4134		134
WONG, Gordon	604 631-4140		140

Whitehorse Office Numbers
#3 Calcite Business Centre, 151 Industrial Road,
Whitehorse, Yukon Y1A 2V3
Telephone: 867 633-4881 Fax: 867 633-4882

CARLETON, Michelle	867 633-4881		2
PINTER, Winnie	867 633-4881		246
MACMILLIAN, Colette	867 668-6463		225
STEPHENS, Kirsten	867 633-4881		4

Site Numbers and extensions (867) 996-2330 Fax (867) 995-2600) Landline 867 995-3113

Name	Direct line	Name	Direct line
Administration	5900	**Mill Office Managers**	778 372-2754
Car & Maintenance	5910	**Mill Foreman**	778 372-2757
District Development	5930	**Mill Maintenance**	778 372-2755
District Operations	5907	**Mine Manager**	778 372-2687
Environmental Coord	5909	**Mine Engineers**	778 372-2686
Exploration	5904	**Mine Tech**	604 759-4762
First Aid & ship/Receiving	5921	**Procon Supers**	778 372-2759 after hours 6001
HR	5911	**Procon Safety**	604 759-4777
IT	5912	**Boart Longyear**	778 372-2708
Safety & Hygiene	5913		
Kitchen	5927		
General Manager	5901		
Nmechanics	5914		
Purchasing	5922		
Special Projects	5918 or 5924		
Site Services	5919 or 5926		
Water Treatment	5903		
Residences		**Residences**	
Bunk A	5925	**House 1**	5915
Bunk B	5920	**House 2**	5902
Bunk C	5923	**House 3**	5916
Bunk D	6000	**House 4**	5917

Alexco **Channel #**	**Channel Name**	**Receive** **TX**	**Transmit** **RX**	**Tone**
CH 1	**First Aid** *Used by First Aid Attendants in the event of an emergency*	160.73	165.73	RX & TX = C 131.8
CH 3	**Repeater** *Routine on-site radio traffic*	157.605	151.97	No Tone
CH 4	Ladd 1	154.1	154.1	No Tone
CH 5	Ladd 2	158.94	158.94	No Tone

Underground channel

The Leaky feeder is channel 1 - which can only be contacted by the BelleKeno East folks
So you need to call the BelleKeno East people on channel 3, and ask them to contact whomever you are looking for and that individual will call you back on channel 3

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ALEXCO	SAFETY STANDARD	Document Number:	ERP-002
		Version Date:	03/28/12
		Version:	02
		Approved by:	

Management ERT Duties – Fire in Camp

ALEXCO RESOURCE CORP
Effective Date: 03/28/12
Implementation Date: 04/30/12
Revision No.: 02
Review Date: 01/15/13
Prepared By: Neil Bottrell, Revised by Alexco Management/Safety
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure a safe evacuation and accounting of all personnel at site during a fire at all Camp Accommodations in the Silver Hill Silver District.

SCOPE

These procedures apply to all employees including independent contractors, working at Alexco`s Keno Hill Mining District.

RESPONSIBILITY

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.
- Reporting to the Emergency Control Centre (ECC) located at the Administration Office conference room and setting up the Emergency Management Team.
- Serving as a member of the Emergency Management Team to manage the fire emergency in conjunction with the Emergency Response Team Coordinator.
- Ensuring that a radio and camp master keys are available in the Emergency Control Centre (ECC).
- Advising the Camp Monitors or designate the names of the personnel who are present at the ECC.
- Advising the Emergency Response Team Coordinator (ERTC) that the Emergency Management Team is in place at the ECC.
- Consulting with the ERTC and other Emergency Management Team members before declaring the “All-Clear” and authorizing re-entry to the camp complex or certain portions of the camp complex.
- Contacting off-site Alexco personnel and regulatory agencies (as required by the Alexco Resource Corp. – Keno Hill Mining District Crisis Management Plan) of the situation.

Management ERT Duties – Fire in Camp

First Aid Personnel / Emergency Response Team (ERT) are responsible for:

- Monitoring Alexco Repeater (Channel 3) on a 24-hour basis and obtaining all First Aid and Emergency details from any person announcing the emergency.
- Respond accordingly to any and all First Aid or Emergency situations
- Gathering emergency equipment/supplies if conditions permit (enlist assistance from others leaving the building if necessary) and load equipment/supplies into the mobile Treatment Centre and report to the muster station for roll call.
- Being available at the muster station to treat any medical emergencies.

Alexco Camp Monitor or designate is responsible for:

- Wearing a high visibility vest for identification
- Reporting to the muster area via the closest emergency exit with radio and camp accommodations list
- Taking charge and doing a roll call at the muster area and notifying the Emergency Management Team of persons unaccounted for.
- Ensuring personnel remain at the muster area unless the Emergency Management Team has requested their release for other duties.
- Sending the camp vans with mustered personnel to the Alexco Administration Building.
- Instructing the van driver to return to the muster area as soon as personnel are delivered and continuing the roll call.

Safety Manager or designate is responsible for:

- Monitoring the implementation of this procedure.
- Reporting to the ECC to serve as a member of the Emergency Management Team.

Each Area Manager or Designate is responsible for (in their respective areas):

- Providing ECC a list of available ERT personnel in addition to an accurate headcount of all onsite personnel and their locations.
- Providing ECC with a status update of any available equipment which may be of use in responding to the emergency.

Emergency Response Coordinator (ERC) is responsible for:

- Radioing the names of Emergency Response Team (ERT) personnel present at the scene to the ECC to complete the roll call.
- Managing the fire emergency in conjunction with the General Manager and the Emergency Management Team in a safe manner and in accordance with the ERT Safe Work Guidelines.

Management ERT Duties – Fire in Camp

ERT Members are responsible for:

- Radioing their location to the ERC and reporting to the emergency location to prepare to control/contain the fire as per direction from the ECC.
- Understanding and working in accordance with the ERT/Mine Rescue protocol.

All personnel at the Keno Hill Mining District are responsible for:

- Understanding the requirements of this procedure.
- Complying with this procedure.

EMERGENCY RESPONSE PROCEDURE

ERC will:

- Ensure that all ERT members on site have been contacted and are reporting to the location as per the direction of the ECC.
- Ensure that the ERT members are preparing the Fire Fighting equipment and instruct them to standby for further instructions.
- Have ERT members mobilize all gear and equipment available as per the direction of the ECC.
- Ensure all information regarding the known fire conditions are passed on to the ECC.
- Manage the fire emergency in conjunction with the ECC in a safe and timely manner.

Emergency Control Centre Members will:

- Meet in the ECC room to manage the fire emergency in conjunction with the ERC.
- Manage the fire emergency in conjunction with the ERC in a safe manner.
- The ECC will contact off-site Alexco personnel and regulatory agencies (as required by the Alexco Resource Corp. – Keno Hill Mining District - Crisis Management Plan) of the situation.
- Hold a de-briefing session with all involved participants after the fire emergency is over to determine the effectiveness of this procedure and what revisions should be made.

All Clear Message

- The ERC in consultation with the ECC will determine when the camp complex is safe to re-enter.
- The General Manager or designate will authorize the “ALL-CLEAR” message for return to the building.

ALEXCO	SAFETY STANDARD	Document Number:	ERP 003
		Version Date:	03/28/12
		Version:	03
		Approved by:	

RESIDENCE / KITCHEN / RECREATION EMERGENCY EVACUATION

ALEXCO RESOURCE CORP
Effective Date: 03/31/12
Implementation Date: 04/30/12
Revision No.: 03
Review Date: 03/28/13
Prepared By: Neil Bottrell, Revised by Alexco Management/Safety
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure a safe evacuation and accounting of all camp occupants during an emergency evacuation of the main camp complex.

SCOPE

These procedures apply to all employees including independent contractors, working at the Keno Hill Mining District and designated sites.

RESPONSIBILITY

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.
- Reporting to the Emergency Control Centre or ECC (Administration Office conference room) and setting up the Emergency Control Centre Members.
- Serving as a member of the Emergency Control Centre to manage the fire emergency in conjunction with the Emergency Response Coordinator.

Emergency Response Coordinator (ERC) is responsible for:

- Coordinating the ERT and notifying the ECC those members who have responded as ERT personnel.

ERT Members are responsible for:

- Maintaining radio communication after notification of an emergency
- Radioing their location to the ERC and report to the muster area as directed by the ECC.

Safety Manager or designate is responsible for:

- Monitoring the implementation of this procedure.
- Reporting to and serve as a member of the ECC.

Area Managers or Designates are responsible for:

- Doing a roll call of their employees at the worksite and reporting this to the ECC.
- Ensuring a stand down of all non-essential work affected by the emergency until the emergency is declared over.

RESIDENCE / KITCHEN / RECREATION EMERGENCY EVACUATION

Appointed Camp Monitor is responsible for:

- Wearing a high visibility vest for identification
- Performing the roll call in the Admin building Muster Area and notifying the ECC of persons unaccounted for.
- Ensuring personnel remain in the Muster Area unless the ECC has requested their release for other duties.

Site First Aid Attendant is responsible for:

- Moving the mobile Treatment Centre and supplies to the muster station and reporting for roll call.
- Being available to provide emergency medical services as required.

All personnel at Alexco's Keno Hill Mining District are responsible for:

- Understanding the requirements of this procedure.
- Complying with this procedure.

PROCEDURE

In case of fire, sounding of the fire alarm or any other emergency in the main camp complex requiring evacuation, the following procedures must be followed if you are in the main camp complex:

- **In the event that a fire is detected**, attempt to extinguish the fire if it is accessible and safe to do so (fire extinguishers are mounted at intervals in the hallways). If unable to extinguish the fire, immediately activate one of the fire pull alarm stations located throughout the camp complex. If alarm is unavailable yell **"Fire, Fire, Fire,"** to warn others and announce by radio on channel three (3) **"Fire, Fire, Fire,"** notify answering personnel of the location of the fire.

- **REMEMBER** – PROTECTION OF HUMAN LIFE IS THE FIRST PRIORITY! Do not put yourself at risk to fight a fire.

- **Upon hearing the alarm** immediately evacuate the main camp complex by the closest available exit, shouting fire and knocking on doors as you do so (do not wait for a response to the knocking). Outerwear suitable for winter conditions must be readily available in your room.

- **Report to the Main Laydown Area across from Flat Creek Camp.** A roll call will be done to determine the location of all personnel by the Camp Monitor. Remain there until directed otherwise. People may be moved to the Alexco Administration building. If you are taken there remain there until directed otherwise.

- **Under no circumstances** should you re-enter the main camp complex until a senior Alexco representative has given the "ALL-CLEAR" message. Report any information concerning the fire or other concerns to a Senior Alexco or JH&S representative.

Personnel Not in the Main Camp Complex During a Fire in the Main Camp Complex

- **ALL PERSONNEL WILL "STAND DOWN" UNTIL NOTIFIED OTHERWISE BY THE EMERGENCY MANAGEMENT TEAM.**

- **Shut down of the District Mill** will only be performed if absolutely required. Mill operations will continue in an emergency with the minimum number of crew members until the all clear is given.

- **All personnel, company and contractors, working on surface at any Alexco Keno Hill Mining District Underground Operation** will report to their respective surface muster areas where the senior person will perform a roll call of all personnel present and relay this information to the ECC by radio on channel three (3). They will stay at their respective surface muster area until advised otherwise. Underground personnel will be notified to stand down and report to the nearest Refuge Station until notified.

- **All personnel, company and contractors, on shift at the District Mill** will remain at the Mill and report to the Mill Office lunch room Muster area. The Mill Manager or designate will perform a roll call of all Mill personnel and additional workers and relay this information to the ECC by radio on channel three (3). Mill personnel will remain at the Mill and continue operations with a minimum crew required until notified otherwise by the ECC.

- **All personnel, company and contractors, working for Site Services, Exploration or Administration that are in the Elsa the immediate area** will report to the Core Shack for roll call. **If out travelling on the site** they will pull vehicles over where they are (without blocking traffic flows) and park until notified otherwise by the ECC. Equipment operators must stay with their vehicles in case their piece of equipment is requested by the ECC.

- **All other personnel, company and contractors,** will muster at their work site and their supervisors will do a roll call and report roll call results to the ECC.

REFERENCES AND RELATED DOCUMENTS

ERP-002 – Management ERT duties fire in camp

APPENDICES

See one page "Appendices I" for Posting in Rooms and Bulletin Boards, "Fire Evacuation Procedure for the Flat Creek Camp Complex" and "Fire Evacuation Procedure for Bunkhouse D".

Appendices I - For Posting in Rooms and Bulletin Boards

EVACUATION PROCEDURE FOR THE FLAT CREEK CAMP COMPLEX

In case of fire, sounding of the fire alarm or any other emergency in the main camp complex requiring evacuation, the following procedures must be followed if you are in the main camp complex:

- **In the event that a fire is detected**, attempt to extinguish the fire if it is accessible and safe to do so (fire extinguishers are mounted at intervals in the hallways). If unable to extinguish the fire, immediately activate one of the fire pull alarm stations located throughout the camp complex. If alarm is unavailable yell **"Fire, Fire, Fire,"** to warn others and announce by radio on channel three (3) **"Fire, Fire, Fire,"** notify answering personnel of the location of the fire.

- **REMEMBER** – PROTECTION OF HUMAN LIFE IS THE FIRST PRIORITY! Do not put yourself at risk to fight a fire.

- **Upon hearing the alarm** immediately evacuate the main camp complex by the closest available exit, shouting fire and knocking on doors as you do so (do not wait for a response to the knocking). Outerwear suitable for winter conditions must be readily available in your room.

- **Report to the Main Laydown Area across from Flat Creek Camp.** A roll call will be done to determine the location of all personnel by the Camp Monitor. Remain there until directed otherwise. People may be moved to the Alexco Administration building. If you are taken there remain there until directed otherwise.

- **Under no circumstances** should you re-enter the main camp complex until a senior Alexco representative has given the "ALL-CLEAR" message. Report any information concerning the fire or other concerns to a Senior Alexco or JH&S representative.

Personnel Not in the Main Camp Complex During a Fire in the Main Camp Complex

- **ALL PERSONNEL WILL "STAND DOWN" UNTIL NOTIFIED OTHERWISE BY THE EMERGENCY MANAGEMENT TEAM.**

- **Shut down of the District Mill** will only be performed if absolutely required. Mill operations will continue in an emergency with the minimum number of crew members until the all clear is given.

- **All personnel, company and contractors, working on surface at any Alexco Keno Hill Mining District Underground Operation** will report to their respective surface muster areas where the senior person will perform a roll call of all personnel present and relay this information to the ECC by radio on channel three (3). They will stay at their respective surface muster area until advised otherwise. Underground personnel will be notified to stand down and report to the nearest Refuge Station until notified.

- **All personnel, company and contractors, on shift at the District Mill** will remain at the Mill and report to the Mill Office lunch room Muster area. The Mill Manager or designate will perform a roll call of all Mill personnel and additional workers and relay this information to the ECC by radio on channel three (3). Mill personnel will remain at the Mill and continue operations with a minimum crew required until notified otherwise by the ECC.

- **All personnel, company and contractors, working for Site Services in the Elsa Shop, offices or the immediate area** will report to the Core Shack for roll call. **If out travelling on the site** they will pull vehicles over where they are (without blocking traffic flows) and park until notified otherwise by the ECC. Equipment operators must stay with their vehicles in case their piece of equipment is requested by the ECC.

- **All other personnel, company and contractors,** will muster at their work site and their supervisors will do a roll call and report roll call results to the ECC.

Appendices I - For Posting in Rooms and Bulletin Boards in the Bunkhouse D

FIRE EVACUATION PROCEDURE FOR THE BUNKHOUSE "D"

In case of fire, sounding of the fire alarm or any other emergency in the main camp complex requiring evacuation, the following procedures must be followed if you are in the main camp complex:

- **In the event that a fire is detected**, attempt to extinguish the fire if it is accessible and safe to do so (fire extinguishers are mounted at intervals in the hallways). If unable to extinguish the fire, immediately activate one of the fire pull alarm stations located throughout the camp complex. If alarm is unavailable yell **"Fire, Fire, Fire,"** to warn others and announce by radio on channel three (3) **"Fire, Fire, Fire,"** notify answering personnel of the location of the fire.

- **REMEMBER** – PROTECTION OF HUMAN LIFE IS THE FIRST PRIORITY! Do not put yourself at risk to fight a fire.

- **Upon hearing the alarm** immediately evacuate the main camp complex by the closest available exit, shouting fire and knocking on doors as you do so (do not wait for a response to the knocking). Outerwear suitable for winter conditions must be readily available in your room.

- **Report to the muster area in front of house 4.** A roll call will be done to determine the location of all personnel by the Camp Monitor. Remain there until directed otherwise. People may be moved to the Alexco Administration building. If you are taken there remain there until directed otherwise.

- **Under no circumstances** should you re-enter Bunkhouse D complex until a senior Alexco representative has given the "ALL-CLEAR" message. Report any information concerning the fire or other concerns to a Senior Alexco or JH&S representative.

ALEXCO	SAFETY STANDARD	Document Number:	ERP-004
		Version Date:	03/28/2012
		Version:	02
		Approved by:	

UNDERGROUND EMERGENCY RESPONSE PROCEDURE

ALEXCO RESOURCE CORP
Effective Date: 03/28/12
Implementation Date: 04/30/12
Revision No.: 02
Review Date: 01/15/13
Prepared By: Neil Bottrell, Revised by Site Management/Safety
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure a safe evacuation and accounting of all personnel working underground during a fire or other underground emergency.

SCOPE

These procedures apply to all Alexco underground employees including independent contractors working at any underground operation at Alexco's Keno Hill Mining District.

RESPONSIBILITY

Mine Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.
- Reporting to the Mine Rescue Coordination Centre (MRCC)
- Serving as a member of the Emergency Control Centre (ECC) to manage the UG emergency in conjunction with the Mine Rescue Team Coordinator (MRTC).
- Contacting off-site Alexco and Procon personnel and regulatory agencies of the situation.

Mine Superintendent or designate is responsible for:

- Monitoring the implementation of this procedure.
- Keeping a detailed log including times of the events and activities.
- Reporting to the MRCC to serve as a member of the Emergency Control Centre (ECC)

Alexco Safety Manager or designate is responsible for:

- Managing the emergency in conjunction with the Emergency Control Centre (ECC) in a safe manner and in accordance with mine rescue best management practices.

Alexco and Contractor Personnel located on Surface are responsible for:

- Reporting to the surface muster area where the senior person will perform a roll call of all Alexco and contractor personnel present.
- Staying at the surface muster area until advised otherwise.

Procon Supervision is responsible for:

- Determining the location of all personnel (both underground and on surface) and presenting this information to the ECC.
- Reporting as a member of the ECC at the MRCC.

Site First Aid Attendant is responsible for:

- Being available at the first aid station to treat any medical emergencies.

Administrative Assistant is responsible for:

- Remaining on standby by the phones.

All Underground Personnel are responsible for:

- Knowing and understanding this procedure.

EMERGENCY PREPAREDNESS AND RESPONSE PROCEDURE (EPRP)

All Underground Supervisors on site will review this emergency procedure with all the crews every three months.

Emergency

An emergency is an unforeseen or sudden occurrence of a danger demanding immediate remedy or action. This may involve management and trained first aid, fire and rescue personnel.

Emergencies may include but are not limited to:

- Injury to people or people requiring rescue
- Loss of life
- Fire in the Surface Shop, Office/Dry complex or Fire underground
- Fire on a piece of underground equipment
- Major inflow of water
- Occurrence of flammable, noxious or toxic gas in the underground workings
- Major uncontrolled fall of ground

ALEXCO	SAFETY STANDARD	Document Number:	ERP-004
		Version Date:	03/28/2012
		Version:	02
		Approved by:	

UNDERGROUND EMERGENCY RESPONSE PROCEDURE

General Underground Emergency Preparedness and Response Procedure

Underground Emergency – Other than a fire:

Any person discovering an emergency shall:

- If safe to do so try to rectify the situation with the tools you have at the scene
- Rope off or barricade the area if possible
- Escape to nearest refuge station or out of the mine and warn all others along the way.
- Report the emergency by calling from the nearest Refuge Station on Channel #1 on the underground radio system.

When reporting the incident it is of extreme importance that the following information is included:

- Your name and location
- What happened, who was involved and what have you done
- When and where did the incident occur.
- Who and what do you need for a response. (First aid, rescue equipment and should the stench gas be released and what other assistance is required)
- Monitor the Femco phone/Underground Radio Channel #1 and wait for further instructions.

Underground Emergency – Reporting a Fire:

Any person discovering a fire shall:

1. Activate fire suppression system if fire is on equipment.
2. If safe to do so, use nearby fire extinguishers to extinguish the fire.
3. Warn all personnel in the immediate area to evacuate to a safe location.
4. Do not expose yourself to unnecessary risk and keep a clear area of retreat behind you.
5. If the fire is too big, do not hesitate; leave the area immediately and evacuate.
6. Don your self-rescuer (W65).
7. Proceed in up cast direction to nearest refuge station, fresh air base or out of the mine if safe to do so.
8. If unable to travel safely to refuge station, take refuge in heading and utilize compressed air header and any available material – vent tubing, cloth, etc. to construct a shield around yourself. Remain in the location until mine rescue teams arrive.
9. Once you have reached the Refuge Station and you are the first person to arrive, contact surface (via radio/Femco Phone), apprise them of the situation and advise to initiate the Stench Warning System (if you were unable to control the fire).
10. Once surface has been notified, remain in the Refuge Station and record the names of other employees as they enter and continue to follow Refuge Station Protocols.

Note: Stench is normally injected into the main ventilation streams and compressed air lines for emergencies requiring mine evacuation or refuge such as fires.

UNDERGROUND EMERGENCY RESPONSE PROCEDURE

Upon smelling Stench All Persons Shall:

- Evacuate to the nearest Refuge Station or exit the mine if safe to do so.
- Follow Refuge Station Protocols.
- Not leave the Refuge Station until authorized

ACCIDENT INVOLVING SERIOUS INJURY

- **If you have a radio** announce the Emergency on radio U/G Channel #1 and stay on that channel until you receive confirmation that your notification was received by the Supervisor or surface personnel. Make sure you pass on all details of the Emergency
  - Nature of Accident (i.e. struck by loose, caught between, fell from a height, is the area safe to enter, or any other pertinent information)
  - Number of people injured and description of the injuries
- Render First Aid within the limit of your skills.
- The EMT will proceed to the portal area, be prepared to go underground if required and have the Mobile Treatment Centre ready to receive the injured person
- Underground workers will normally bring the injured person to surface.
- Stretcher and First Aid Kits are located at the Mine Dry, UG Refuge Station and the Mobile Treatment Centre
- **If you do not have a radio** go to the nearest Femco phone and call your supervisor or the surface shops / offices and pass on all details (see above) of the emergency and have them relay the Emergency on the surface repeater channel #3.

Major Inrush of Water Requiring Mine Evacuation:

The person or persons discovering the emergency shall:

- **If you have a radio** announce the Emergency on radio U/G Channel #1 and stay on that channel until you receive confirmation that your notification was received by the supervisor or surface personnel. Make sure you pass on all details of the Emergency.
  - Your name and location.
  - Location/Severity of the flooding (Surface will determine if initiating the Stench System is required).
  - Number of injured/missing employees (if any).
  - If advised, immediately evacuate the mine (Surface will determine the best route), advising other workers you encounter while exiting of the emergency
  - When on surface report immediately to the Surface Lunchroom to tag out

- Those people who learn of the emergency because they smell the stench (if initiated) will report to the refuge station where they will be instructed by the Emergency Management Team to evacuate the mine

- **If you do not have a radio** go to the nearest refuge station and use the base station, underground channel #1 and follow the steps outlined above.

Procedure for Stench Gas Injection

The stench gas injection locations are at the main airline next to the surface compressors and at the main surface fan on 625. All Procon surface maintenance personnel and Alexco technical staff are trained to inject the stench gas.

The Procon Underground or Maintenance Supervisor, the Mine Superintendent or the General Manager or designate will authorize the injection of stench gas into the underground workings. If these people are all underground, the most senior person on surface may authorize the injection of the stench.

Person Encountering Stench Gas:

If you smell stench gas (propane smell) anywhere in the mine:

- Stop working immediately and make sure others in the area are aware of the emergency
- Shut down and secure any equipment you have been using. Make sure it is not parked blocking the roadway or access to emergency or electrical equipment
- If possible go to the nearest Refuge Station. Travel quickly but calmly and do not run. Take any available tools with you. If there is any indication of the smell of smoke put on yourself rescuer
- Always stay on the fresh air side; never travel in air containing smoke
- Do not change the ventilation by altering ventilation door positions
- Warn anyone you meet along the way of the emergency

Procedure for Entry Through a Refuge Station Airlock:

The underground refuge stations have airlocks to prevent contamination of the air inside the refuge station and the following procedure must be followed when entering the refuge station in an emergency.

- Open the outer door and enter the airlock (inner door closed)
- Close outer door
- Turn on the airline to purge the airlock (chamber) with compressed air
- Turn off the airline

- Open inner door and enter the inner chamber
- Reseal the inner door
- Follow the refuge station procedure

Conduct in a Refuge Station:

The following rules of conduct apply in all Refuge Stations:

- The first person in the Refuge Station will take charge until relieved by a Supervisor or designate or mine rescue personnel
- **Smoking is prohibited in all Refuge Stations at all times**. The air in the Refuge Station is crucial to the maintenance of life and must not be contaminated by cigarette smoke
- Upon arrival at a Refuge Station, the door shall be closed. Only seal the door with the clay stored in the Refuge Station when the majority of people have arrived. The compressed air header must be cracked open to keep the Refuge Station under positive pressure. Carbon monoxide, which is the toxic gas associated with underground fires, is a colourless, odourless, tasteless gas and can contaminate a Refuge Station before any smoke is detected
- Use the “Refuge Station Emergency Report” form to collect information on those in the Refuge Station; name, whether or not injured, stench smelled, etc. A similar form “Refuge Station Emergency Report” is available at the MRCC to record this same information provided over the telephone or radio
- Wait for contact from the MRCC. The people at the MRCC will contact you. Avoid using the Femco phone or radio unnecessarily. The list of people in the Refuge Station must be completed immediately so that the MRCC can account for all of the people underground at the time of an emergency. If conditions change call the MRCC and advise them of the changes.
- People in the Refuge Station must space themselves out to equally distribute the available air
- Every twenty minutes one of the people in the Refuge Station shall be delegated to walk back and forth in the Refuge Station to stir up the stagnant air and prevent layering of the oxygen and carbon dioxide
- If the compressed airline supplying fresh air to the refuge station stops blowing compressed air there are oxygen bottles that can be used to supplement the air in the refuge station. The procedure for using this oxygen is posted at the oxygen bottles. Do not use this oxygen if the compressed airline is blowing compressed air.
- Remain calm – do not panic. The MRCC knows where you are and will not forget you
- Noisy and boisterous behaviour is not allowed
- Food and water shall be conserved and rationing may be necessary because the Mine Rescue team may have difficulty fighting the fire and your stay in the Refuge Station

may be longer than anticipated. Turn off cap lamps. Only one cap lamp may be used at a time. The other cap lamps must be conserved in case the main electrical power is shut off

- Upon arrival at surface, tag out with your supervisor and remain in the Surface Lunchroom for further instructions

Emergency Control Centre (ECC) and MRCC:

All major emergencies require senior management personnel to form an Emergency Control Centre (ECC) in the MRCC. This team will direct emergency operations and assign tasks to individuals or groups. Some of their responsibilities include the following but are not limited to this list:

- Inform the Administrative Assistant of the emergency and have them remain on standby at the phones
- The Mine Manager or Designate is in charge of the ECC for all underground emergencies
- The ECC will designate persons for the following (note: One person may be assigned multiple tasks/duties):
    - Incident Controller (Mine Manager or Designate)
    - Access Control Officer
    - Communications Officer
    - Emergency Plans Officer
    - Resources Officer
    - Surface Muster Point Monitor (Warden)
    - Emergency Response Coordinator
    - Fresh Air Base Officer

- NOTE – the people listed above are to be directed to the appropriate site locations. Reference ERP-010 – Alexco Underground Duty Cards

Map and Plans (To be located in the MRCC):

Five (5) complete sets of 250 scale as built plans of underground work areas for all underground operation in the Keno Hill Mining District. One (1) complete set of updated ventilation plans for the mine workings of all active underground workings in the Keno Hill Mining District.

Detailed Duties by Individual or Group:

General Manager or Designate

The General Manager or designate shall:

- Accept direct communication only from the following:
  - Vancouver Corporate Office and/or Senior Procon management
  - Neighbouring Mine Managers
- Authorize all movement in and out of the property except that of emergency vehicles
- Make the final decision on all matters pertaining to the emergency
- Form a tentative plan of action with the ECC Members and pass along information to the Emergency Response Coordinator
- Ensure that adequate personnel are available to check out workers as they come to surface
- Brief the Mine Rescue Team Coordinator on the status of the evacuation, workers missing, work type, location, etc.
- Advise Yukon WCB / Mine Safety of the emergency and liaise with them on updates
- Provide any other assistance that may be required
- Hold a de-briefing session with all involved participants after the emergency is over to determine the effectiveness of this procedure and what revisions should be made.

Mine Manager or Designate

The Mine Manager or designate is in charge of the ECC during all underground emergencies. He has the responsibility of coordinating the overall plan of action to deal with the emergency. He will coordinate the activities of all personnel involved in the handling of the emergency and will establish the necessary priorities for the emergency organization. His prime area of concern is for the safety of all employees and rescue personnel. Once all personnel are secure, activities of the rescue organization are directed at restoration of the mine.

UNDERGROUND EMERGENCY RESPONSE PROCEDURE

The Mine Manager or designate shall:

- Ensure that the stench has been injected
- Set up the ECC in the Alexco Technical Office Conference Room
- Coordinate the count of all underground personnel through shift supervisors and the Procon Superintendent
- Gather information on the emergency location, type of fire or other emergency, cause of fire, and the status of evacuation giving the numbers and location of workers still missing
- Control all material, personnel, and vehicles in and out of the property during the emergency through other managers.
- Ensure a scribe is made available and that all events are recorded.
- Determine the location of the emergency and its cause and select the appropriate personnel to be on the ECC
- Along with the ECC, determine the priorities and plan of action, with the well being of the Mine Rescue team and employees being the prime concern.
- Determine the direction of any smoke – if smoke is blowing in the general direction of the outlining mine buildings and determine if crews must also be evacuated.

In the event that the Mine Manager is not available, the Procon Supt. will assume these duties. In the event that both the Mine Manager and Procon Superintendent or their designated replacements are unavailable, the project Engineer will assume the duties of the Procon Superintendent.

ALEXCO	SAFETY STANDARD	Document Number:	ERP-005
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		Version:	01
		Approved by:	

Emergency Radio Communication

ALEXCO RESOURCE CORP
Effective Date: 01/08/12
Implementation Date: 11/20/11
Revision No.: 01
Review Date: 01/15/13
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To establish and ensure a process for the reporting of emergencies associated with injuries, fires, accidents, uncontrolled releases, etc. To ensure protection of personnel, environment, property and equipment.

SCOPE

These procedures apply to all employees including independent contractors, working at Alexco Resource Corp properties and designated sites.

RESPONSIBILITY

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.

Safety Manager or designate is responsible for:

- Ensuring implementation of this procedure is monitored
- Monitoring the implementation of this procedure.

All Department Managers and Supervisors are responsible for:

- Ensuring that all of their employees understand the radio procedure for announcing emergencies

Site First Aid Attendants, Emergency Response Team (ERT) are responsible for:

- Monitoring Alexco Channel 3 (Repeater) on a 24-hour basis
- Obtaining all Emergency details from any person announcing the emergency.
- Announcing the Emergency and all of the details over Channel 3 (Repeater)
- The preferred order for confirming and rebroadcast of Emergency announcements is:
    - 1st - Site First Aid personnel
    - 2nd – Designated Safety personnel
    - 3rd – ERT personnel

Emergency Radio Communication

Site Administrative Personnel are responsible for:

- Recording all radio transmissions on channel 3 (repeater) for the duration of the Emergency

Site Safety Personnel is responsible for:

- Radioing the names of Emergency Response Team (ERT) personnel present on site to the Emergency Management Team.

ERT Members are responsible for:

- Monitoring radio channel 3 (repeater) after notification of an emergency
- Radioing their location to the ECC, and reporting to the location as advised by the ECC to prepare for the emergency.

Site First Aid Attendant is responsible for:

- Monitoring channel 3 (repeater) - 24 hours a day
- Gathering emergency equipment/supplies that may be required for the emergency, including ETV.
- Being available to treat any medical emergencies.

All Personnel at Alexco Resource Corp properties are responsible for:

- Understanding the requirements of this procedure and complying with this procedure.

PROCEDURE

- In the event of an occurrence requiring emergency response from the Alexco ERT the individual requiring assistance must report the Emergency (details as noted below) on channel 3 (repeater).
- All Alexco Management monitor channel 3 (repeater) at night or during off work hours.
- All essential radio traffic is switched to channel 4 (LADD 1) during the night shift hours. Channel 3 (repeater) will remain the emergency channel during this time.
- When reporting an emergency the following information shall be provided over the radio:
    - “FIRE, FIRE, FIRE” or “FIRST AID, FIRST AID, FIRST AID” (3 times)
    - If the emergency is of a medical/injury nature, follow the three “FIRST AID” calls with the appropriate colour code as outlined below:
        - “CODE RED” – Serious incident requiring medical assistance immediately.
        - “CODE YELLOW” – Incident requiring medical assistance, but there is no risk of death/serious complications (minor cut, abrasion, etc).
        - “CODE GREEN” – Minor incident requiring medical assistance more

in a consolatory nature (mild illness, soreness from pre-existing condition, etc).

- STATE YOUR NAME.
- ADVISE THE NATURE OF THE EMERGENCY (injury, fire, accidents, uncontrolled release, etc.)
- NUMBER OF PEOPLE INVOLVED.
- LOCATION OF THE EMERGENCY.
- WHERE THE ERT CAN BE MET BY SOMEONE IF THEY NEED GUIDANCE TO THE LOCATION.

- NOTE!! When phoning or radioing in an emergency it is important that you are the last to hang-up. This allows the party receiving the call to ask for more information if required.

NOTE: All personnel other than those involved in the emergency and Emergency Response Team (ERT) members will "Stand Down" upon hearing a Emergency Call, and remain as Stand Down until notified otherwise.

Radio silence by all non involved personnel must be observed until the all clear is given. If you are on a radio controlled road, pull your vehicle over and wait for the "All Clear" before resuming.

ALEXCO	SAFETY STANDARD	Document Number:	ERP-006
		Version Date:	01/16/2012
		Version:	01
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Medical Emergencies on Site - Surface and Underground

ALEXCO RESOURCE CORP
Effective Date: 01/16/12
Implementation Date: 04/30/12
Revision No.: 01
Review Date: 01/15/13
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

Is to provide an Emergency Response Plan for all Alexco Resource Properties and designated sites in the event of a medical emergency on site.

SCOPE

These procedures apply to all employees including independent contractors, working at all Alexco Resource Properties and designated sites.

RESPONSIBILITY

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.
- Reporting to the Emergency Control Centre (ECC – Alexco Administration Office conference room) and setting up the Emergency Management Team (if required).
- Serving as a member of the Emergency Management Team to manage the emergency in conjunction with the Emergency Response Team Coordinator (ERTC) (if required).
- Communicating management decisions to the ERTC. The senior Alexco Management member of the Emergency Management Team is in charge of the Emergency Management Team.
- Holding a de-briefing session with all involved participants after the medical emergency is over to determine the effectiveness of this procedure and what revisions should be made.

Site First Aid Attendant, Emergency Response Team (ERT) Receiving Medical Emergency is responsible for:

- Obtaining all Medical Emergency details from any person announcing the emergency. Asking the person calling in the emergency for all details of the emergency such as:
    - Name of person calling
    - Exact location of the emergency
    - The details of the medical emergency

- Type of medical emergency
- How the medical emergency occurred

- Announcing the Medical Emergency and all pertinent details over Channel 3 (repeater)

ERT Coordinator (ERTC) is responsible for:

- Advising ERT personnel on Channel 3 (repeater) how to respond to the emergency.
- Managing the medical emergency in conjunction with the senior Alexco Management member of the Emergency Management Team (if assembled) in a safe manner and in accordance with the ERT Safe Work Guidelines.

ERT Members are responsible for:

- Changing to radio Channel 3 (repeater) after notification of a “Code Red” emergency (as defined in ERP-005 Emergency Radio Communication).
- Understanding and working in accordance with the ERT Safe Work Guidelines and Alexco - 019 Infectious Diseases.
- Providing whatever assistance is required at the scene under the direction of the ERTC or the Primary First Aid Attendant.

Health and Safety Manager or designate is responsible for:

- Monitoring the implementation of this procedure.
- Reporting to the ECC to serve as a member of the Emergency Management Team (if required).
- Provide backup assistance to the Site First Aid Attendant (if required).

Site First Aid Attendant is responsible for:

- Mobilizing the site mobile Treatment Centre to the accident scene to treat the medical emergency.
- Understanding and working in accordance with the ERT Safe Work Guidelines and Alexco -019 Infectious Diseases.

All Site Personnel are responsible for:

- Standing down when they hear a Medical Emergency as per ERP-005-Emergency Radio Communication (unless involved with the emergency) to allow the Site First Aid Attendant and ERT to respond

PROCEDURE

The Site First Aid Attendant and the ERTC will review all information and develop an immediate response plan.

- Any outside medical assistance required will be coordinated on site by the Site First

Aid Attendant and/or the ERTC.

- Upon completion of response to the medical emergency all equipment will be placed in the “Ready Position” and all checks completed.

Underground Medical Emergencies

Underground medical emergencies may require members of the ERT to go underground to respond.

- All underground travel will be coordinated by the Mine Manager or designate.
- The ERT will wear all normal underground PPE and follow all contractor underground procedures as required.
- The Mine Manager or designate will act as a guide for the ERT.

REFERENCES AND RELATED DOCUMENTS

- Alexco 0019 - Infectious Diseases
- Alexco 0009 - Personal Protective Equipment
- ERP-005 Emergency Radio Communication
- ERP-006 Alexco Emergency Contact List
- ERT Safe Work Guidelines
- Alexco - Crisis Management Plan (Corporate Document in development)

ALEXCO	SAFETY STANDARD	Document Number:	ERP-007
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Aircraft Incident

ALEXCO RESOURCE CORP
Effective Date: 01/16/12
Implementation Date: 04/30/12
Revision No.: 01
Review Date: 01/15/13
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure that an aircraft or helicopter crash at site is dealt with in an expedient and safe manner that does not jeopardise the safety of Emergency Response Team (ERT) members or other site personnel.

SCOPE

These procedures apply to all employees including independent contractors, working at all Alexco Resource Properties and designated sites.

RESPONSIBILITY

An aircraft or helicopter crash at site has the potential for serious injury and property damage. Although highly unlikely to occur at our sites it is better to be prepared to handle a situation like this than not. Certain responsibilities are assigned to various personnel and are outlined below.

Person witnessing an aircraft or helicopter crash is responsible for:

- Reporting the Emergency and all details by radio as quickly as possible
- Relaying all information as quickly as possible so that the ERT is fully informed of the situation.
    - Exact location of the crash scene and distance from site.
    - The approximate size of the fire if any.

Person receiving a radio call from a person witnessing an aircraft or helicopter crash is responsible for:

- Announcing the Emergency and all details over radio Channel 3 (repeater).
- Reporting the information received to the General Manager or designate or the Health and Safety Manager or designate.

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Ensuring personnel receive appropriate training.
- Contacting the local authorities and informing them of the crash and its location.
- Assembling the Emergency Management Team in the Emergency Control Centre

(location to be determined by the General Manager or Designate) for a briefing when information is received.

- Communicating management decisions to the ERTC. The Senior Alexco Management member of the Emergency Management Team is in charge of the Emergency Management Team.
- Contacting the affected air carrier to apprise them of the situation. (See phone numbers under References and Related Documents)
- Contacting off-site Alexco personnel and regulatory agencies (as required by the Alexco Resource Corp - Crisis Management Plan) of the situation
- Monitoring the implementation of this procedure.
- Hold a de-briefing session with all involved participants after the crash emergency is over to determine the effectiveness of this procedure and what revisions should be made.

Emergency Management Team will:

- Coordinate with local authorities and assist in rescue or fire fighting duties.
- Manage the crash emergency in conjunction with the ERTC in a safe manner.
- Ensuring that the ERT has whatever additional resources they need to deal with the crash emergency.
- Determine the direction of any smoke – if smoke is blowing in the general direction (east) of the mine ventilation raise instruct the Mine Manager or designate to have the stench gas injected and implement the mine evacuation procedure.

Health and Safety Manager or designate is responsible for:

- Reporting to the ECC to serve as a member of the Emergency Management Team.
- Ensuring Logistics personnel contact aircraft operating in the area and request them to check the fire and report the distance from site, approximate size, and direction that the fire is burning. Any new information received should be relayed to local authorities.

Mine Manager or designate (in the event of smoke entering the ventilation system) is responsible for:

- Ensuring the stench is injected, and the mine is evacuated. Underground personnel may be assigned to work on surface if the fire does not pose a threat to site personnel of the site.

Mill Manager or designate is responsible for:

- Ensuring a timely plant evacuation **if required** and ensuring that all plant personnel report to the camp complex.

ERTC is responsible for:

- Managing the emergency in conjunction with the senior Alexco Management

member of the Emergency Management Team in a safe manner and in accordance with the ERT Safe Work Guidelines.

ERT members are responsible for:

- Mobilizing gear, equipment and supplies as instructed by the ERTC and local authorities.
- Understanding and working in accordance with the ERT Safe Work Guidelines.

Site First Aid Attendant is responsible for:

- Ensuring that the Mobile Treatment Centre is loaded and ready for immediate action.
- Being available at the Alexco Admin building First Aid Station to treat any medical emergencies that may occur as a result of the crash or the emergency response.

All management and ERT personnel at the Alexco Resource Corp properties are responsible for:

- Understanding the requirements of this procedure.
- Complying with this procedure and ERT Safe Work Guidelines.

PROCEDURE

This procedure relies heavily on the person witnessing or reporting an aircraft or helicopter crash giving concise and full information so that the Emergency Management Team and the Emergency Response Team are fully informed. The person receiving a call (radio or phone) must ensure that all information is passed on to the Emergency Management Team. The Emergency Management Team in conjunction with the Emergency Response Team Coordinator will determine what action is appropriate.

REFERENCES AND RELATED DOCUMENTS

- ERP-001 – Emergency Contact List
- ERT Safe Work Guidelines)
- Alexco Resource Corp. - Crisis Management Plan (Corporate Document to be developed)

Carrier	Address	Contact
Air North		
Alcan Air		

ALEXCO	SAFETY STANDARD	Document Number:	ERP-008
		Version Date:	01/08/2012
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Medevac Protocols

ALEXCO RESOURCE CORP
Effective Date: 11/08/11
Implementation Date: 04/30/12
Revision No.: 01
Review Date: 01/15/13
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

The purpose of the medevac (medical evacuation) procedure is to provide guidelines to all parties involved in making arrangements to evacuate personnel with life threatening injury or serious illness from Alexco's Keno Hill Mining District to Whitehorse General Hospital in Whitehorse, YT for further treatment.

SCOPE

This procedure covers all medevac cases from the Keno Hill Mining District to Whitehorse General Hospital in Whitehorse, YT in the event that the requirement for urgent medical care beyond the Mayo Health Clinic facility.

RESPONSIBILITY

Site First Aid Attendant is responsible for:

- Liaising with the Mayo Health Clinic to establish the requirements surrounding the medevac evacuation and requesting support from the clinic as required.
- Mayo Health Clinic to confirm the need and make arrangements for a medevac.

Alexco Physician is responsible for:

- Liaising with medical travel staff at Whitehorse General Hospital in Whitehorse, YT and the Mayo Health Clinic.

General Manager or designate is responsible for:

- Ensuring this procedure is implemented and maintained.
- Contacting off-site Alexco personnel and regulatory agencies (as required by the Alexco Resource Corp. - Crisis Management Plan) of the situation.

Site Services Manager or designate is responsible for:

- Providing current site weather report and Landing Zone coordinates to the Mayo Health Clinic .

Health and Safety Manager or designate is responsible for:

- Ensuring that any assistance that the Site First Aid Attendant may require is provided in a timely manner.
- Monitoring the implementation of this procedure.

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		Version:	01
		Approved by:	

Medevac Protocols

PROCEDURE

When a person is injured or seriously ill at Alexco's Keno Hill Mining District and the condition is beyond the medical care of the site First Aid Attendant and the Mayo Health Clinic, Medevac may be required.

The Medevac will be authorized and arranged by the Mayo Health Clinic to the Whitehorse General Hospital.

The Mayo Health Clinic will be in contact with the Health and Safety Manager and liaise with the following people to initiate a medevac.

- **Alexco Physician** – Dr. Ian Seal – Whitehorse General Hospital

Office: (867)-???-????

Cell: (867)-???-????

The Health and Safety Manager should have the following Information available for the Mayo Health Clinic:

1. **Name of Injured:**
2. **Provincial Health Care #/ Treaty #:**
3. **Age and Date of Birth:**
4. **Gender:**
5. **How the injury occurred:**
6. **Nature of Injuries:**
7. **Clinical Examination:**
8. **Provisional Diagnoses:**
9. **Medication Administered:**
10. **Contact Telephone Number:**

ALEXCO	SAFETY STANDARD	Document Number:	ERP-008
		Version Date:	01/08/2012
		Version:	01
		Approved by:	

Medevac Protocols

The Mayo Health Clinic will phone Whitehorse General Hospital - Medical Travel at **(867) 393-8700,** who will arrange dispatch of a medevac team to the site. They will keep the Health and Safety Manager informed of the time frame that will be required to have the medevac team on site.

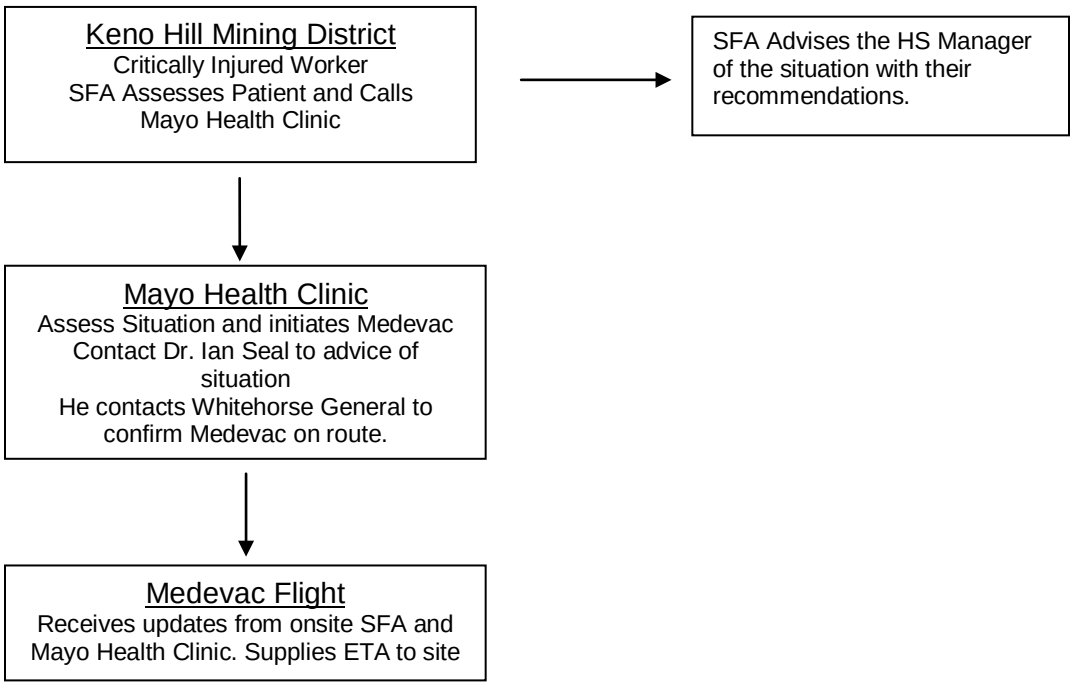
When Whitehorse General Hospital - Medical Travel gets the statistical information on the patient and the presenting diagnosis, they will contact the onsite Health and Safety Manager and get a clinical report on the patient

Note

Site Service Manager should ensure that the site weather reports are accurate and supplies the Air Carrier with a current weather report, and location.

- Mayo Health Clinic (867) - 996 - 4444
- Whitehorse General Hospital (867) 393-8700
- Dr. Ian Seal (867) 667-6421 Office, (867) 667-7933 Home
  dseal@hotmail.com

KENO HILL MINING DISTRICT'S MEDEVAC FLOW CHART



Medevac Protocols

When the Site Services Manager or designate sends the weather conditions to Mayo Health Clinic it is important that the landing zone has been determined and the following information must also be relayed:

Location of Elsa: (Shop / Transport area)

Latitude - 63° 54 min North
Longitude -135° 29 min West

Location of the District Mill: (Mill Yard)

Latitude – 63° 54 min North
Longitude – 135° 19 min West

Location of Bellekeno East: (Upper Lay down Area)

Latitude - 63°54 min North
Longitude - 135°15 min West

Location of Lucky Queen: (Black Cap Waste Dump)

Latitude -63° 56 min North
Longitude -135° 16 min West

Location of Onek Portal:

Latitude -63° 54 min North
Longitude -135° 17 min West

REFERENCES AND RELATED DOCUMENTS

- Not yet created

APPENDICES

N/A

ALEXCO	SAFETY STANDARD	Document Number:	ERP-009
		Version Date:	03/26/2012
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ALEXCO RESOURCE CORP
Effective Date: 01/08/12
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Version No.: 02
Review Date: 03/26/2012
Prepared By: Neil Bottrell, Revised by Alexco Management/Safety
References: Yukon Occupational Health and Safety Regulations

Purpose

To establish a minimum standard for the Mine Rescue Standards on all Alexco Resource Corporation projects, and operations

Scope

These procedures apply to all employees including independent contractors working at Alexco's Keno Hill Mining District.

Responsibilities

Site Manager and Department Managers are responsible for ensuring these procedures are implemented and maintained.

Designated Supervisors and Department Managers are responsible for implementing these procedures.

Health and Safety Manager is responsible for monitoring the implementation of these procedures.

Objectives

To establish mandatory requirements for safe and responsible working standards, for using all mine rescue equipment and training as per the British Columbia Mine Rescue Manual and the Yukon Occupational Health and Safety Regulations for Alexco's Keno Hill Mining District.

Personal Protective Equipment

All employees shall comply with site safety policies and government regulations.

Tools and Equipment

Draeger BG4 PSS II SCBA's, firefighting equipment, atmospheric testing equipment and all necessary equipment if required at mine site.

Other Equipment or Material

Scaling bars proper length and in good condition, required PPE.

Mine Rescue

Procon Mining and Tunneling will provide all aspects of mine rescue components to ensure the safety of underground workers and the property itself.

Procon, if required, will supply the following but not be limited to:

- Creation of mine rescue programs, policies and protocols;
- Suitable mine rescue apparatus to fit the needs of the client/contract;
- Training on the apparatus and equipment;
- Training in the relevant provincial, territorial and or national mine rescue standards; and
- Periodic testing and audits of the mine rescue program to ensure effectiveness.

Mine Rescue Personnel

Procon and Alexco will ensure that an adequate number of personnel holding certificates of competence in underground Mine Rescue valid in British Columbia or other similar certification (Procon Certification as Dragerman) will be present at site at all times.

Training

Procon will supply site specific mine rescue training for all personnel working at the Bellekeno and Lucky Queen operations. Training will be held for all available mine rescue personnel every 30 days. This training will be focused on the site in which the employee will be working and will cover but not be limited to:

- O2 Therapy
- Electrical Safety
- Ropes, Knots and Rigging
- Fire Fighting
- Drager BG4
- Mine Ventilation
- Mine Gases
- Team Procedures
- U/G Emergencies
- Mine Rescue Operations
- Survival Mine Rescue
- Trainer's Choice (The trainer can pick something they want to go over or add something site specific – Confined space, mill evacuation, vehicle extraction, first aid etc…)

Mine Rescue List

The Procon Project Superintendent shall ensure that a list of names and location of all Mine Rescue Personnel is created and posted in a conspicuous location for quick reference. This list must be updated

weekly to ensure the mine rescue personnel are on site and available for a rescue operation. In addition, each fully trained Mine Rescue member will have a colour coded (blue) tag on the tag board for each underground operation in Alexco's Keno Hill Mining District.

Roles and Responsibilities

Incident Controller

The Incident Controller will be a senior company or contractor official familiar with the Emergency Response Procedures and daily operations and resources of the operation and its location.
The Incident Controller will report directly to Senior Management on the rescue operation and will be the only contact with the Emergency Response Coordinator in regards to the coordination of the emergency. This individual will be responsible to contact the Yunon Worker Compensation Health and Safety Board (YWCHSB) to report the occurrence and coordinate any assistance required from the YWCHSB or mines included in the mutual assistance agreement. The Incident Controller will be located in the designated Control Center.

Emergency Response Coordinator

The Emergency Response Coordinator must have mine rescue experience and will be stationed at the Fresh Air Base. The Coordinator must have direct communication with the team in the mine as well as with the Incident Controller in the Control Center.

The Coordinator will report directly to the Incident Controller and acts on his orders or advice. He should also be in a position to inform the Team captain of all relevant date and give instructions on the work to be done. The progress and actions of the team will be accurately marked / documented on a mine plan and all relevant details shall be logged.

Team Captain

The Team Captain leads and directs the team members and is responsible for discipline, general safety and the work the team performs. The Team Captain reports to the Emergency Response Coordinator and is under his/her direction. However when the team is on a mission the Captain is the chief decision maker. It is vital that the Captain be knowledgeable in all facets of mine rescue theory and procedures so that he/she can make correct and timely decisions as circumstances dictate. Mostly the Captain will be a leader, using each team members individual or group skills to the fullest to ensure the safety of the team.

Vice-Captain

The Vice-Captain will have similar qualifications to that of the Captain. The Vice Captains main responsibility is to watch over the team and warn the Captain if any Team member shows any signs of distress. It is common practice to have the Vice-Captain assist the Captain in updating the mine plans and taking gas and ventilation tests. He also makes close checks of team members during rest breaks and assists the Captain with routine duties. The Vice-Captain must be kept informed of the Captain's finings, the work done and the work still to do. The Vice-Captain will have the skills and the knowledge to step into the role of Captain if required.

Team Members

Team Members will be well trained in such duties as: firefighting, first aid, air sampling, and erecting seals. As Mine Rescue Teams are assembled, consideration will be given to the special skills that may be

required. Team members should be chosen with all these factors in mind. Emergencies in mines require the special skills of a fully trained mine rescue worker.

Procedure

In the event of an emergency where the onsite mine rescue teams are activated, the following steps must be followed:

1. Upon notification of an emergency underground the Site Superintendent or Supervisor will initiate the emergency warning system (e.g. stench gas) to warn all underground personnel. The individual in charge will then contact all mine rescue personnel on site or in camp to respond.

2. Alexco and Procon management will be contacted and notified of the situation.

3. Alexco and Procon Management will contact the local authorities and appropriate personnel as per the site Emergency Response Plan.

4. The Mine Rescue operation must be carried out in accordance to the British Columbia Mine Rescue Manual and the Yukon Occupational Health and Safety Regulations.

5. Teams responding will be briefed on the potential situation effecting the underground by the designated Emergency Response Coordinator.

6. The teams responding will prepare for the emergency as required with the appropriate equipment relevant to the occurrence (e.g. SCBA's or First Aid equipment).

7. Teams will proceed on the mission as required. No one team will proceed on a mission without the backup of another team present unless authorized by senior management and/or Yukon Workers Compensation Health and Safety Board

8. Safety of the Mine Rescue Team will not be compromised.

9. The team shall ensure the safety of trapped workers and casualties. Proper first aid will be administered and the workers and/or casualties will be transported to surface accordingly.

10. The team will ensure the protection of Mine Property.

11. The team will assist in the rehabilitation of the mine/tunnel back to safe operational conditions.

12. Teams will not be required to respond in apparatus for more than two hours on a mission without an adequate rest period (e.g. 4 hours)

13. Teams returning from a mission will be debriefed and the information shared shall be supplied to the next responding team.

14. Teams from neighboring sites will be contacted and requested to respond as per any Mutual Assistance agreements that have been established.

15. Upon completion of the operation a thorough investigation of the incident and audit of the response will be conducted by Alexco and Procon personnel.

Contacts

Alexco Management

Contact	Position	Office	Cell
Tom Fudge	Senior VP – Eng & Dev	867 996 2330 ext 5907	604 340 5855
Tim Hall	VP & General Manager	867 996 2330 ext 5901	604 340 5832
Scott Smith	Mine Manager	778 327 2687	778 384 9607
TBD	Safety Manager	867 996 2330 ext 5913	

Procon Management

Contact	Position	Office	Cell
Jim Dales	Vice President	604 291 8292	
Colin Wilson	Area Manager	604 296 3369	778 772 1076
John Scott	Director of HR&S	604 291 8292	
Jon Miller	Corporate Safety	604 291 8292	604 341 1449

All government mine regulations and company standards must be followed.

ALEXCO	**SAFETY STANDARD**	Document Number:	ERP-010
		Version Date:	03/31/12
		Version:	01
		Approved by:	

Underground Emergency Response – Duty Cards

ALEXCO RESOURCE CORP.
Implementation Date: 04/30/12
Revision No.: 01
Review Date: 08/01/12
Prepared By: Neil Bottrell / Dean Coles (Procon), Revision by Alexco Management/Safety
References: Yukon Occupational Health and Safety Regulations

1.1 PURPOSE

The aim of this document is to provide those involved in responding to emergencies with detailed information about the particular tasks that they are required to undertake.

These "Underground Emergency Response Duty Cards" indicate the systematic actions that should be followed in case of an underground emergency. Although they are intended as a detailed guide, there may be additional tasks and/or a different sequence required depending on the particular emergency incident that has occurred.

1.2 SCOPE

This document, the Underground Emergency Response Duty Cards forms part of the documentation of Underground Emergency Procedures (ERP-004).

1.3 IMPLEMENTATION

1.3.1 Who Has Responsibilities - Training Required

The Underground Emergency Response Duty Cards have been developed for the Team members who undertake the following roles during an underground mining emergency:

Incident Control Team (control and coordination)

- Incident Controller
- Access Control Officer
- Communications Officer
- Emergency Plans Officer
- Resources Officer
- Surface Muster Point Warden

Emergency Response Team (incident response)

- Emergency Response Coordinator
- Fresh Air Base (FAB) Officer

1.3.2 Who Else Should Know - Awareness Required

Each ***Department Manager*** is responsible for the effectiveness of emergency management within their area of responsibility. This includes implementing the requirements of the Underground Emergency Response Procedures and ensuring understanding of essential aspects of these Duty Cards.

The Site or Contractor Underground Superintendent *and* ***Underground Shift Supervisors*** are responsible for ensuring that local area emergency and evacuation procedures are communicated to team members regularly (i.e. not just at induction) and that regular drills are conducted. This includes providing team members for training in their roles under the Duty Card system.

The ***Underground Manager*** or ***the Site or Contractor Underground Superintendent*** are likely to act as the ***Incident Controller*** (i.e. leader of the area or ***Site Incident Control Team***) should a local emergency occur. This person will be required to use the Emergency Response Duty Card system to help manage the emergency.

The ***Mine Emergency Response Coordinator*** is responsible for maintaining and up-dating the Underground Emergency Response Duty Cards. This includes training site team members in the use of the Duty Card system.

Team members assigned particular roles or tasks under the Underground Emergency Response Procedures (e.g. via Duty Cards) are responsible for carrying out those roles or tasks to the best of their ability.

2. DETAILS

3.1 AUDIENCE

This information is important to the safety of everyone associated with the Underground Mine Operation and is to be used by all team members who may be required to undertake duties in an emergency. This information must be communicated to team members through formal training so the various requirements are understood and acknowledged.

3.2 DUTY CARD SYSTEM

The Duty Card system is designed to provide team members in emergencies with a set of instructions to follow to assist in the effective management of the incident. The Underground Emergency Response Duty Cards have been developed as “generic” Duty Cards that could apply to any emergency at any underground mine.

The Duty Cards themselves will be placed at strategic locations:

- Underground operations in the Emergency Box(s).
- Underground Superintendents mine office in the Emergency Box.
- Alexco Mine Technical Services office building Emergency Box
- Alexco administration building in the Elsa Emergency Box.
- Mine Rescue Building in the Emergency Box.
- Every Underground Shift Supervisor will also have a set of Underground Emergency Response Duty Cards.

Where appropriate, the Duty Cards will also have attached the forms or checklists that are required to be used or completed. There is also room to record important information on the Duty Card itself.

All information (e.g. time, date, comments etc) must be recorded once the above step has been completed. This acts as a record of what has been done in real-time. Any additional steps or information should be recorded on the blank sheets attached at the rear of the Duty Card.

Note: Duty cards are intended as a detailed guide in the event Underground Emergency Response is required. There may be additional tasks and/or a different sequence required depending on the particular emergency that has occurred.

A list of the Underground Emergency Response Duty Cards is contained in Table 1.

The Duty Cards themselves are contained in the attached Appendices.

Table 1 - List of Underground Emergency Duty Cards

Duty Card	Title	Reports To	Based At	Comments
1	**Incident Controller**	Vice President or Underground Manager	Incident Control Centre	Controls and directs overall Emergency Response (ER) effort; liaises with Disaster Management Team Leader (if initiated).
2	**Access Control Officer**	Incident Controller	Incident Site Access Control Points	Assigns personnel: to secure and control all accesses to the underground; record all movements using ***Access Control Log***; directs Emergency Response Team members leaving mine to Surface Muster Point; Observes status of exhausts/surface fans and provides reports to Emergency Plan Officer; records observations using ***Ventilation Observation Form.***
3	**Communications Officer**	Incident Controller	Incident Control Centre	Manages and controls all communications; maintains ***Communications Log;*** records all decisions and actions taken by Incident Controller.
4	**Emergency Plan Officer**	Incident Controller	Nearby to Incident Control Centre	Provides and up-dates level and decline plans showing all services, isolation points, accesses, etc to Incident Controller. Provides advice on ventilation aspects eg likely impacts, repairs needed, fan or regulator settings etc; monitors ventilation system; reviews ventilation plans.
5	**Resources Officer**	Incident Controller	Nearby to Incident Control Centre	Supervises and controls effort to maintain equipment and services; arranges and coordinates additional resources (materials, manpower, specialist services etc), transport, supplies etc; may source internal and/or external resources.
6	**Surface Muster Point Warden**	Incident Controller	Initially Lamp Room/Tag Board, then Surface Muster Point	Controls issue of lamps and self-rescuers; monitors Team members who go/return from underground; records names and status of Team members who return to Surface Muster Point on ***Muster Point Log.***
7	**Emergency Response Coordinator**	Incident Controller	Mine Rescue Facility	Will usually be the Mine Emergency Response Coordinator; controls and directs Emergency Response Team and back-up support teams; acts as Deputy to Incident Controller.
8	**FAB Officer** *(Emergency Response Team member)*	Emergency Response Coordinator	Fresh Air Base or Forward Control Point	Controls and manages FAB (ERT forward control point closest to incident) to ensure safety of team members; records communications using ***FAB Communication Log****; records team members movements using* ***FAB Team members Log***

3. RELATED DOCUMENTS

Details of the structure of the various teams (i.e. Incident Control, Emergency Response and Disaster Management) are given in the Underground Emergency Response Procedures.

4. APPENDICES

The following Underground Emergency Response Duty Cards are contained in the following Appendices:

Appendix 1 – Duty Card 1 "Incident Controller"

Appendix 2 – Duty Card 2 "Access Control Officer"

Appendix 3 – Duty Card 3 "Communications Officer"

Appendix 4 – Duty Card 4 "Emergency Plans Officer"

Appendix 5 – Duty Card 5 "Resources Officer"

Appendix 6 – Duty Card 6 "Surface Muster Point Warden"

Appendix 7 – Duty Card 7 "Emergency Response Coordinator"

Appendix 8 – Duty Card 8 "Fresh Air Base Officer"

4.1 UNDERGROUND DUTY CARD 1 - INCIDENT CONTROLLER

(Page 1 of 3)

Name:	**Date:**	**Time:**

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No.	Task Description	Date/Time	Comments
01	Put on the Incident Controller vest and receive details of the incident.		
02	If evacuating, initiate mine evacuation alarm: *(tick which alarms apply)* ☐ Underground Radio/Emergency Call ☐ Portal Stench Gas ☐ Mine Stench Gas (if applicable) ☐ Emergency Siren (if applicable) ☐ Other: Ask person(s) who have been instructed to activate alarm(s) to confirm that alarm has been initiated and time. (Report Back)		
03	Ask *Communications Officer* to contact persons as required.		*Name of Communications Officer:* *Phone Number:* *Radio Channel:*
04	Appoint *Resources Officer* to operate Duty Card Number 5. Record their contact number.		*Name of Resources Officer:* *Phone Number:* *Radio Channel:*
05	Establish a suitable room or office as an Incident Control Centre. The Incident Control Centre is in a safe location which will not be affected by the emergency itself (e.g. Shift Boss Office).		*Location:* *Incoming Phone No:* *Outgoing Phone No:* *Radio Channel:*

UNDERGROUND DUTY CARD 1 - INCIDENT CONTROLLER
(Page 2 of 3)

No.	Task Description	Date/Time	Comments
06	Appoint *Surface Muster Point Warden* to operate Duty Card Number 6. Record their contact number. required.		*Name of Surface Muster Point Warden:* *Phone Number:* *Radio Channel:*
07	Appoint *Emergency Plans Officer* to operate Duty Card Number 4. Record their contact number.		*Name of Emergency Plans Officer:* *Phone Number:* *Radio Channel:*
08	Appoint *Access Control Officer* to operate Duty Card Number 2. Record their contact number.		*Name of Access Control Officer:* *Phone Number:* *Radio Channel:*
09	Appoint *Emergency Response Coordinator* to operate Duty Card Number 7. Record their contact number.		*Name of Emergency Response Coordinator:* *Phone Number:* *Radio Channel:*
10	Supply all necessary information about current situation to the Emergency Response Coordinator, once they arrive on site. A copy of the *Emergency Response Coordinator's* Duty Card (Duty Card 7) is included in the Emergency Box.		

UNDERGROUND DUTY CARD 1 - INCIDENT CONTROLLER
(Page 3 of 3)

Record any additional tasks on the following page(s):

No.	Additional Tasks* Undertaken	Date/Time	Comments

** Use extra sheets, if required*

Attached:

Duty Card List/Summary (Table 1 from Underground Emergency Duty Cards)

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc.)

Signed: **Date:**

4.2 UNDERGROUND DUTY CARD 2 - ACCESS CONTROL OFFICER

(PAGE 1 0F 3)

Name:	**Date:**	**Time:**

In The Event Of An Emergency:

The *Incident Controller* will usually appoint the **Access Control Officer.**

If you are instructed to operate this Card, complete the information on the line above, then follow the instructions below. Any additional instructions or occurrences should also be recorded on the blank sheet provided at the end of this section.

No.	Task Description	Date/Time	Comments
01	Put on the Access Control Officer vest and receive details of the incident.		
02	Obtain contact details of *Incident Controlle*r and Incident Control Centre. Ensure you have compatible communications e.g. Handheld radio Telephone Record the contact details:		*Name of Incident Controller:* *Phone Number:* *Radio Channel:*
03	Compose an initial log of people in the mine from the underground tag board. Wait for the *Incident Controller* to contact you. (**Tag board log book**).		
04	Observe all surface ventilation fans. If smoke is present proceed to portal(s) and set off stench gas. Give details when the *Incident Controller* requests.		

UNDERGROUND DUTY CARD 2 – ACCESS CONTROL OFFICER

(Page 2 of 3)

No.	Task Description	Date/Time	Comments
05	Post guards at all Mine Entrances to establish access control to underground workings, both in and out. Access Control points must be established in a safe location. (The Incident Controller will establish these points). No access will be granted unless authorized by the Incident Controller.		*Designated Access Control Point Locations: A map will be provided to the Access Control Officer as part of his / her Duty Card. Access Control Points will be clearly marked.*
06	Record the names/times of all incoming and outgoing Team members and equipment using the ***Access Control Log*** (attached) Ensure that no team members are permitted access to the incident site unless authorised by the *Incident Controller.*		
07	Direct all underground personnel leaving the mine to the Surface Muster Point.		The Surface Muster Point will be determined by the Emergency Control Centre
08	Provide situation up-dates to *Incident Controller* regarding status of incident site security or other relevant information.		This includes any changes to the status of the surface ventilation fans.
09	Once the situation is under control and you are given "All Clear" by *Incident Controller*, stand-down and return to Surface Muster Point. Note Some Access Control Points may remain active after "All Clear" given to maintain security of affected area(s).		
10	Ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc)		
11	Attend de-briefing session, as requested.		

UNDERGROUND DUTY CARD 2 – ACCESS CONTROL OFFICER
(Page 3 of 3)

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Attached: Access Control Log

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc)

Signed: **Date:**

DATE: **TIME:**

ACCESS CONTROL LOG			
INCIDENT CONTROL CENTRE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*
INCIDENT CONTROL TEAM:			
Incident Controller	*Accident Control Officer*	*Communications Officer*	*Emergency Plans Officer*
Resources Officer	*Surface Muster Point Warden*	*Emergency Response Coord.*	*Fresh Air Base Officer*
FRESH AIR BASE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*

ACCESS CONTROL POINTS: *attach map as provided*

Location A *description of location*	*Comments*
Location B *description of location*	

* Use extra sheets, as required.

DATE: **TIME:**

ACCESS CONTROL LOG							
PEOPLE							
TIME	***A***	***B***	***NAME***	***IN***	***OUT***	***KEY INFO****:* *Cap lamp No.* *IC Team member*	***REASON*** *for access to Incident Site*

* Use extra sheets, as required.

ACCESS CONTROL LOG							
EQUIPMENT							
TIME	***A***	***B***	***TYPE***	***IN***	***OUT***	***REQUESTED BY:***	***REASON*** *requested*

* Use extra sheets, as required.

4.3 UNDERGROUND DUTY CARD 3 - COMMUNICATIONS OFFICER

(PAGE 1 OF 5)

Name:	**Date:**	**Time:**

<u>In The Event Of An Emergency</u>:

The *Incident Controller* will appoint the **Communications Officer.**

Only give incident information out as directed by the *Incident Controller.* It is important to control the flow of information. Non-essential phones/internet connections should be disabled to prevent unauthorized information from leaving the immediate site of the emergency-+

If you are instructed to operate this Card, complete the information on the line above, then follow the instructions below. Any additional instructions or occurrences should also be recorded on the blank sheet provided at the end of this section.

No.	Task Description	Date/Time	Comments
01	Put on the Communications Officer vest contained in the Emergency Box.		
02	Determine what communications are available for use or likely to be used: □ telephones □ u/g leaky-feeder 2-way radio □ UHF 2-way radio □ Internet □ mobile telephones, □ other: ...Femco phones.....		
03	Source appropriate communication equipment for use by the Incident Control Team		Where possible, have two independent means of communication. (eg telephone and radio, telephone and mobile etc).
04	Determine which team members are available on site to assist with the emergency (i.e. Team members who could act as Incident Control Team members).		This information can come through the *Incident Controller*.
05	Obtain copies of the Communications Log attached to this Duty Card		Record details of any communications to or from the Incident Control Centre.

UNDERGROUND DUTY CARD 3 - COMMUNICATIONS OFFICER
(Page 2 of 5)

No.	Task Description	Date/Time	Comments
06	Determine the location of the Incident Control Centre from the *Incident Controller*. Ensure the Incident Control Centre has adequate communications. Where possible, use separate telephone numbers & radio channels for incoming and out-going communication. Obtain assistance to monitor the communications. Once communications are established, you should remain in the Incident Control Centre with the *Incident Controller*.		
07	Identify and record telephone/fax numbers etc for the Incident Controller.		*<u>Incoming:</u>* *Phone:* *Fax:* *Mobile:* *<u>Outgoing:</u>* *Phone:* *Fax:* *Mobile:*
08	If required, commence contacting essential team members who may be off-site. Use the Key Person Contact List (Will be included with this duty card). Record all calls made on the Communications Log. If additional assistance is available, consider giving this task to a competent person. Ensure the contact number for the Incident Control Centre is provided. Release information only as instructed by the Incident Controller.		**Communications Log** Each **phone/radio** should have a **log** with specific instructions to obtain permission from the communication officer before using the phone/radio **Key Person Contact List** -emergency aid, Mine inspector, corporate office, police, fire dept., ambulance, etc.

UNDERGROUND DUTY CARD 3 - COMMUNICATIONS OFFICER

(Page 3 of 5)

No.	Task Description	Date/Time	Comments
09	Once communications with Refuge Chambers and FABs are established, ensure relevant information (employees present, condition etc) is recorded on the Evacuation Log		Particularly important: (*As per Refuge Station Protocol*) - Information concerning the incident - Location of people Underground who are NOT in the Refuge Chamber or FAB but still thought to be Underground - Condition of people Underground who are NOT in the Refuge Chamber or FAB but still thought to be Underground
10	Determine status of employees working underground and mine communications, with mine officials (i.e. who has been accounted for, locations of personnel, condition of personnel, number of personnel unaccounted for etc.). Consult Surface Muster Point Warden.		
11	Provide report to *Incident Controller* regarding status of personnel and mine communications		
12	Liaise with *Incident Controller* to determine any additional assistance that can be provided (as well as recording communications, etc.)		
13	Record and pass-on any messages to *Incident Controller*, as necessary		
14	Record details of all situation reports made to *Incident Controller*		

UNDERGROUND DUTY CARD 3 - COMMUNICATIONS OFFICER
(Page 4 of 5)

No.	Task Description	Date/Time	Comments
15	Continue to record all incoming and outgoing communications (telephone calls, radio calls, emails, etc.) using Communications Log.		
16	Provide on-going situation up-date to *Incident Controller* regarding status of communications, etc.		
17	Once the situation is under control The Communications Officer will communicate the "All Clear" to all Team members as instructed by the *Incident Controller*.		This is an instruction for Incident Control and Emergency Response Team members to stand down from their positions.
18	Instruct all Incident Control Team members to sign-off and return their Duty Cards (including all checklists, forms etc).		
19	Arrange for the de-briefing sessions to be scribed, including recording all Incident Control Team members who attended.		
20	Liaise with the *Incident Controller* to arrange for statements to be taken from all witnesses/relevant personnel.		
21	Once the "All Clear" is given, ensure Duty Card is completed, signed (including any completed logs etc)		
22	Attend de-briefing session.,		
23	Collect and sign all completed Cards.		

UNDERGROUND DUTY CARD 3 - COMMUNICATIONS OFFICER

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Attached:

Communications Log

Key Persons Contact List

Evacuation Log

Please ensure Duty Card is completed and signed-off before handing to **Incident Controller** (include any additional pages, completed checklists/logs etc)

Signed: **Date:**

DATE: **TIME:**

LOG LOCATION: **Log Page:**

COMMUNICATIONS LOG

INCIDENT CONTROL CENTRE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*
INCIDENT CONTROL TEAM:			
Incident Controller	*Accident Control Officer*	*Communications Officer*	*Emergency Plans Officer*
Resources Officer	*Surface Muster Point Warden*	*Emergency Response Coord.*	*Fresh Air Base Officer*
FRESH AIR BASE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*

Release information only as instructed by the Incident Controller.

Time	**Communication Method** Phone: indicate tel #), Radio: *indicate channel*), Email: indicate address Fax: indicate # Other	**Incoming Coms** Name:	**Outgoing Coms** Name:	**Notes:**

* Use extra sheets, as required.

DATE: **TIME:**

LOG LOCATION: **Log Page:**

COMMUNICATIONS LOG				
Release information only as instructed by the Incident Controller.				
Time	**Communication Method** Phone: indicate tel #), Radio: *indicate channel*), Email: indicate address Fax: indicate # Other	**Incoming Coms** Name:	**Outgoing Coms** Name:	**Notes:**

* Use extra sheets, as required.

KEY PERSONS –KENO HILL PROJECT - CONTACT LIST

Release information only as instructed by the Incident Controller.

Alexco Resource Corp - Keno Hill Project
PO BOX #7, Elsa, YT.,Y0B 1J0
Lat 63.54 N Long 135.29 W (Elsa)

Phone: MAIN 867 996-2330
Phone: LANDLINE 867 995-3113
Fax: 867- 995-2600

NAME	Position	Home Phone	Mobile Phone	Work Phone
BAIN, Sharlaina	Administration	**867-633-5814**	**867-333-0310**	**867-996-2300 Ext. 5900**
BATTISON, Laura	Sr. Geologist	**250-926-0720**	**250-302-1850**	**778-372-2686**
BENWOOD, Vanessa	Environmental Coordinator	**250-816-5275**		**867-996-2330 Ext. 5909**
FEDAK, Ken	District Development Manager	**250-482-4112**	**250-997-5143**	**867-996-2330 Ext. 5930**
FUDGE, Tom	Sr. VP. Construction & Engineering	**280-755-2836**	**604-340-5855**	**867-996-2330 Ext.5907**
HALL, Tim	VP General Manger Operations	**907-790-2245**	**604-340-5832**	**867-996-2330 Ext.5901**
HILLIER, Dave	Site Services Manager	**867-660-4630**	**867-335-2001**	**867-996-2330 Ext. 5919**
JOHNSON, Peter	Projects & Construction Manager	**867-993-5911**	**867-334-7484**	**867-996-2330 Ext. 5905**
MACFIE, Annabelle	Administration		**867-335-4168**	**867-996-2330 Ext. 5900**
MacMILLIAN, Colette	Yukon Business Services Manager	**867-633-2096**	**867-668-6463**	**867-668-6463 Ext. 225**
McONIE, Al	VP Exploration	**+64-7 549-1194**	**604-340-5815**	**867-996-2330 Ext. 5904**
McPHIE, Ian	Industrial Hygienist & Safety / First Aid	**250-392-9103**	**250-305-9942**	**867-996-2330 Ext. 5913**
MANSELL, Andrea	Human Resources Coordinator	**867-993-5911**	**867-334-7484**	**867-996-2330 Ext.5911**

NAUMAN, Clynt	Chief Executive Officer	**360-371-0176**	**604-250-3293**	**604-631-4138**
PENNEY, Katherine	Keno Hill District Mill Manager	**208-512-3996**	**206-818-4656**	**778-372-2754**
SCHNEIDER, Rob	Water Treatment Supervisor	**867-660-5544**	**867-332-5544**	**867-996-2330 Ext. 5910**
SHARP, Scott	IT Specialist	**867-993-5233**		**867-996-2330 Ext.5912**
SHEMLEY, Paula	Industrial Hygienist & Safety / First Aid	**604-941-8656**	**604-807-0666**	**867-996-2330 Ext.5913**
SMITH, Scott	Mine Manager	**604-941-8656**	**778-384-9607**	**778-372-2687**
THRALL, Brad	Chief Operating Officer	**306-332-1180**	**604-250-6501**	**604-631-4133**

SITE AREA –KENO HILL PROJECT - CONTACT LIST

Site Numbers and extensions (867) 996-2330

BUNK A **5925**	**HOUSE #1** **5915**	**ADMIN BLDG.** **5900**	**MINE MANGER OFFICE** **778-372-2687**
BUNK B **5920**	**HOUSE #2** **5902**	**KITCHEN** **5927**	**MINE ENGINEERING** **778-372-2686**
BUNK C **5923**	**HOUSE #3** **5916**	**MECHANICS** **5914**	**SHIFTERS OFFICE** **778-372-2759**
BUNK D **6000**	**HOUSE #4** **5917**	**FIRST AID** **5921**	**MINE SAFETY OFFICE** **604-759-4777**
			BOART LONGYEAR **778-372-2708**
			MILL MANAGER OFFICE **778-372-2754**

RADIO FREQUENCIES –KENO HILL PROJECT - CONTACT LIST

Alexco Channel	Channel Name	Receive TX	Transmit RX	Tone
CHANNEL 1	FIRST AID Emergency First Aid channel	160.73	165.73	RX & TX = C131.8
CHANNEL 3	REPEATER Routine On-site Radio Traffic	157.61	151.97	No Tone
CHANNEL 4	Ladd 1 Routine On-site Radio Traffic	154.1	154.1	No Tone
CHANNEL 5	Ladd 2	158.94	151.94	No Tone

KEY PERSONS –EXTERNAL AGENCY - CONTACT LIST			
Release information only as instructed by the Incident Controller.			
Alexco Whitehorse Office	**867-633-4881**	**Roads Highways & Bridges**	**867-996-2232**
Canutec	**613-996-6666**	**Superior Propane**	**877-873-7467**
Environment Spills	**867-667-7224**	**Trans North Helicopter**	**867-668-2177**
Fireweed Helicopter	**867-668-5888**	**Whitehorse Hospital**	**867-393-8700**
Forest Fire	**888-798-3473**	**Wildlife Management**	**867-996-2162**
Marine & Air Search & Rescue	**800-567-5111**	**YEMS**	**867-667-3333**
Mayo Fire Department	**867-996-2222**	**Wolverine Mine**	**604-638-0921**
Mayo Health Centre & Ambulance	**867-996-4444**	**Yukon Energy – Regular Hours**	**867-393-5355**
Minto Mines	**604-759-0860**	**Yukon Energy – Emergency**	**800-676-2843**
Poison Control	**888-393-8700**	**YT Chief Mines Safety Officer**	**867-667-8739**
Procon Mining & Tunnelling	**604-291-8292**		
RCMP	**867-996-5555**		

4.4 UNDERGROUND DUTY CARD 4 - EMERGENCY PLAN OFFICER
(PAGE 1 OF 3)

Name:	Date:	Time:

In The Event Of An Emergency:

The *Incident Controller* will usually appoint the **Emergency Plans Officer.**

If you are instructed to operate this Card, complete the information on the line above, then follow the instructions below. Any additional instructions or occurrences should also be recorded on the blank sheet provided at the end of this section.

No.	Task Description	Date/Time	Comments
01	Put on the Emergency Plans Officer vest contained in the Emergency Box.		
02	Obtain details from the *Incident Controller* regarding the type and extent of the emergency (i.e. location, type of incident)		
03	Determine with *Incident Controller* likely plans/drawings/maps or other information required		Particularly important: ☐ Composites ☐ Drive layouts ☐ Most recent ventilation survey ☐ Single line electrical drawings *Ensure appropriate scale is available (i.e. 1:250*)
04	Supply copies of relevant plans to the Emergency Response Coordinator, if requested.		
05	Arrange to update prints with current ventilation information obtained by the *Access Control Officer*		
06	Provide any advice or assistance to *Incident Controller as requested*		

UNDERGROUND DUTY CARD 4 - EMERGENCY PLANS OFFICER

No.	Task Description	Date/Time	Comments
07	Once All Clear is given, ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc)		
08	Attend de-briefing session.		

UNDERGROUND DUTY CARD 4 - EMERGENCY PLANS OFFICER

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

Please ensure Duty Card is completed and signed-off before handing to Communications Officer (include any additional pages, completed checklists/logs etc)

Signed: Date:

4.5 UNDERGROUND DUTY CARD 5 - RESOURCES OFFICER
(PAGE 1 OF 4)

Name:	Date:	Time:

In The Event Of An Emergency:

The *Incident Controller* will usually appoint the **Resources Officer**.

If you are instructed to operate this Card, complete the information on the line above, and then follow the instructions below. Any additional instructions or occurrences should also be recorded on the blank sheet provided at the end of this section.

No.	Task Description	Date/Time	Comments
01	Put on the "Resources Officer" vest.		
02	Obtain details from the *Incident Controller* regarding the type and extent of the emergency (i.e. location, type of incident, impact on mine services, infrastructure etc)		
03	Determine with *Incident Controller* and Emergency Response Coordinator what additional equipment, services and transport is required.		*Equipment/ Services required:*
04	Identify what equipment is available at the mine to suit the needs of the emergency response. Provide the Incident Controller with an assessment of resources which may require and available from other mines, from local contractors or local providers. If the site or local area does not have the required equipment, coordinate contact efforts with the *Incident Controller* and or Emergency Response Controller.		*Equipment/ Services available on site or locally:*
05	Allocate Emergency Team Transport and equipment requirements on priority needs basis. Record any details and notify *Incident Controller*, once completed.		

UNDERGROUND DUTY CARD 5 - RESOURCES OFFICER
(Page 2 of 4)

No.	Task Description	Date/Time	Comments
06	Contact the Surface Muster Point Warden to determine any special needs for team members returning from underground		Particularly important: □ Meals & Drinks □ Clothes □ Blankets □ Counselling services
07	Arrange for food/ beverages etc from the camp(s) for the Incident Control and Emergency Response Team members.		
08	If required, appoint a competent person (e.g. Maintenance Supervisor) to coordinate maintenance activities.		Particularly important: □ Mechanics, electricians and fabricators have work ares prepared for incoming tasks *Person appointed:*
09	Arrange with maintenance crews to lock and tag out all switches or isolators etc as required by the *Incident Controller* and Emergency Response Coordinator.		
10	Determine any additional transport needs with the *Incident Controller* and Emergency Response Coordinator		*Transport required:* EX: Backup mine rescue,(Wolverine, Cantung), Mayo-minesite.
11	Establish reserved areas for loading and unloading facilities.		*Loading/ unloading areas are:*

UNDERGROUND DUTY CARD 5 - RESOURCES OFFICER
(Page 3 of 4)

No.	Task Description	Date/Time	Comments
12	Control external equipment/materials/team members upon arrival to site. If required, appoint a competent person to supervise the unloading or loading operations, and meet arriving external response Teams etc.		*Person appointed:*
13	Remain in close contact with the mine rescue facility regarding status of any external resources requested.		
14	When requested by the *Incident Controller*, provide situation up-dates regarding status of additional resources and transport (e.g. estimated time of arrival of resources being provided, etc)		
15	If likely to be a prolonged event", arrange for Relief Teams and crews, where required. This should be done in consultation with the Emergency Response Coordinator and other designated personnel.		
16	Once the "All Clear" is given, ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc)		
17	Attend de-briefing session.		

UNDERGROUND DUTY CARD 5 - RESOURCES OFFICER

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc)

Signed: **Date:**

4.6 UNDERGROUND DUTY CARD 6 - SURFACE MUSTER POINT WARDEN

(PAGE 1 OF 3)

Name:	Date:	Time:

In The Event Of An Emergency:

The *Incident Controller* will usually appoint the **Surface Muster Point Warden**.

If you are instructed to operate this Card, complete the information on the line above, then follow the instructions below. Any additional instructions or occurrences should also be recorded on the blank sheet provided at the end of this section.

No.	Task Description	Date/Time	Comments
01	Put on the "Surface Muster Point Warden" vest.		
02	Obtain details from the *Incident Controller* regarding the type and extent of the emergency (i.e. location, type of incident)		
03	Ask the *Incident Controlle*r the location of the "Surface Muster Point".		*Location of Surface Muster Point:*
04	Verify contact details to maintain communications with the *Incident Controller*.		*Incident Controller:* …… Phone No. : Radio Channel: Mobile Phone No. :
05	Contact details for the Incident Control Centre (if different)		Phone No. : Radio Channel:

UNDERGROUND DUTY CARD 6 - SURFACE MUSTER POINT WARDEN

No.	Task Description	Date/Time	Comments
06	Obtain the Mine Visitors Book or Log so you can help account for any visitors in area. If so relay to Communications Officer, *Incident Controller*, etc.		
07	Make your way to the designated Surface Muster Point to wait for personnel returning from underground.		
08	Once Team members begin to arrive at the Surface Muster Point, record their names, arrival times and condition (i.e. physical/ mental) on the ***Evacuation Log.***		
09	Provide any relevant information concerning the incident obtained from Team members returning from underground to the *Incident Controller*.		
10	Once the "All Clear" is given, ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc.)		
11	Attend de-briefing session.		

UNDERGROUND DUTY CARD 6 - SURFACE MUSTER POINT WARDEN

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Attached: Evacuation Log

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc)

Signed: **Date:**

DATE: **TIME:**

EVACUATION LOG

INCIDENT CONTROL CENTRE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*
INCIDENT CONTROL TEAM:			
Incident Controller	*Accident Control Officer*	*Communications Officer*	*Emergency Plans Officer*
Resources Officer	*Surface Muster Point Warden*	*Emergency Response Coord.*	*Fresh Air Base Officer*
FRESH AIR BASE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*

Release information only as instructed by the Incident Controller.

Time	**NAME of EVACUEE**	**CONDITION Physical**	**CONDITION Mental / Emotional**	**TREATMENT RECOMMENDED First Aid CIS Debriefing Other**

* Use extra sheets, if required

DATE: **TIME:**

EVACUATION LOG				
Release information only as instructed by the Incident Controller.				
Time	**NAME of EVACUEE**	**CONDITION** Physical	**CONDITION** Mental / Emotional	**TREATMENT RECOMMENDED** First Aid CIS Debriefing Other

* Use extra sheets, if required

4.7 UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR

(PAGE 1 OF 8)

Name:	**Date:**	**Time:**

In The Event Of An Emergency:

.

The ***Emergency Response Coordinator*** will be one of the Safety Officers, Mine Superintendents or Advisors.

The ***Emergency Response Coordinator*** should have already been notified of the emergency by an Underground Emergency Response Team member and will have already decided if the Emergency Response Team requires calling-out. The Emergency Response Coordinator will then make their way to the mine to assist the *Incident Controller* in responding to the emergency.

If you are instructed to operate this Card, complete the information on the line above, then follow the steps below. Any additional steps should also be recorded.

No.	Task Description	Date/Time	Comments
01	Put on the "Emergency Response Coordinator" vest.		
02	Obtain latest details from the *Incident Controller* regarding the nature and extent of the emergency (i.e. what has happened, type of incident etc)		Particularly important: □ Description of Incident □ Time Incident began □ Extent of the emergency □ Evacuation required o YES o NO
03	Confirm with *Incident Controller* whether or not mine/area evacuation has been initiated.		Evacuation initiated o YES o NO
04	Check with *Incident Controller* if the "Emergency Duty Card" system has been initiated. This will initiate the formation of Incident Control Team.		Duty Card system initiated o YES o NO

UNDERGROUND DUTY CARD 7 – EMERGENCY RESPONSE COORDINATOR

No.	Task Description	Date/Time	Comments
05	Obtain from *Incident Controller* a list of the names of the Incident Control Team members who have been activated to respond to the emergency and record.		"Access Control Officer" "Communications Officer" "Emergency Plan Officer" "Resources Officer" "Surface Muster Point Warden"
06	Identify and record contact details for the Incident Control Centre. (There should be separate communications for each).		*Incoming:* *Phone:* *Fax:* *Radio Channel:* *Outgoing:* *Phone:* *Fax:* *Radio Channel:*

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR

No.	Task Description	Date/Time	Comments
07	Assist the *Incident Controller* in determining a Response Plan. The type of response will depend on the nature of the incident. This should include consideration of any external assistance that might be required.		Incident Response Plans will be documented and recorded before implementation.
08	If required, confirm status and estimated time of arrival of Emergency Response Team.. Ensure with the Communications Officer that the Emergency Response Team Members have been notified and informed of Emergency Response Team Muster Point..		
09	Record the names of all Emergency Response Team members attending.		NAMES: □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR
(Page 4 of 8)

No.	Task Description	Date/Time	Comments
10	Liaise with *Incident Controller* to determine any additional assistance required (e.g. Local Authorities call-out, **Mutual Aid** call-out, etc).		
11	If external assistance required, appoint Incident Control Team members to contact assistance providers unless able to do it yourself. (Communications officer could be appointed, if in place).		
12	Determine location of the Emergency Response Team's FABs with the *Incident Controller* and Emergency Plans Officer.		
13	Appoint an Emergency Response Team Captain, if not already done. (Mine Rescue Team List- members hours experience, will help determine this).		*Emergency Response Team Captain:* …… Phone No. : Radio Channel: :

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR
(Page 5 of 8)

No.	Task Description	Date/Time	Comments
14	Ensure all required Emergency Response Team equipment is available and in serviceable condition. Assign specific tasks to Emergency Response Team members to do this.		
15	If additional equipment or materials are required, contact the Resources Officer. If not available on site, other personnel may be required to assist in sourcing additional equipment or supplies.		
16	Assist *Incident Controller* in briefing Emergency Response Team and Emergency Response Team Captain of situation and proposed incident Response Plan.		
17	Allocate and supervise additional tasks / roles such as: □ Safety Officer □ Equipment maintenance □ Communications □ Progress of operations.		
18	Check with the Emergency Plans Officer that appropriate plans are available for the Emergency Response Team		
19	Appoint Fresh Air Base Officer(s), if required Instruct FAB Officer to operate Duty Card 8.		*Fresh Air Base Officer(s):* …… Phone No. : Radio Channel: :

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR

No.	Task Description	Date/Time	Comments
20	Check with the Resources Officer regarding the availability of suitable transport for the Emergency Response Team (if required).		
21	Ensure that all equipment that needs to be transported to Fresh Air Bases is checked and fully serviceable before delivery.		
22	Check and verify that Emergency Response Team members are wearing the proper personal protective equipment before entering incident area(s). (ERT checklist).		
23	Check that Emergency Response Team has established Fresh Air Bases in safe locations. Check that all FABs are inspected, gas tested and deemed safe before being used.		
24	Check FABs and obtain location/contact details for FAB Officers: *Note: contact could include phone number, radio channel, mobile number etc		*Fresh Air Base Location* …… FAB Officer Phone No. : Radio Channel:
25	Ensure the Emergency Plans Officer records locations of FABs on Emergency Plans.		
26	Receive regular situation reports from Emergency Response Team and FAB Officers and pass on to *Incident Controller*		
27	Determine with the *Incident Controller* any additional resources (e.g. back-up teams) that might be required. If external assistance is required, contact the Resources Officer.		

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR

(Page 7 of 8)

No.	Task Description	Date/Time	Comments
28	Relay any instructions issued by the *Incident Controller* to the Mines Rescue Team Captain or FAB Officer(s).		
29	Organise standby/back-up team(s) to search for any Operational Emergency Response Team that does not return within the expected time.		
30	Provide regular situation reports to the *Incident Controller.*		
31	Once the “All Clear” is given, ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc)		
32	Attend De-briefing session, as requested.		

UNDERGROUND DUTY CARD 7 - EMERGENCY RESPONSE COORDINATOR

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc)

Signed: **Date:**

4.8 UNDERGROUND DUTY CARD 8 - FRESH AIR BASE/"FAB" OFFICER

(PAGE 1 OF 5)

Name:	**Date:**	**Time:**

In The Event Of An Emergency:

The *Emergency Response Coordinator* will usually appoint the **FAB Officer**.

If you are instructed to operate this Card, complete the information on the line above, then follow the steps below. Any additional steps should also be recorded.

No.	Task Description	Date/Time	Comments
01	Put on the "FAB Officer" vest.		
02	Obtain details from the *Emergency Response Coordinator* regarding the nature and extent of the emergency (i.e. location, type of incident, likely location of FAB etc)		
03	Identify and obtain communications equipment for use at FAB.		Use Emergency Response Team equipment or see *Resource Officer* for additional equipment (if required).
04	Record the contact numbers of the *Emergency Response Coordinator* and Incident Control Centre:		*Emergency Response Coordinator* Phone No. : Radio Channel: *Incident Control Centre* Location: Phone No. : Radio Channel:
05	Synchronize watches with the *Emergency Response Coordinator* and *Emergency Response Team Captain.*		The FAB Officer may be timing Emergency Response Team members using SCBA. It is essential to accurately record times in the FAB Log

UNDERGROUND DUTY CARD 8 - FAB OFFICER
(Page 2 of 5)

No.	Task Description	Date/Time	Comments
06	Upon arrival at the designated FAB location check the physical state to ensure it is safe by inspection and initial gas testing. If FAB location not suitable, immediately notify Emergency Response Coordinator to obtain alternate location.		FAB Location Safety Status o Physical Inspection performed o Initial gas testing performed
07	Establish FAB communications. Where possible, have 2 independent means of communications (e.g. telephone and radio).		*FAB Location Communications* Phone No. : Radio Channel
08	Record Communications using *Communications Log* (attached) If possible, appoint a competent person to do this for you. You must record all "incoming" and "outgoing" messages or communications.		
09	Check that all Fresh Air Base equipment (e.g. fire extinguishers, first-aid kits, emergency equipment, emergency air supply, water, etc) is available and in good working order		
10	Commence on-going monitoring of gas levels (e.g. carbon monoxide, oxygen, and carbon dioxide levels). Record readings at least every 10 minutes or more frequently if the carbon monoxide levels begin to climb. If in doubt, refer to *Emergency Response Coordinator.*		
11	Communicate with the *Emergency Response Coordinator* to advise of relevant team movements and gas analysis results.		
12	Report any changes in recorded gas levels immediately to the *Emergency Response Coordinator.*		

UNDERGROUND DUTY CARD 8 - FAB OFFICER
(Page 3 of 5)

No.	Task Description	Date/Time	Comments
13	Record comings and goings of Emergency Response Team members and any other team members using *FAB Team Members Log* Include arrival and departure times, the number of team members, physical state, expected return time etc.		
14	Arrange for first-aid/medical treatment for any injured Team members and report immediately to *Emergency Response Coordinator.* This may include arranging for transport of injured Emergency Response Team members or others involved in the response effort that have been adversely affected.		
15	Record and relay directions from *Emergency Response Coordinator* to Emergency Response Team Captain, if required.		
16	Record details of all Team members about to enter the irrespirable atmosphere.		Particularly important: □ Response Team □ Responders name □ Cap lamp no. □ Expected duration U/g □ Time anticipated on surface
17	Immediately notify the Emergency Response Team Captain and the *Emergency Response Coordinator* if any Team members are overdue or have not reported in on time.		
18	Provide situation up-dates to *Emergency Response Coordinator* regarding status of response effort and safety of FAB.		Communicate immediately to *Emergency Response Coordinator*, any pertinent changes in incident conditions, and safety of FAB or state of Emergency Response Team members.

UNDERGROUND DUTY CARD 8 - FAB OFFICER
(Page 4 of 5)

No.	Task Description	Date/Time	Comments
19	Ensure materials or supplies ordered from the surface are available in advance of emergent need. Ensure vehicles are unloaded and returned immediately. Appoint persons to unload and check supplies if available		
20	Brief any backup or external assistance teams on: - Communication protocols - Relevant information regarding the mine and its workings.		
21	De-brief the Captain of the returned Operational Emergency Response Team. Obtain the Captain's: - Written report card - First aid card, Ensure documents are kept for the *Emergency Response Coordinator* to take to the de-brief.		
22	Once the "All Clear" is given, ensure Duty Card is completed, signed and returned to Communications Officer (including any completed logs etc)		
23	Attend de-briefing session.		

UNDERGROUND DUTY CARD 8 - FAB OFFICER

Record any additional tasks in the following spaces:

No.	Additional Tasks* Undertaken	Date/Time	Comments

* Use extra sheets, if required

Attached:

Communications Log

FAB Team members Log

Please ensure Duty Card is completed and signed-off before handing to **Communications Officer** (include any additional pages, completed checklists/logs etc

Signed: **Date:**

DATE: **TIME:**

FRESH AIR BASE LOG GENERAL			
INCIDENT CONTROL CENTRE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*
INCIDENT CONTROL TEAM:			
Incident Controller	*Accident Control Officer*	*Communications Officer*	*Emergency Plans Officer*
Resources Officer	*Surface Muster Point Warden*	*Emergency Response Coord.*	*Fresh Air Base Officer*
FRESH AIR BASE:			
Location:	*Incoming Phone No.:*	*Outgoing Phone No.:*	*Radio Channel*

Tasks to be completed prior to arrival of Emergency Response Teams

- ☐ *Watch Synchronized with Emergency Responder Coordinator*
  - o *FAB LOCATION*
    - *Physical Inspection*
    - *Initial Gas Testing*
  - o *Area Safe*
    - *Yes*
    - *No*
- ☐ *Alternate Fresh Air Base Location*

DATE: **TIME:**

FRESH AIR BASE LOG EMERGENCY RESPONDERS					
Release information only as instructed by the Incident Controller					
TIME Arrival at FAB	**NAME of RESPONSE TEAM MEMBER**	**DETAILS** Response Team Cap Lamp No. CONDITION Physical Mental Emotional	**TIME** DEPART FROM FAB	**U/g** Expected duration U/g	**TREATMENT RECOMMENDED** First Aid CIS Debriefing Other

* Use extra sheets, if required

DATE: **TIME:**

FRESH AIR BASE LOG AIR QUALITY				
Release information only as instructed by the Incident Controller				
TIME	**CARBON MONOXIDE**	**OXYGEN**	**CARBON DIOXIDE**	**Notes & Recommendations**

* Use extra sheets, if required

ALEXCO	**SAFETY STANDARD** **WILD LIFE ENCOUNTERS**	Document Number:	ERP-011
		Version Date:	03/31/12
		Version:	01
		Approved by:	Tim Hall

ALEXCO RESOURCE CORP
Effective Date: 03/31/12 Review Date: 09/25/12
Implementation Date:
Revision No.: 01
Review Date: 09/25/12
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure all Alexco Resource Corporation personnel and independent contractors are aware of proper procedures when encountering wildlife on or around the site.

SCOPE

These procedures apply to all employees including independent contractors, working at the Bell Keno Mines and designated sites.

RESPONSIBILITY

Site Manager and Department Managers are responsible for:

- Ensuring sightings that require reporting are reported to the Regional Conservation Officers.

Safety and Health Manager is responsible for:

- Implementing the provisions of this procedure and ensuring that all precautions are taken.

Every individual is responsible for:

- Recording the sighting on the Wildlife Management Log.
- Reporting the sighting to their supervisor.

PROCEDURE

1. IMPACT ON WILDLIFE

The project area provides both year-round and seasonal habitat for wildlife species. Wildlife may be impacted by the loss or modification of habitat and disturbance from vehicles and equipment during sensitive life-cycle periods (e.g., breeding and rearing). The environmental awareness and orientation sessions provide some insight into wildlife encounters.

2. VEHICLE AND EQUIPMENT USE

- Drivers will maintain a safe and appropriate speed on the road and drivers will not chase animals down roads. Instead, drivers will stop and turn off their headlights to allow stressed animals to disperse.

- Hunting and firearm use is not permitted on site unless prior authorisation is obtained from the site manager.
- When encountering wildlife, remember they have the right of way.

  Never feed wildlife! Feeding wildlife may cause them to stay at the site and become habituated to human contact. The consequences of feeding may result in serious harm to humans, and/or the animal being relocated or destroyed.
- If encountering wildlife on the road, stop the vehicle and allow wildlife to pass. Be sure to:
  - Remain in the vehicle.
  - Avoid using the horn.
  - Avoid provoking the animals.
  - Wait for the animal(s) to pass before continuing.
- If you encounter a fox, wolf, wolverine, bear or moose on foot:
  - Back away slowly and do not make direct eye contact.
  - Do not make sudden movements.
  - Call in the sighting by radio as soon as possible without alarming the animal.
  - Stay in radio contact until you are at a safe distance and return to a safe area (e.g., inside a vehicle) as soon as possible.
- Call in wildlife sightings of foxes, wolves, wolverines, bears or moose to your supervisor, and when returning to the camp, fill out the Wildlife Management Log.

RELATED DOCUMENTS

- 0023 - Pedestrian Traffic
- 0006 – Alexco Vehicles and Driving

ALEXCO	**SAFETY STANDARD** **BEAR SIGHTING / CONTACT**	Document Number:	ERP-012
		Version Date:	09/25/11
		Version:	01
		Approved by:	Tim Hall

ALEXCO RESOURCE CORP
Effective Date: 09/25/11Review Date: 09/25/12
Implementation Date:
Revision No.: 01
Review Date: 09/25/12
Prepared By: Neil Bottrell
References: Yukon Occupational Health and Safety Regulations

PURPOSE

To ensure all personnel are aware of the procedure for reporting the sighting of bears and bear/human encounters.

SCOPE

These procedures apply to all employees Alexco Resource Corporation including independent contractors, working at the Bell Keno Mines and designated sites.

RESPONSIBILITY

Site Manager and Department Managers are responsible for:

- Ensuring that this procedure is implemented and maintained.

Supervisors are responsible for:

- Implementing this procedure and educating his/her workforce in this procedure.

Health and Safety Manager or Environmental Technician is responsible for:

- Attending the scene of the sighting with the responding ERT members to help evaluate the situation and determine the appropriate course of action.
- In conjunction with the ERT issue appropriate directives to other personnel on the site (i.e. “bear alert” and all personnel to stay indoors) as required.
- Reporting the bear encounter to the Yukon Conservation Officer.

Every individual is responsible for:

- Reporting the sighting or encounter to the Safety Manager or Environmental Manager or Designates.
- Recording the sighting or encounter in the Wildlife Management Log.
- Ensuring that he / she and others are not at risk

DRAFT

ALEXCO	SAFETY STANDARD BEAR SIGHTING / CONTACT	Document Number:	ERP-012
		Version Date:	09/25/11
		Version:	01
		Approved by:	Tim Hall

OVERVIEW

Black bears and grizzly bears may be active in the area from early May to late October. Due to the potential risk that a bear poses to human safety, it is important that all sightings or encounters with bears be reported immediately. Early detection of bears allows camp personnel time to take appropriate ac

For the purposes of determining the Emergency Response Team (ERT) response, the following definitions are used:

DEFINITIONS

Sighting:

The bear is seen further than 1 km from the camp perimeter, and further than 100 m from any area of human activity.

Encounter:

The bear is seen closer than 1 km to the camp perimeter, and within 100 m to any area of human activity.

WHAT TO DO

SIGHTING

Bears are a common site in and around remote mining facilities. The smell associated with a camp, mine and mill facilities and refuse dumps are very inviting to these large sometimes dangerous animals.

When a bear is spotted outside of 1 kilometer radius from camp or further than 100 meters from human activity:

- Do not approach the bear.
- Alert the site Safety Department or Site Services Supervisor via radio if possible, if you do not have a radio go to the nearest office or occupied building and utilize the radio available there.
- Note the location of the Bear and its direction of travel.
- Warn any other persons in the area of the bear's presence.
- Record the sighting in the wildlife management log.

DRAFT

ENCOUNTER

HOW TO PREVENT BEAR ENCOUNTERS

- Be alert at all times.
- Respect all bears – they can be dangerous.
- Never approach a bear for any reason.
- Never feed bears or other wildlife.
- If leaving the camp ensure someone knows where you are going and when you plan to return. Always carry a portable radio or other communication device to contact the camp.

WHAT TO DO IN THE EVENT OF AN ENCOUNTER

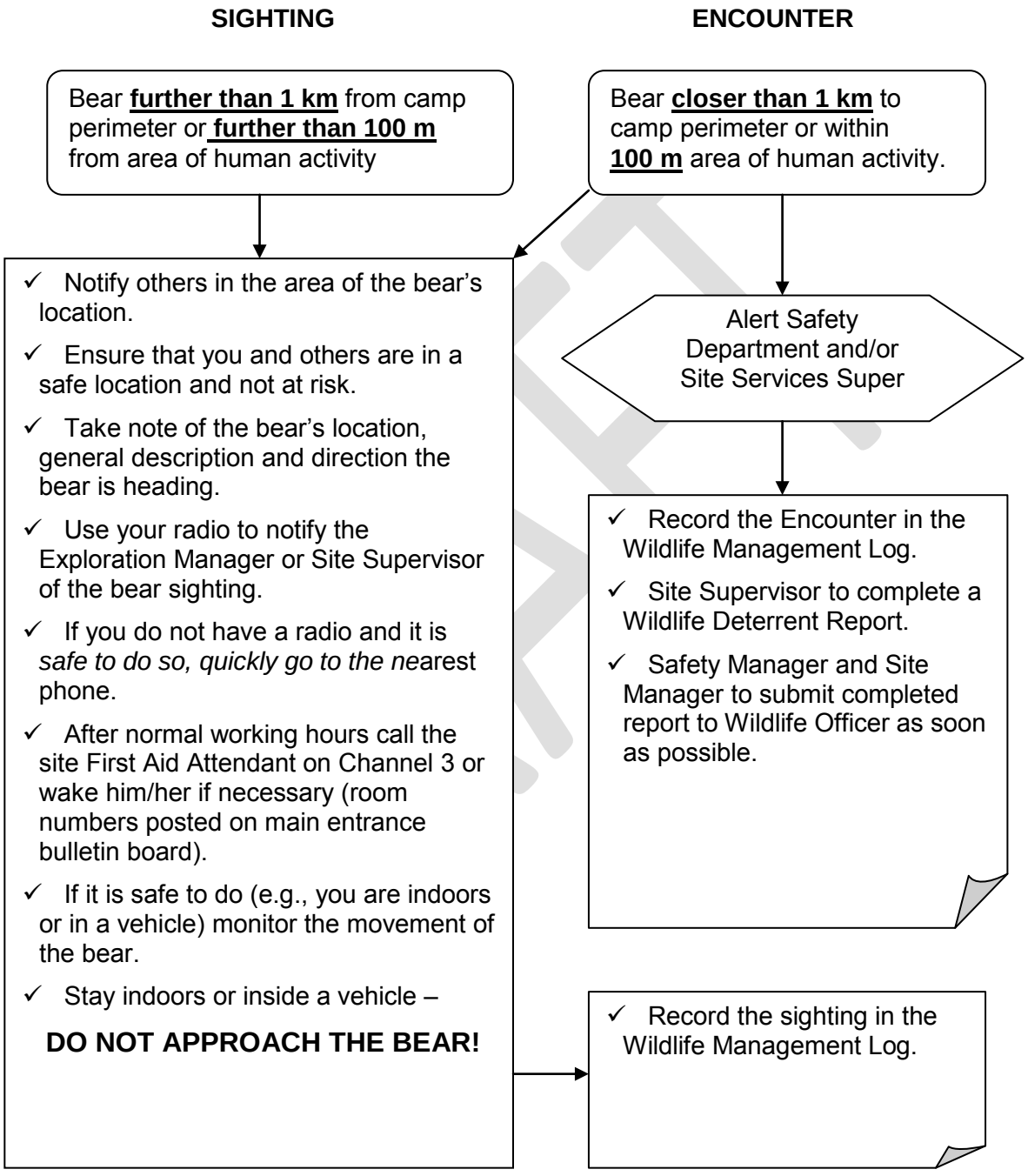
There is always a possibility that you may surprise a bear at close range, or encounter a bear unafraid of people. Though there is no guaranteed formula for reacting to a bear encounter, each one being unique, the following tips may help:

- Stop, stand still and stay calm.
- Assess the situation.
- Slowly back away while keeping your eye on the bear. Do not run.
- If the bear is aware of you, help the bear identify you as human by talking in a low voice and slowly waving your arms. Moving upwind will help the bear get your scent.
- If possible, go to a safe location, e.g., inside a building or vehicle.
- Immediately alert the Safety Department or designate of your situation (by radio if possible) if this individual is not available inform anyone within radio contact.

DRAFT

ALEXCO	SAFETY STANDARD BEAR SIGHTING / CONTACT	Document Number:	ERP-012
		Version Date:	09/25/11
		Version:	01
		Approved by:	Tim Hall

PROCEDURE



Bellekeno Mine Environmental Response Notification Protocol

Applies To: Water Licence : QZ09-092, Metal Mining Effluent Regulations

Foreword: The following notification protocol is to be followed in the event of non-compliance with either Water Licence QZ09-092 or the regulatory requirements of the Metal Mining Effluent Regulations. These steps are to be followed in order to ensure that the non-compliant event is addressed in a timely and appropriate manner.

1) Verification of Non-Compliance

Verification of the situation is the first step that must be conducted immediately on determination that there is a potential situation of non-compliance at the site. We need to ensure proper investigation and reporting of all non-compliant incidents.

Contact Name	Position/Organization	Contact Information
Robert Schneider	**Keno Hill Care and Maintenance Supervisor**	Email: rschneider@accessconsulting.ca Phone: 867-995-3113
Vanessa Benwood	**Keno Hill Site Environmental Coordinator**	Email: vbenwood@alexcoresource.com Phone: 867-334-6002
Tim Hall	**Keno Hill District Manager**	Email: thall@alexcoresource.com Phone: 867-995-3113

On determining that there is a non-compliant event occurring then the remainder of the notification list shown below should be followed. The Keno Hill Site Environmental Coordinator, or their designate, will be responsible for internal notifications.

2) Internal Notification List

Contact Name	Position/Organization	Contact Information
Brad Thrall	**Chief Operating Officer**	Email: bthrall@alexcoresource.com Phone: 604-633-4888 Ext. 133
Jim Harrington	**President – Alexco Environmental Group**	Email: jharrington@alexcoresource.com Phone: 303-808-9101
Tom Fudge	**Senior VP - Eng and Corp Development**	Email: tfudge@alexcoresource.com Phone: (604) 631-4139 Vancouver Office Phone: (867) 996-2330 Keno Hill
Tim Hall	**Keno Hill District Manager**	Email: thall@alexcoresource.com Phone: 867-996-2330 Ext. 5901

		Phone: 778-372-2687 (Mine)
Scott Davidson	**Senior Project Manager – Keno Hill Closure (Access)**	Email: sdavidson@accessconsulting.ca Phone: 867 668-6463
David Petkovich	**Senior Environmental Manager (Access)**	Email: dpetkovich@accessconsulting.ca Phone: 867-668-6463
Scott Keesey	**Environmental Manager (Access)**	Email: skeesey@accessconsulting.ca Phone: 867-668-6463
Scott Smith	**Bellekeno Mine Manager**	Email: ssmith@alexcoresource.com Phone: 867-996-2330 Ext. 5901 Phone: 778-372-2687

3) External Notification List

The Keno Hill Environmental operations Manager, or their designate, will be responsible for the external notifications. Initial notification by e-mail is acceptable but the listed agencies should also be contacted by phone within 24 hours of the e-mail notification.

Contact Name	**Position/Organization**	**Contact Information**
Daniel Wolfish	**Director, Environmental Protection Operations Directorate Environment Canada**	Email: daniel.wolfish@ec.gc.ca Phone: (604) 666-0064
Wade Comin	**Sr. Enforcement Officer Environmental Enforcement Division Environment Canada**	Email: Wade.Comin@ec.gc.ca Phone: 867-667-3470
Troy Searson	**Government of Yukon Water Resources Inspector**	Email: troy.searson@gov.yk.ca Phone: 867-667-3120

Alexco Keno Hill Mining, Bellekeno Minesite

Spill Report Form

1	DATE OF SPILL:	TIME OF SPILL:	SPILL REPORT #:
2	LOCATION OF SPILL:	SITE CONDITIONS (TEMPERATURE, WIND, GROUND PERMEABILITY ETC.):	
3	SAFETY HAZARDS (FIRE, FUMES, EXPLOSIVE SUBSTANCE, ETC):		
4	TYPE OF PRODUCT SPILLED: OIL ( ) GASOLINE ( ) DIESEL ( ) OTHER ( ) _____ QUANTITY RELEASED (IN LITRES):		
5	CAUSE OF THE SPILL (E.G., BROKEN HOSE, VEHICLE ACCIDENT, EQUIPMENT FAILURE, POLICY AWARENESS) Incident Report #_____ (if applicable)		
6	ENVIRONMENTAL CONTAINMENT FACTORS (E.G., NATURAL DEPRESSION/BERM, SNOW)		
7	ACTIONS TAKEN TO DATE TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS:		

8	ENVIRONMENTAL RISK (DESCRIBE DISTANCE TO NEAREST WATER BODY, SENSITIVE HABITAT, WAS IT A SPILL TO GROUND OR WATER ETC.): LOW ( ) MEDIUM ( ) HIGH ( )	
9	SAMPLES TAKEN (DESCRIBE NATURE OF SAMPLES, LOCATION, INTENDED ANALYSIS):	
10	SUBSEQUENT ACTIONS REQUIRED TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS:	
11	RECOMMENATIONS FOR IMPROVEMENTS AND PREVENTATIVE MEASURES	
12	COMPANY / CONTRACTOR INVOLVED:	
13	NAME OF AKHM ONSITE SUPERVISOR(S) AT THE TIME OF SPILL:	DEPARTMENT SUPERVISOR INVOLVED
14	IS THE SPILL REPORTABLE AS PER TABLE 1.0 REPORTABLE SPILL VOLUMES (BELOW)? YES ( ) NO ( ) If **YES** then complete form to the end of section 17 and contact 24-Emergency Spill Line If **NO** then complete form to the end of section 16	
15	HAVE ADDITIONAL LICENCE / PERMIT REPORTING REQUIREMENTS BEEN TRIGGERED BY THIS SPILL? (E.G., MLU LQ00240, WUL QZ09-092, QML-0009) YES ( ) NO ( ) IF YES, NAME LICENCE / PERMIT _____	

16	**INTERNAL REPORTING SEQUENCE** FIRST OBSERVER: NAME COMPANY Department/Position REPORTED TO: NAME COMPANY Department/Position REPORTED TO ENVIRONMENTAL DEPARTMENT: TO WHO BY WHOM DATE/TIME REPORTED TO AKHM MANAGEMENT: TO WHO BY WHOM DATE/TIME
17	**EXTERNAL REPORTING SEQUENCE** REPORTED TO 24-HOUR YUKON SPILL HOTLINE (867) 536-2912: TO WHO BY WHOM DATE/TIME DETAILED WRITTEN REPORT TO YWB, EMR, ENVIRONMENT CANADA, AND NND (REQUIRED WITHIN 10 DAYS OF SPILL): DATE SUBMITTED BY WHOM

NOTE: If needed, contact CANUTEC (national advisory centre offering advice on dangerous goods emergencies) at (613) 996-6666 or (613) 992-4624

ALEXCO

Table 1.0 Reportable spill quantities

TDG Class	Substance for 24-Hour Spill Line	Typical Products on Site	Immediately Reportable Quantities
1	Explosives	ANFO	Any amount spilled outside of blast pattern
2.3 2.3 2.4 6.2 7.0 None	Toxic gas (compressed/non-compressed) Poisonous Gases Corrosive gas (compressed/non-compressed) Infectious substances Radioactive Unknown substance		Any amount
2.3	Non-poisonous Gases		>100 Litres
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non flammable)	Propane Acetylene	Any amount of gas from containers with a capacity >100 Litres
3.1 3.2 3.3	Flammable liquids	Diesel Gasoline Glycol Hydraulic &/ Engine Oil	>200 Litres
4.1 4.2 4.3	Flammable Solids Spontaneously combustible solids Water reactant (dangerous when wet)		>25 kg
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	Sodium Hydroxide Lime Solution Sodium Nitrate Calcium Hypochlorite Ammonium Nitrate	>50 kg or 50 Litres
5.2 9.2	Organic Peroxides Environmentally hazardous		>1 Litre or 1 kg
6.1 8.0 9.3	Poisonous substances Corrosive substances Dangerous wastes (waste oil)	 Hydrochloric / Muriatic Waste Oil	>5 Litres or 5 kg
9.1	PCB Mixtures of 5 or more ppm	Transformer oil	>0.5 Litre or 0.5 kg
9.1	Miscellaneous dangerous goods		>50 kg
None	Other contaminants (eg crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)		>100 Litres or 100 kg
None	Sour natural gas (eg contains H2S) Sweet natural gas		Uncontrolled release or sustained flow of >10 min

STATION.

COOKHOUSE

WR WR

PARKING

BUNKHOUSE 'A'

35	33	31	29	27	25	23	21	19	STORAGE	15	M	FIRE HOSE	REC ROOM	WR	WR	11	9	7	5	3	1
36	34	32	30	28	26	M	24	22	20	18	16	14	WR	WR	L	13	12	10	8	6	4	BOOT ROOM

FX

FX

FX= FIRE EXTINGUISHER

THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

NEW DRY

ALEXCO

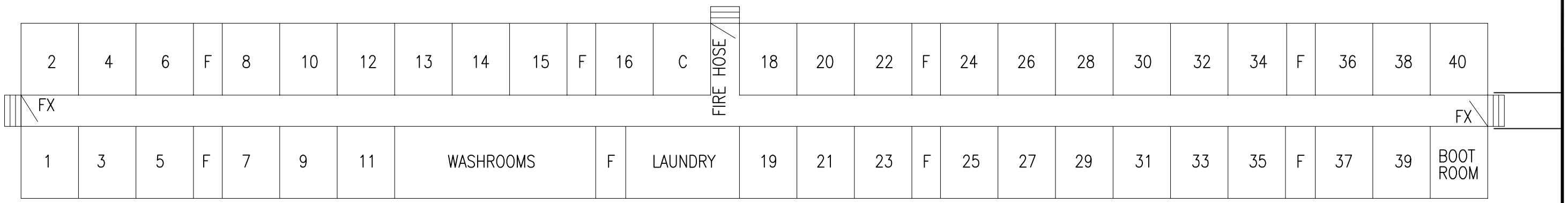
ALEXCO RESOURCE CORP
BELLKENO MINE

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *CAMP COMPLEX*
BUNKHOUSE 'A'

Drawn by: *MIKE MCGREGOR* Scale: *NOT TO SCALE*
Date: *04/27/2011* Approval: Date:
File: *H:\Bellekeno Underground\Engineering - Use me\Fire Escape Plans\TypicalHous*

BUNKHOUSE 'B'



FX= FIRE EXTINGUISHER

THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

ALEXCO

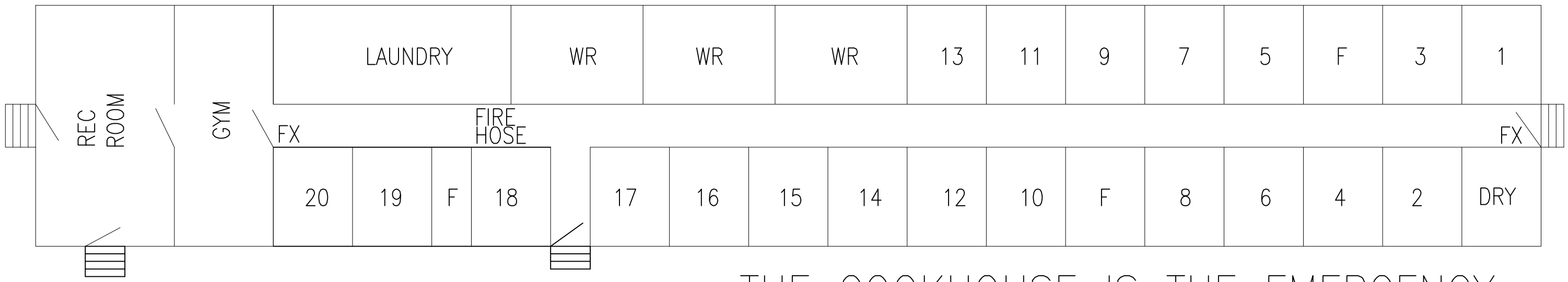
ALEXCO RESOURCE CORP
BELLKENO MINE

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *CAMP COMPLEX*
BUNKHOUSE 'B'

Drawn by: *MIKE MCGREGOR* | Scale: *NOT TO SCALE*
Date: *04/27/2011* | Approval: | Date:
File: *H:\Bellekeno Underground\Engineering - Use me\Fire Escape Plans\TypicalHous*

BUNKHOUSE 'C'



FX= FIRE EXTINGUISHER

THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

ALEXCO

ALEXCO RESOURCE CORP
BELLKENO MINE

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *CAMP COMPLEX*
BUNKHOUSE 'C'

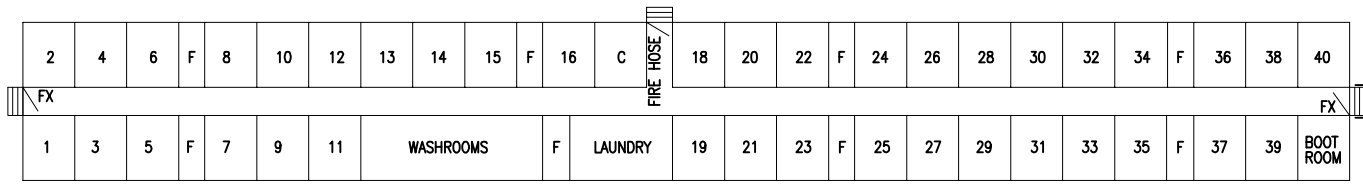
Drawn by: *MIKE MCGREGOR* | Scale: *NOT TO SCALE*
Date: *04/27/2011* | Approval: | Date:
File: *H:\Bellekeno Underground\Engineering - Use me\Fire Escape Plans\TypicalHous*

BUNKHOUSE 'C'

FX= FIRE EXTINGUISHER

THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

BUNKHOUSE 'B'



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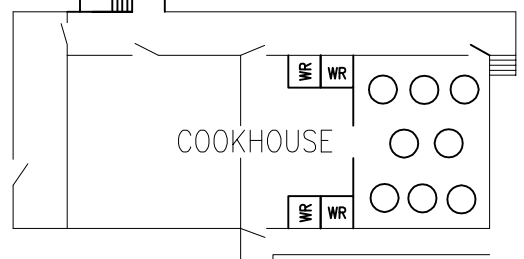
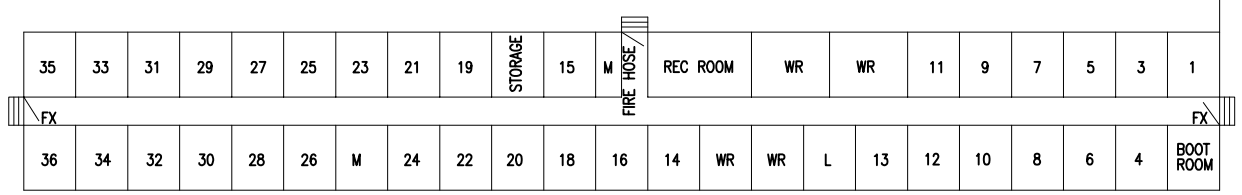
THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.



THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

PARKING

BUNKHOUSE 'A'



FX= FIRE EXTINGUISHER

THE COOKHOUSE IS THE EMERGENCY MUSTER STATION.

NEW DRY

ALEXCO

ALEXCO RESOURCE CORP
BELLKENO MINE

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *CAMP COMPLEX*

Drawn by: *MIKE MCGREGOR*	Scale: *NOT TO SCALE*
Date: *04/27/2011*	Approval: Date:
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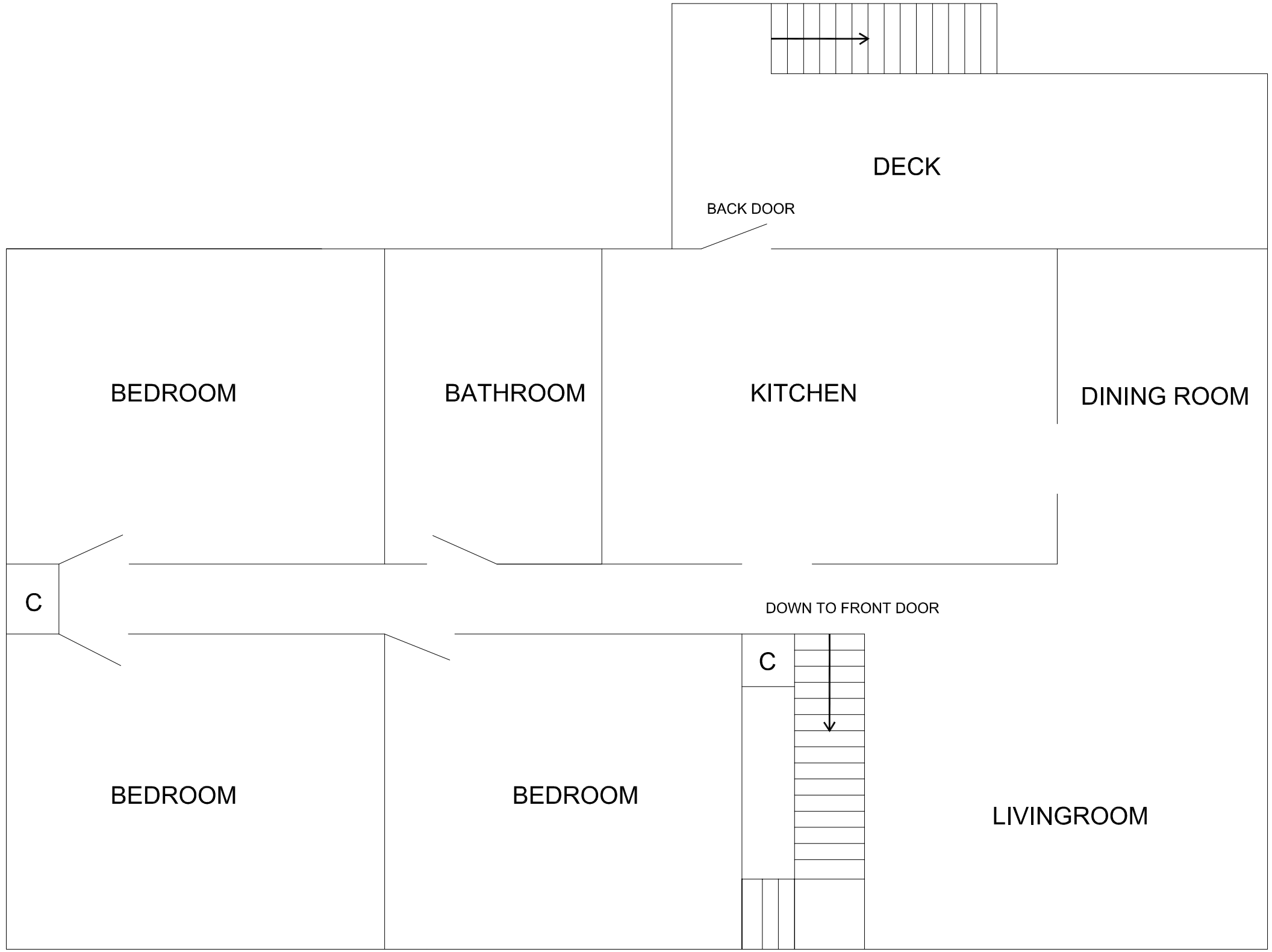

TYPICAL HOUSE - UPSTAIRS

ALEXCO

ALEXCO RESOURCE CORP
BELLKENO MINE

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *TYPICAL HOUSE DRAWING*
UPSTAIRS LAYOUT

Drawn by: *MIKE MCGREGOR*	Scale: *NOT TO SCALE*
Date: *04/23/2011*	Approval: Date:
File: *H:\Bellekeno Underground\Engineering - Use me\Fire Escape Plans\TypicalHous*	

AKHM

ALEXCO KENO HILL MINING CORP.

WASTE MANAGEMENT PLAN

Revision 2

Keno Hill Silver District Mining Operations

November 2013

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1.0 INTRODUCTION

Throughout the course of the Keno Hill Silver District (KHSD) mining operations various forms of waste will be produced and require management to ensure proper disposal under the applicable legislation. As such, the following Waste Management Plan Revision 2 has been prepared to outline the facilities and measures that will be used to manage the waste streams. Because the KHSD mining operations will operate within the context of existing and ongoing care and maintenance and closure planning for the whole Keno Hill Silver District, existing waste management facilities and permits are already in place. However it is anticipated that amendments to existing permits may be required to accommodate wastes generated by mining operations. As the project proceeds and permits are obtained or amended that regulate the management and disposal of waste, this plan will be revised accordingly with approvals appended.

2.0 WASTE MANAGEMENT FACILITIES

2.1 Existing Waste Management Facilities and Permits

A number of existing waste management facilities exist on site and are used in support of care and maintenance and closure activities, and will be amended in order to accommodate waste resulting from mining operations (see Figure 1). Permission to mine and "perform activities and construct improvements collateral to mining" which includes use of waste management facilities has been granted by Elsa Reclamation and Development Corporation (ERDC) to Alexco Keno Hill Mining Corp (AKHM) as set out in Quartz Mining Licence QML-0009. ERDC is a wholly owned subsidiary of Alexco, and will accept, handle and dispose of wastes generated by Alexco from Keno Hill Silver District mining operations according to protocol and permits held by ERDC.

- A Commercial Dump Permit # 81-012 is currently held from YG Environment in accordance with the Environment Act Solid Waste Regulations as well as the Public Health and Safety Act. This permit will continue to be used in support of mining operations.

- Alexco currently holds two (2) sewage disposal system permits at Elsa issued by YG Environmental Health Services: an absorption bed permit for the Flat Creek Camp (Permit #3448) in replacement to a septic tank permit (Permit #3012) and an absorption permit for five houses (Permit #3449) in replacement of a septic tank permit (Permit #3246).

- Part 7 of permit # 81-012 includes provisions for air emissions and replaced Air Emissions Permit # 4201-60-026. Permit # 81-012 permits open burning of > 5 kg of solid waste in an incinerator at the Valley Tailings Landfill area and other landfills around the district. This permit is included as Attachment 2.

- Special Waste Permit # 43-049 is currently held from YG Environment in accordance with the *Environment Act* Special Waste Regulations for burning waste oil, generating and/or storing waste batteries, waste oil, waste solvents, and other special wastes.

2.2 Valley Tailings Landfill

An amendment to existing commercial dump permit # 81-012 has been received from Yukon Environment as per the *Solid Waste Regulations*. This permit allows for the disposal and incineration of solid waste at a number of other landfill locations for district wide decommissioning and reclamation. However, the Valley Tailings landfill will be used exclusively to accommodate solid wastes generated during construction, operation, and closure activities of the Keno Hill Silver District mining operations. The location for this waste management area is north of the Elsa near the Valley Tailings Area (see Figure 1).

Alexco has made a corporate commitment to the residents of Keno City that Alexco and its contractors will not use or add to the Keno City solid waste management facility and landfill, which is located approximately 650m west of Keno City.

2.3 Incinerator

Existing Air Emission Permit # 4201-60-026 is being used in accordance with Yukon Environment Act, *Air Emissions Regulations,* in order to incinerate solid waste from the Bellekeno Mine, and is being amended to include solid waste from other Keno Hill Silver

District mining operations. This facility is located at the Valley Tailings Landfill area (see Figure 1).

The incinerator consists of a burning barrel fabricated from old fuel tanks. Barrels such as these have been successfully utilized in various community dump applications throughout the Yukon as it is a highly efficient method of clean burning waste and mitigating fugitive litter and ash.

Included within the barrels are spark arrestors and ventilation holes. These ventilation holes will create the draft necessary to draw air through the bottom and pull it through to the top of four separate screened stacks. The unit is completely self-contained, requiring no external source of energy to operate.

Onsite managers/operators initiate and monitor the burning of Elsa camp waste on a regular basis.

Refuse originating as camp and office waste, plus warehouse scrap containing some organic wastes are incinerated. Garbage and debris destined for disposal are collected routinely and, prior to incineration, are stored in wildlife proof containers / fenced short term storage areas in a manner which does not attract wildlife to the mine or mill site. Solid wastes are completely incinerated in a manner which minimizes odours and eliminates the attraction of bears and other wildlife to the mine site. Combustible waste containing a fossil fuel by-product shall be drained prior to incineration and that material will be recycled where possible.

The incinerator is located in a remote area approximately 11 km from the nearest community of Keno City. The incinerator is located 2 kilometers north of Elsa camp in a remote location, which will assist in mitigating the impact of emissions on the immediate camp site. The incinerator is set back from the forest edge in an existing clearing, and the incinerator is monitored for proper functioning during use.

Ash from the incinerator is shoveled by heavy machinery (bobcat or loader) on an as needed basis. The ash is transported to and deposited in a constructed trench located adjacent to the burn barrel location. The transportation and deposition of ash waste is dealt with in the solid waste permit.

2.4 Land Treatment Facility

A multi-use Land Treatment Facility (LTF) is currently under consideration and will be located in the vicinity of Elsa for the potential collection, storage and treatment of soil and/or liquid contaminated with petroleum hydrocarbons. In the event of a petroleum spill, the Contaminated Site Regulations will be followed and an LTF will be permitted based on analytical results.

2.5 Sewage Disposal

Numerous separate locations throughout the Keno Hill Silver District require sewage services in order to accommodate mining development and operations, each of whose specific circumstances are dealt with through terms and conditions of permits obtained under the Public Health and Safety Act. Sewage disposal facilities currently include both permanent and portable facilities.

All disposal facilities will comply with the Public Health and Safety Act, *Sewage Disposal Systems Regulations*. In particular, septic tanks, sewage holding tanks or contained privies will be located at least 15 m from the ordinary high water mark (OHWM) of nearby water bodies; while the soil absorption system (or pit privies) will be located not less than 30 m from the high water level of nearby water bodies. Soil absorption systems are not located where soil conditions are unsuitable for absorption of effluent.

2.5.1 Flat Creek Camp and Elsa

Alexco currently holds two (2) sewage disposal system permits at Elsa issued by YG Environmental Health Services: an absorption bed permit for the Flat Creek Camp (Permit #3448) in replacement of a septic tank permit (Permit #3012) and an absorption permit for five houses (Permit #3449) in replacement to a septic tank permit (Permit #3246)

A 36-person trailer camp was established in 2006 and a septic system was installed under permits (#3012 and #3246), including septic tanks and absorption bed. However, the absorption bed was not constructed. In 2008, additional trailer units were added to bring the camp capacity to 100-persons. This required the construction of a new absorption bed system, which was built concurrently and was oversized to handle flow equivalents of 150 persons.

The camp was further expanded to 150 persons during the summer of 2010. This camp expansion utilized the septic absorption bed system constructed in 2008 under permit number 3448.

2.5.2 District Mill Site

The septic system at the District mill site will consist of a holding tank, which will be periodically pumped out and trucked to Flat Creek Camp for disposal.

2.5.3 Bellekeno, Lucky Queen and Onek Mine Sites

The septic systems at each mine site will consist of holding tanks, which will be periodically pumped out and trucked to the Flat Creek Camp facilities for disposal.

2.5.4 Flame & Moth Mine Sites

The septic systems at the Flame & Moth mine site will consist of holding tanks, which will be periodically pumped out and trucked to the Flat Creek Camp facilities for disposal.

2.6 Sediment Control & Events Ponds

During construction the accumulated sediment within the sediment control & events ponds will be collected as required and buried below ground away from drainage flow paths and watercourses.

3.0 WASTE STREAMS & SEGREGATION

The types of waste that will be managed at the site include:

- Solid Waste (non-hazardous)
    - Putrescible (i.e. camp refuse)
    - Non-putrescible (i.e. burnable or non-burnable)
- Special wastes (i.e. waste oil, batteries – only to be segregated and stored temporarily)

3.1 Solid Waste (non-hazardous)

Kitchen / organic waste is temporarily stored in clear plastic bags inside a 10'x10' bear proof steel clad shed (previously an explosives magazine) at the camp site with a 1" thick steel door with heavy clasp for security. The bin is emptied daily and taken to the incinerator for immediate burning.

Waste that is non-burnable, non-hazardous, and non-recyclable will either be temporarily stored in steel bins at the valley tailings landfill area (e.g. construction wastes) or in the steel clad bin at the camp site (e.g. washed out containers for non-hazardous contents). This waste, along with incinerator ash is buried within the dump. Material will periodically be covered with a layer of soil to prevent the loss of waste through wind action.

Used tires requiring disposal and have a rim size of 24.5 inches or greater are buried within the commercial dump at the valley tailings landfill. Used tires requiring disposal with a rim size of 24.5 inches or less will be dealt with in accordance with the Yukon Used Tire Management Program and transported off site to an approved facility.

3.2 Special Waste

Any special wastes, as defined by the *Special Waste Regulations* (batteries, used oil, antifreeze, solvents), are collected and stored in specially marked containers and then shipped to an appropriate treatment or disposal facility. Wildlife-proof rig bins are used to provide segregated storage for solid waste that cannot be burned and special wastes in compliance with *Special Waste Regulations*.

Alexco's wholly owned subsidiary Elsa Reclamation and Development Company holds Special Waste Permit # 43-049 for this project and will comply with the Yukon *Special Waste Regulations* and track wastes through the use of Transportation of Dangerous Goods Waste Manifests. Special wastes generated from the Bellekeno Project will be disposed of in accordance with Special Waste Permit # 43-049. Special Waste Permit # 43-049 includes authorization to use a waste oil burner at the site (in Elsa) as per the *Special Waste Regulations.* Waste oil is burned and used as a source of heat.

A concrete floor will be provided throughout the truck maintenance area and will be sloped towards a dry sump, which will collect any wash solutions and petroleum products that result from the maintenance activities. Oil-absorbent products will also be used on the shop floors.

Any accumulated sump water will be separated and oils will be pumped to the waste oil tank or empty drums. All oily wastes from oil changes, including the sump separation products and absorbent, will be hauled off the site for disposal or recycling in an environmentally acceptable manner or disposed of in the waste oil burner. An oil and water separator is used in the truck shop to capture oil, which is then taken offsite by the oil supplier for disposal or disposed of in the waste oil burner.

The lubrication bay of the maintenance shop has a vacuum evacuation system for waste oil. Hose reels feed from the lubrication storage area and dispense antifreeze, grease and various grades of oil to the lubrication bay.

3.3 Waste Management Matrix

Both controlled / hazardous and non-controlled / non-hazardous materials are dispensed of accordingly. Signage will be in place to assist in proper segregation of wastes. The general projected types of waste expected to be disposed of at the commercial dump for the project are presented in Table 1 while Figure 1 follows and shows the general location for the commercial dump.

Table 1 Waste Management Matrix

Type of Waste Generated	On Site Storage Method	On Site Storage Location	Disposal Method
Non-Controlled Materials			
Incinerator Ash	Open top drums with sealable lids.	N/A	Incinerator ash will be removed from the incinerator with machinery and hauled directly into the dump.
Scrap Steel	N/A	Waste management area	Segregated and recycled or buried.
Wood - Burnable	N/A	Waste management area	Incinerated.
Kitchen /Camp Waste	Clear plastic bags inside 10'x10' steel clad with a 1" thick steel door with heavy clasp for security.	Within camp	Bin shall be emptied daily and taken to the incinerator for immediate burning.
Construction Waste - drywall, glass, insulation, electrical wire, etc. (non hazardous)	Steel bins.	Waste management area	Bins shall have their contents emptied into the dump and buried.
All tires with a rim size of 24.5 inches or greater.	These tires will be taken directly to the ash disposal area.	N/A	These tires will be buried.
All tires with a rim size of 24.5 inches or less.	These tires will be placed in a segregated area within the waste management area.	Shall be stored in a segregated area determined by managers. Location will be clearly labeled.	These tires will be transported off site to a regulated and permitted dump with tire segregation on an as required basis.
Plastic containers - non hazardous contents	Containers will be inside placed 10'x10' steel clad with a 1" thick steel door with heavy clasp for security. Containers shall be washed out completely and not contain any residual.	Within camp	Bin shall be emptied as required and taken to the incinerator for immediate burning.
Metal containers - non hazardous contents	Containers will be inside placed 10'x10' steel clad with a 1" thick steel door with heavy clasp for security. Containers shall be washed out completely and not contain any residual.	Within camp	Bin shall be emptied as required and taken to the dump to have the contents buried.
Glass containers - non hazardous contents	Containers will be inside placed 10'x10' steel clad with a 1" thick steel door with heavy clasp for security. Containers shall be washed out completely and not contain any residual.	Within camp	Bin shall be emptied as required and taken to the dump to have the contents buried.
Controlled Materials			
Batteries	Lined wooden box	Segregated area at waste management area. Clearly labeled.	Batteries will be placed in an upright position within a 4'x4' box. When the 4'x4' box is full, another will be built and the full box shall be shipped off site to the local Waste Management facility in Whitehorse. Appropriate measures will be taken to ensure batteries remain upright during transport (i.e. waste construction wood will be used as filler to take up extra space).
Used Oil	Used oil will be placed in a 300 gallon container located in a bermed area.	Enclosed tanker.	When the container is full, the oil will either be transported to a waste oil burner onsite or management will contact a local supplier to transport oil to a recycling facility offsite.
Fuel Filters	Open top drums with sealable lids.	Waste management area - segregated special waste storage area.	Residual oil and fuel will be drained from filters into waste oil/fuel storage containers.
Antifreeze	Closed top drums with both bungs.	Segregated lined area at waste management area. Clearly labeled. Bungs sealed tight.	When enough drums are gathered up they shall be palletized in similar groups of 4 and banded together for shipment to the local Waste Management facility in Whitehorse.
Solvents	Closed top drums with both bungs.	Segregated lined area at waste management area. Clearly labeled. Bungs sealed tight.	When enough drums are gathered up they shall be palletized in similar groups of 4 and banded together for shipment to the local Waste Management facility in Whitehorse.

475000 480000 485000

7090000 7085000

N W E S

Christal Creek

SILVER TRAIL HIGHWAY

Star Creek

No Cash Creek

McQuesten Creek

Sandy Creek

Erickson Creek

Gulch

INCINERATOR

SORTED WASTE

Porcupine Gulch

Brefalt Creek

HISTORIC LANDFILL

ELSA SPECIAL WASTE STORAGE

Flat Creek

Galena Creek

FLAT CREEK CAMP

WASTE STORAGE

LUCKY QUEEN MINE SITE

ONEK MINE SITE

DISTRICT MILL SITE

Christal Lake

WASTE STORAGE

FLAME AND MOTH MINE SITE

KENO CITY

Lightning Creek

BELLEKENO MINE SITE

Thunder Creek

HILL

GALENA

SOURDOUGH HILL

Duncan Creek

Forty Creek

475000 480000 485000

7085000

Site hydrography and contours provided by Aero Geometrics LTD, derived from aerial photograph.

Datum: NAD 83; Map Projection: UTM Zone 8N

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1:43,774 (when printed on 11 x17 inch paper)

0 0.5 1 2 Kilometers

- Incinerator
- Historic Landfill
- Waste Storage; Sorted Waste
- Highway
- Secondary
- Track
- 100 meter contour
- Watercourse
- Waterbody
- Valley Tailings
- As Built, Tailing Stockpile, Sept 2013
- Mill Site Footprint

AKHM

ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 1

WASTE MANAGEMENT PLAN

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Mapl\02_Permit\WasteManagement\WasteManagementPlan_20131122.mxd
(Last edited by: jpan; 2013-11-22/12:02 PM)

4.0 ATMOSPHERIC EMISSIONS

Alexco has implemented the following measures with respect to the control of atmospheric emissions generated as a result of waste management activities:

Fugitive Dust	• Minimize the footprint of waste management activities that may generate fugitive dust; • Use dust suppression measures where necessary to control generated fugitive dust such as watering haul roads and waste management areas (ensuring water quality standards identified for release into receiving waters are met); • Progressively reseed/reclaim disturbed waste management areas that may contribute to fugitive dust as far as possible.
Combustion	• Ensure proper maintenance of vehicles, pumps, compressors, generators, and other equipment used for waste management activities to minimize emissions of polluting gases; • Use low sulphur fuels including diesel fuel with a sulphur content <15 ppm and propane with negligible sulphur content and where appropriate, waste heat recovery and energy efficient techniques will be employed to decrease diesel use. • Ensure that incinerator is well maintained and operated at peak efficiency

More general details regarding dust suppression/management measures and dust modeling which has been undertaken can be found in the Mill Development and Operation Plan and the Dry Stack Tailings Facility Development and Operation Plan, respectively.

5.0 SLUDGE MANAGEMENT

Sludge produced from the Bellekeno mine is currently disposed of in accordance with the district wide Sludge Management Plan under QZ06-074 at the Valley Tailings Area. Sludge from the Onek 400 Water Treatment Plant will also be disposed of in the Valley Tailings Area. The Sludge Management Plan will be updated accordingly.

AKHM

ALEXCO KENO HILL MINING CORP.

SPILL CONTINGENCY PLAN

KENO HILL SILVER DISTRICT

November 2013

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1 INTRODUCTION

This guide sets out the response protocol in the event of a spill for all hazardous substances used throughout the course of the Keno Hill Silver District (KHSD) mining operations. Additional information pertaining to hazardous materials can be found in the Hazardous Materials Management Plan. Additional information pertaining more broadly to emergencies and incidents of all kinds are laid out in the Emergency Response Plan.

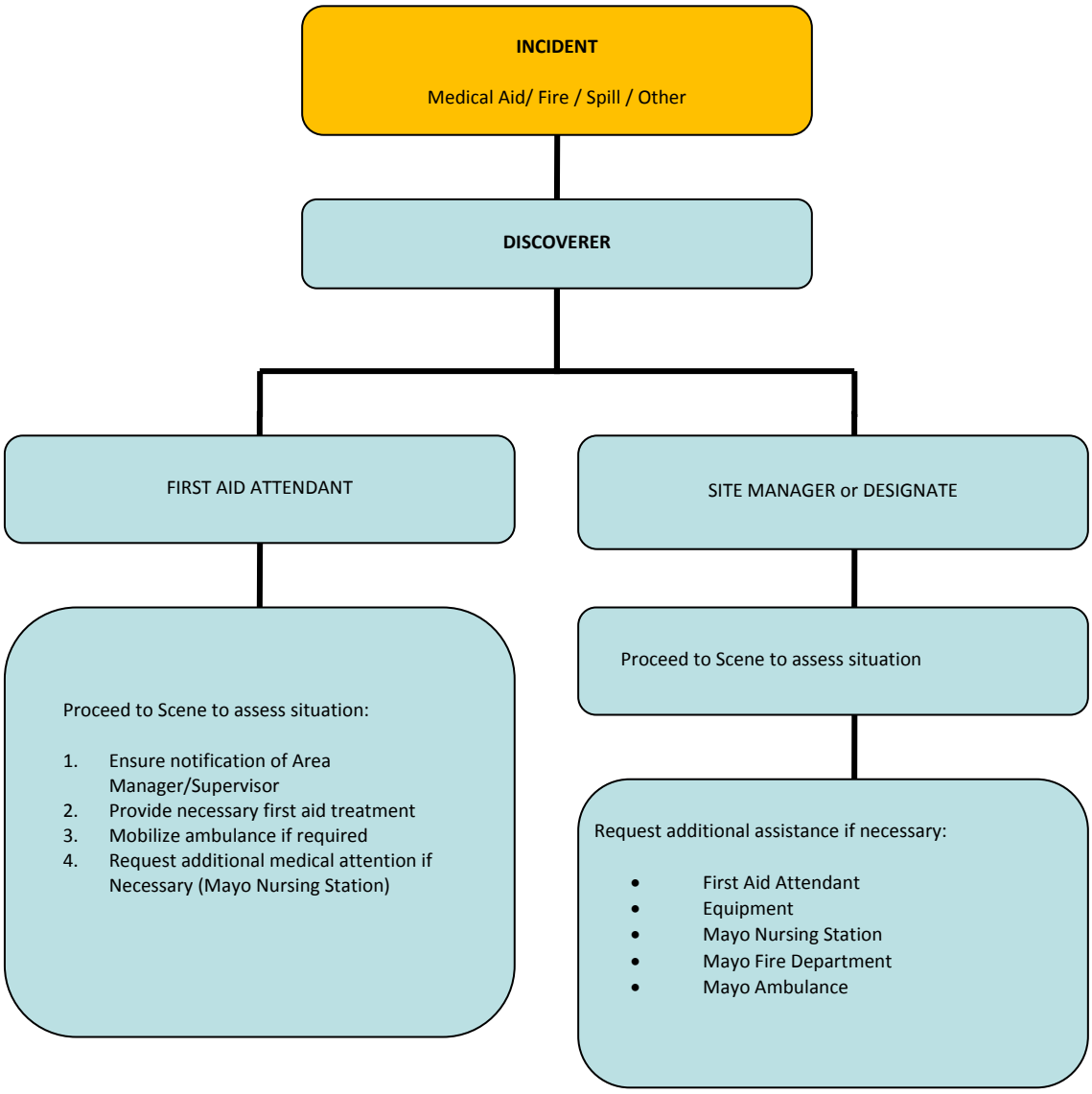
2 DEFINITIONS

A "Serious Incident" is defined as any occurrence meeting one or more of the following criteria:

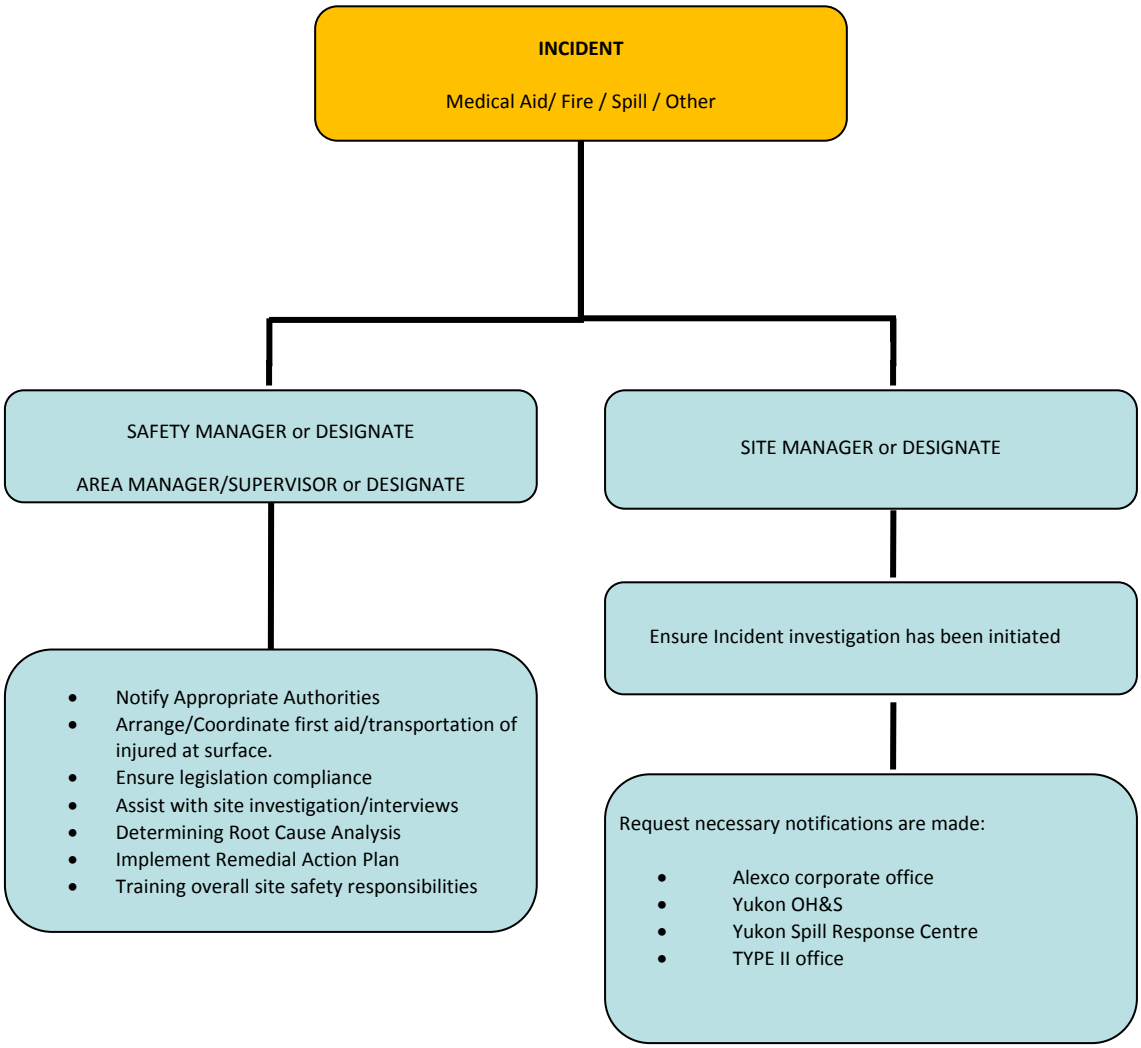
1. Any "serious injury" or "serious accident" as defined in OH&S 33(1) (see Section 2.2),
2. Any incident requiring first aid or rescue response to the scene,
3. Any fire requiring discharge of a fire extinguisher,
4. Any release of mill process solution outside of containment,
5. Any release of a hazardous product where there is potential for that product to enter a waterway,
6. Any hazardous product spill of reportable volume, as defined in Section 6.0.

Thus, as per OH&S 33(1) Section 2.2, spills as described above are to be treated as "serious incidents" and will be followed up as per the protocol as described below:

3 INITIAL RESPONSE TO SERIOUS INCIDENT – KENO HILL SILVER DISTRICT MINING OPERATIONS



4 FOLLOW-UP TO SERIOUS INCIDENT



5 SERIOUS INCIDENT RESPONSIBILITY MATRIX

Position	Responsibilities
Area Manager/Supervisor	• Coordinate initial response • E.R.T. and specialized resources mobilization & consultation • Attend and coordinate response for all incidents involving "serious injury" and "serious accident", as defined in Sec. 33, OHS Act • Initial scene control • Responsible for investigation – determine contributing causes and take immediate proactive action • Request additional external resources as necessary • Coordinate recovery and investigative activity • Notify Site Manager • Ensure all government reporting has been completed • Organize and conduct post-incident debriefings • Prepare Incident Report and make recommendations
First Aid Attendant	• Ensure area supervisor has been notified of incident • Provide first aid treatment if necessary • Mobilize ambulance to scene, if required • Stand by to assist as required by scene coordinator
Site Manager	• Designate on-call senior personnel during weekends • Receive briefings on incident details • Provide direction as required • Notify regulatory agencies, government and Alexco corporate office of incident • Review Incident Reports • Attend at all incidents involving "serious injury" and "serious accident", as defined in Sec. 33, OHS Act • Verify compliance with standards and government regulatory requirements • Forward necessary reports to regulatory agencies • Fire Chief – assume responsibility for fire investigation
Safety Manager	• Notify appropriate authorities • Arrange/Coordinate first aid/transportation of injured at surface • Ensure legislation compliance • Assist with site investigation/interviews • Determining Root Cause Analysis • Implement Remedial Action Plan • Training overall site safety responsibilities

6 REPORTABLE SPILL QUANTITIES

Should a spill of reportable quantity occur, under federal and territorial regulations, we are required to immediately notify the 24-hour Yukon Spill Report line: telephone number 867-667-7244.

For the purposes of the water use license:

1. Any quantity of spill is reportable.
2. The Site Manager, Area Manager/Supervisor or Manager On-Call are responsible for reporting spills.
3. Reportable spills require an Incident Investigation Report to be completed.

This guide will assist in determining what volume of product requires reporting to regulatory agencies.

If a spill is deemed to be of reportable quantity, the Area Manager/Supervisor will immediately notify the Site Manager who will in turn ensure that spill reporting is completed by designated personnel.

Reportable Spill Quantities

HAZARD Class	Typical Products On Site	Reportable Quantity
Explosives (1)	• ANFO	Any amount spilled outside of blast pattern
Flammable Gases (2.1)	• Propane • Acetylene	From a container lager than 100 Liters
Non-Flammable Gases (2.2)	• Halon	From a container larger than 100 Liters
Poisonous Gases (2.3)		Any Amount
Non-poisonous Gases (2.3)		>100 Liters
Corrosive Gases (2.4)		Any Amount
Non-corrosive Gases (2.2)		>100 Liters
Flammable Liquids (3.)	• Diesel • Gasoline • Glycol • Hydraulic &/or Engine Oil	>200 Liters
Flammable Solids (4.)		>25 kg
Spontaneous Combustibles (4.)		>25 kg
Dangerous When Wet (4.)		>25 kg
Oxidizers (5.1)	• Sodium Hydroxide / Caustic Soda • Lime Solution • Sodium Nitrate • Calcium Hypochlorite • Ammonium Nitrate	>50 kg or 50 Liters
Toxic Substances (6.1)	• Products or substances that are poisons of as defined in sections 3.19(a) to (e) and 3.20(a) of the Federal Regulations	5 kg or 5 L
Infectious substances such as biomedical waste (6.2)	• Organisms that are infectious or that are reasonably believed to be infectious and the toxins of these organisms as defined in sections 3.19(f) to 3.20(a) of the Federal Regulations	Any Amount
Corrosive Materials (8.)	• Hydrochloric / Muriatic	>5 kg or 5 Liters
Miscellaneous Dangerous Goods (9.1)		>50 kg
Dangerous Waste (9.3)	• Waste Oil	>500 mL

7 SPILL RESPONSE EQUIPMENT RESOURCE LIST

	Location	Contact
Spill Response Kit	• Bellekeno East Fuel Tank • Bellekeno East Shop • Bellekeno 625 Adit • Keno District Mill • All Vehicles Carrying Hazardous Materials • Lucky Queen Fuel Tank on portal pad • Onek Fuel Tank on portal pad	Area Manager/Supervisor
Oil- Absorbent Pads	• In Spill Kits	Area Manager/Supervisor
Oil- Absorbent Booms	• In Spill Kits	Area Manager/Supervisor

Any contaminated soils will be removed to location of the future land treatment facility in Elsa and stored covered on a liner until the permitting and construction of the facility is completed.

All vehicles carrying hazardous materials will be equipped with a spill kit and personnel will be trained in spill response measures.

8 EMERGENCY EQUIPMENT AND EQUIPMENT LOCATIONS

Emergency Equipment	Location	Use is Authorized by:
Ambulance 4x4 Suburban with Stretchers	Elsa Town site Fire hall	Site Manager Area Manager/Supervisor First Aid Attendant
(MMTU) Mobile Medical Treatment Unit 4 x 4 Truck with Stretchers	Bellekeno Mine Site	Site Manager Area Manager/Supervisor First Aid Attendant
AED Automatic External Defibrillator Use when CPR is required	Admin First Aid Room Black and Neon ZOLL – AED Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Oxygen **Airway Adjuncts (OPA)**	MMTV First Aid Jump Kit Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Spinal Precautions Spine Boards & Head Blocks Stiff Collars Spyder Straps KED – Vehicle extrication device	Ambulance MMTV Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Splints Vacuum Splints – Extremity breaks	Admin First Aid Room Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
Wound Management **Burn Dressings** Sterile Water Bandages & Dressings	Ambulance MMTV Admin First Aid Room First Aid Jump Kit Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant
EPI Pens Anaphylactic Shock / allergies	Ambulance MMTV Admin First Aid Room First Aid Jump Kit Bellekeno E. First Aid Room Lucky Queen First Aid Room Onek First Aid Room Keno District Mill First Aid Room	Site Manager Area Manager/Supervisor First Aid Attendant

9 MSDS INFORMATION AND PERSONNEL TRAINING

Type	Information
Hazardous Materials Storage	• All hazardous materials will be stored safely and appropriately • All hazardous materials will be segregated and stored to ensure integrity of product containers, avoidance of accidental mixing, and safety from weather effects • Hazardous materials will be stored in locations with secondary containment measures in place in order to limit potential for spills • A complete listing of MSDS sheets for all hazardous materials and spill response strategy protocol will be made available to all employees and will be located at the following locations: o Administration Office o Bellekeno East, Lucky Queen and Onek Shifters Office o Care & Maintenance Shop o First Aid Room(s) o General/Site Managers Workspace o Kitchen Medical Station o Mine Rescue Shed – Bellekeno East o Safety Coordinators Office o Keno District Mill Office o Explosives Magazines
Employee Training	• All employees involved with handling hazardous materials will receive training in safe and appropriate use as per Workplace Hazardous Materials Information Systems Regulations (WHMIS) of the Occupational Health and Safety Act. • All employees will follow OH&S and regulations and use appropriate Personal Protective Equipment (PPE) and handling procedures when using hazardous materials
Spills and Emergencies	• All spills will be dealt with as per measures described in the Emergency Response Plan • Should a spill of reportable quantity occur, the 24 hour Yukon Spill Report line (867-667-7244) will be immediately notified
Signage and Monitoring	• All areas which will be used to store hazardous materials will be clearly indicated with appropriate signage • Monitoring of areas which will be used to store hazardous materials will be monitored on a regular basis in order to ensure measures set out in this plan are complied with

ALEXCO KENO HILL
MINING CORP.

HAZARDOUS MATERIALS MANAGEMENT PLAN

KENO HILL SILVER DISTRICT MINING OPERATIONS

NOVEMBER 2013

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1 INTRODUCTION

The following Hazardous Materials Management Plan has been assembled to define a protocol for safe handling, storage, and monitoring of hazardous materials during the undertaking of the Keno Hill Silver District Mining Operations. The primary goals of this plan are to ensure the safety of employees and the protection of the environment. A summary of the Hazardous Materials Management Plan is presented below in Table 1-1.

Table 1-1 Hazardous Materials Management Plan Summary

Hazardous Materials Storage	• All hazardous materials will be stored safely and appropriately as per material safety data sheets (MSDS) • All hazardous materials will be segregated and stored to ensure integrity of product containers, avoidance of accidental mixing, and safety from weather effects • Hazardous materials will be stored in locations with secondary containment measures in place in order to limit potential for spills • A complete listing of MSDS sheets for all hazardous materials and spill response strategy protocol will be made available to all employees and will be located at the following locations: o Administration Office o Bellekeno , Lucky Queen, Onek and Flame and Moth Shifters Office o Maintenance Shop o First Aid Room(s) o General, Site and Department Managers Workspace o Kitchen Medical Station o Mine Rescue Sheds – Bellekeno , Lucky Queen, Onek and Flame and Moth o Safety Manager/Coordinators Office o Keno District Mill – Reagent Storage Facility
Employee Training	• All employees involved with handling hazardous materials will receive training in safe and appropriate use as per Workplace Hazardous Materials Information Systems Regulations (WHMIS) of the Occupational Health and Safety Act. • All employees will follow OH&S and regulations and use appropriate Personal Protective Equipment (PPE) and handling procedures when using hazardous materials
Spills and Emergencies	• All spills will be dealt with as per measures described in the Emergency Response Plan • Should a spill of reportable quantity occur, the 24 hour Yukon Spill Report line (867-667-7244) will be immediately notified
Signage and Monitoring	• All areas which will be used to store hazardous materials will be clearly indicated with appropriate signage • Monitoring of areas which will be used to store hazardous materials will be monitored on a regular basis in order to ensure measures set out in this plan are complied with

As with any industrial undertaking, a number of hazardous materials are used for various purposes and various locations during the project. Primarily, these materials include fuels and lubricants used for the operation of surface and underground equipment, chemicals for water treatment, explosives for underground mining, and reagents used for the mill flotation processes.

2 STORAGE OF HAZARDOUS MATERIALS

All the reagents will be prepared in a separate reagent preparation and storage facility in a containment area inside the Keno District Mill building. The reagent storage tanks are equipped with level indicators and instrumentation to ensure that spills do not occur during normal operation. Appropriate ventilation and fire and safety protection are provided at the facility.

All solid reagents such as copper sulphate, zinc sulphate, sodium sulphite, and SIPX are dissolved, mixed, and diluted prior to being transferred into separate holding tanks from where the reagents are distributed to various addition points.

Lime is mixed and stored in a dedicated solution storage tank located inside the mill building. Lime is mixed in the Elsa care and maintenance lime mixing building and transported from the Elsa mixing facility and delivered into the lime solution storage tank.

Liquid collectors and frother are stored in separate holding tanks prior to being pumped in undiluted form to various addition points. Anti-scale chemicals may be required to minimize scale build-up in the reclaim or recycle water lines. This reagent will be delivered in liquid form and metered directly into the reclaim water tank.

Please see Material Safety Data Sheets, presented as Appendix A, for detailed toxicological as well as human health and safety considerations for all mill reagents. Emergency response planning and medical considerations are presented in Section 4.0, *Human Health & Safety*.

The majority of mill reagents are received in bulk, such as palletized bags, chemtainers, drums, or bulk bags.

The covered and curbed reagent storage and preparation area is located adjacent to the flotation area. A forklift with a drum handler attachment is used for reagent handling, while the electric hoist servicing the mill and reagent areas is used to lift the reagents to the respective reagent mixing area located above the mixed reagent storage area. The reagent system includes unloading and storage facilities, mixing tanks, transfer pumps, and feeding equipment. Table 2-1 below shows the reagents specified for use in the Keno District Mill.

Table 2-1 Summary of Reagents – Keno District Mill

	Preparation Method	Use
Flocculant	Received as powder in 25 kg bags; mixed to 0.3% storing strength; transferred to a storage tank and dosed directly to thickeners following further dilution to 0.3% dosing strength.	Flocculation of flotation tailings and flotation lead and zinc concentrates in thickeners.
Copper Sulphate-Regulator	Received as powder in 25 kg bags; mixed to 10% strength; transferred to a storage tank. Dosed to the zinc flotation circuit.	Regulator for zinc sulphide minerals in flotation process.
MIBC-frother	Received as liquid in 200 L drums; dosed undiluted to lead and zinc flotation circuits.	Promotion and stabilization of froth bubbles in flotation cells.
SIBX-collector	Received as powder in 25 kg bags; mixed to 10% strength; transferred to a storage tank. Dosed to both lead and zinc flotation circuits.	Collector reagent for sulphide minerals into the froth phase of the flotation cells.
3418A-collector	Received as liquid in 200 L drums; dosed undiluted to lead flotation circuit.	Collector reagent for lead and silver sulphide minerals into the froth phase of the flotation cells.
Zinc Sulphate Regulator	Received as powder in 25 kg bags; mixed to 10% solution strength; transferred to a storage tank. Dosed to the primary grinding and lead flotation circuit, if required.	Regulator of lead sulphide minerals in flotation process.
Sodium Sulphite Regulator	Received as powder in 25 kg bags; mixed to 10% solution strength; transferred to a storage tank. Added to the primary grinding and lead flotation circuit if required.	Regulator of lead sulphide minerals in flotation process.
Lime Regulator	Received as powder in 1 ton bags, mixed to 20% storing strength; transferred to a storage tank and dosed directly to lead regrind and zinc flotation circuits.	
Sulfuric Acid	Received in totes, stored in lab and/or warehouse	Used for testing purposes on a as-needed basis
Ferric Chloride	Received in 1 gallon plastic containers, stored in lab and/or warehouse	Used for testing purposes on a as-needed basis

2.1 UNDERGROUND CHEMICAL SUBSTANCES

Chemical substances used during underground mining operations will follow all applicable regulations, acts, and permits if required. Substances will be handled and stored in a manner that prevents its release into the environment. In addition, these substances will be stored and handled as per specified requirements indicated by MSDS sheets. Table 2-2 below presents chemical substances and fluids used underground at mines within the Keno Hill Silver District..

Table 2-2 List of Fluids Used Underground

Manufacturer	Product	Designation	Container Type	Max Volume/ # Stored Bellekeno (400tpd)	Max Volume/ # Stored Onek (400tpd)	Max Volume/ # Stored Lucky Queen (100tpd)
Esso	Engine Oil	10W30	5 gallons	10	10	5
Esso	Engine Oil	10W	5 gallons	10	10	5
Esso	Engine Oil	15W40	5 gallons	10	10	5
Esso	Grease	OBRA 30W	5 gallons	6	6	3
Esso	Gear Oil	GX 75W-80W	5 gallons	7	7	4
Esso	Gear Oil	GX 80W-90	5 gallons	7	7	4
Esso	Drill Oil	AROX EP100	5 gallons	15	15	8
Esso	Grease	ARGON EP1	5 gallons	6	6	3
Esso	Grease	UNIREX EP2	5 gallons	6	6	3
Esso	Antifreeze	HD 60/40 Premix	5 gallons	7	7	4
Esso	Hydraulic Oil	HYDRAUL 56	5 gallons	7	7	4
AFD	Fuel	Low Sulphur Diesel S15	#807	30, 000 Litres	30,000 Litres	30,000 Litres
-	Fuel	Low Sulphur Diesel S15	E17-500 Genset	2,100 Litres	2,100 Litres	2,100 Litres
	rock-lock (resin epoxy)		12 kg boxes	100 kg	100 kg	50 kg
	Explosive - multiple kinds		TBD	TBD	TBD	TBD
	Soaps and solvents		5 gallons	1	1	1
	Drilling muds and lubes and polymers		5 gallons	10	10	5
	Paste fluids, lubrication		TBD	TBD	TBD	TBD
	Transmission oil		5 gallons	4	4	2

* TBD – To be Determined

3 HUMAN HEALTH AND SAFETY

A Nursing Station is located in Mayo, which is approximately 65 kilometers from the Keno Hill mining operations. This facility is staffed by two full-time nurses and an occasional physician / specialist. There is an ambulance at the Nursing Station, which is staffed by volunteers. All serious accidents/illness are stabilized in Mayo, and then taken by Air Ambulance to Whitehorse for further treatment.

Alexco provides 24 hour first aid coverage and owns two ambulances; one that is stationed at Elsa, with another ambulance stationed at the Bellekeno East Portal. Ambulances are staffed by the first aid attendants and driven by Alexco employee volunteers. In event of an injury, patients would be stabilized, and then transported if necessary to Mayo in Alexco's ambulance. For serious accidents/illnesses, dispatch of the ambulances are coordinated so that there is a transfer from the Alexco ambulance to the Mayo ambulance (if available) about halfway between Mayo and Elsa. First Aid facilities are located at the Elsa administration building, Bellekeno Mine First Aid Room, Lucky Queen and Onek mine offices and the Keno District Mill. The

first aid facility at the Keno District Mill serves as the first aid facility for development and operation of Flame and Moth.

An Emergency Response Plan has been set in place to minimize effects of environmental disturbances and the resultant hazard to people, aquatic systems, and wildlife. In addition, the Emergency Response Plan outlines response protocols for spills of potentially hazardous substances that may be used during exploration and development and mining activities. Spill response kits are stationed at Bellekeno 625 portal, Bellekeno East portal, Lucky Queen portal, Onek portal, and the Keno District Mill.

4 EMPLOYEE TRAINING

All employees (or contractors) involved with handling hazardous materials receive training on safe and appropriate use as per Workplace Hazardous Materials Information Systems Regulations (WHMIS) of the Occupational Health and Safety Act. All employees will follow OH&S Regulations and use appropriate personal protective equipment (PPE) as well as proper handling procedures when using hazardous materials.

All employees are fully equipped with the proper personal protective equipment standard for working underground, taking into consideration hazards caused by noise level, airborne particulates and confined work space.

All new employees receive an orientation at the Administration office and another orientation of the underground work site. Regular safety meetings with supervisors, safety officer and employees are mandated. Any changes in procedures, equipment, or hazards require immediate notification to employees.

Underground contractors, Alexco personnel, and others must comply with the Yukon Territorial Government OH&S Regulations in addition to Alexco and contractors in-house standards.

A Safety Coordinator/Officer specific for the underground operation ensures that all workers are oriented to all aspects of the work site including hazard identification, personal protective equipment requirements, and that medical and health requirements are followed according to legislation. The Safety Coordinator/Officer position is also charged with ensuring continued training and skill development for all personnel.

APPENDIX A

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet

Preparation Date: 16-Jun-2004 **Revision Date:** 30-Jul-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Product Name: **Ammonium Nitrate Fuel Oil**
Product Code: 125
Alternate Name(s): AMEX™, AMEX HD™, ANFO
UN-No: UN0331
Recommended Use: A booster sensitive blasting agent.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
Risk of explosion by shock, fire of other sources of ignition. If misused or disposed of improperly, material could explode and cause death or serious injury. This product contains one or more substances, which are classified in the EU as carcinogenic, mutagenic and/ or reprotoxic. Irritating to eyes, respiratory system and skin. Harmful if swallowed. Oxidizing agent.

Appearance:	**Physical State:**	**Odor:**
Off-white prills	Solid	Diesel fuel oil

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Ammonium Nitrate	6484-52-2	60-82
Fuels, Diesel, no. 2	68476-34-6	5-10

SECTION 4 – FIRST AID MEASURES

General Advice: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).

Eye Contact: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.

Skin Contact: Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.

Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Ingestion: Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.

Notes to physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Not itself combustible but assists fire in burning materials. The product does not flash. Rate of burning: does not sustain burning at atmospheric pressure.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Specific hazards arising from the chemical: This product is a high explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: Avoid dust formation. Do not breathe dust.

Methods for cleaning up: Avoid the use of metal tools containing iron and/or copper. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.

Other information: Deactivating chemicals: Not applicable.

SECTION 7 – HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. The use of coveralls is recommended. Use good industrial hygiene and housekeeping practices. Keep away from open flames, hot surfaces and sources of ignition.

Storage: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials; combustibles, and sources of heat. Keep away from incompatibles. Ideal storage temperature is 10-27°C (50-80°F). Do not expose sealed containers to temperatures above 40°C (104°F).

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Fuels, Diesel, no. 2	TWA: 100 mg/ m³ Skin		

Other exposure guidelines: Ammonium Nitrate: ORICA Guideline 5 mg/m^3 (internal TWA).

Engineering Measures: No information available.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting safety goggles.

Skin Protection: User should verify impermeability under normal conditions of use prior to general use. Impervious butyl rubber gloves.

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment. A NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice. Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Off-white prills	**Odor:**	Diesel fuel oil
Physical State:	Solid	**Viscosity:**	No information available
pH:	No data available	**Flash Point:**	52℃/ 126℉ (Diesel fuel)
Autoignition Temperature:	230- 265℃	**Boiling Point/Range:**	None
Melting Point/Range:	170℃/ 338℉	**Flammable Limits (Upper):**	Not Applicable
Flammable Limits (Lower):	Not Applicable	**Explosion Power:**	350-400 kJ/ 100g
Specific Gravity:	No data available	**Water Solubility:**	Dissolves slowly with prolonged exposure to water
Other Solubility:	Not available	**Vapor Pressure:**	0.4 mmHg @ 20℃ /68℉ (diesel fuel oil)
Oxidizing Properties:	Oxidizer	**Partition Coefficient (n-octanol/water):**	No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Decomposition Temperature: Ammonium Nitrate will spontaneously decompose at 210℃ (410℉).

Conditions to avoid: Keep away from open flames, hot surfaces and sources of ignition. Not expected to be sensitive to static discharge. Not expected to be sensitive to mechanical impact.

Incompatible materials: Avoid oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous decomposition products: The following toxic decomposition products may be released. At temperatures above 210℃, decomposition may be explosive, especially if confined. Nitrogen oxides (NOx). Carbon oxide. Hydrocarbons.

Hazardous Polymerization: None under normal processing. Hazardous polymerization does not occur. Explosive material under shock conditions.

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium Nitrate	2217 mg/kg Rat	3000 mg/kg Rabbit	88.8 mg/L Rat 4 h
Fuels, Diesel, no. 2	>5000 mg/kg Rat	>5000 mg/kg Rabbit	

Subchronic Toxicity (28 Days): Ammonium Nitrate: Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Toxicity: May cause methemoglobinemia.

Carcinogenicity: The table below lists whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Fuels, Diesel, no. 2	A3			

Legend: A3: Confirmed animal carcinogen.

Mutagenic effects: There is no evidence of mutagenic potential.

Irritation:	Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.
Reproductive effects:	No information is available and no adverse reproductive effects are anticipated.
Developmental effects:	No information is available and no adverse developmental effects are anticipated.
Target Organ:	Eyes, skin, respiratory system, blood, kidney, liver, urinary tract, blood, endocrine system, immune system & gastrointestinal tract (GI).

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects:	Dissolves slowly in water. Harmful to aquatic life at low concentrations. Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.
Persistence/Degradability:	Some water resistance but soluble with extended time periods.
Mobility in Environmental media:	Dissolves slowly in water.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method:	Burn under supervision of an expert at an explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name:	Explosive, blasting type B
Hazard Class:	1.5D
UN-No:	UN0331
Packing group:	II
TDG Proper Shipping Name:	Explosive, blasting type B
Hazard Class:	1.5D
UN-No:	UN0331
Packing group:	II

Transportation Emergency Telephone Number: 1-877-561-3636 or CHEMTREC: 1-800-424-9300

SECTION 15 – REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Ammonium Nitrate (6484-52-2) & Fuels, Diesel no.2 (68476-34-6).

SARA 311/312 Hazardous Categorization

Acute Heath Hazard:	Yes
Chronic Health Hazard:	Yes
Fire Hazard:	Yes
Reactive Hazard:	Yes
Sudden Release of Pressure Hazard:	No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: New Jersey Right-to-Know, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, California Proposition 65.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

The components in the product are on the following international inventory lists:

Chemical Name	TSCA	DSL	NDSL	ENCS	EINECS	ELINCS	CHINA	KECL	PICCS	AICS
Ammonium Nitrate	X	X	-	-	X	-	X	X	X	X
Fuels, Diesel, no. 2	X	X	-	X	X	-	X	X	X	X

Legend: X – Listed

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 16-Jun-2004
Revision Date: 30-Jul-2008

The information contained herein is offered only as guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

Material Safety Data Sheet

Preparation Date: 21-May-2005 **Revision Date:** 22-Oct-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1 303-268-5000

Product Name:	**B-line™, Boostercord™, Cordtex™, Powercord™, Primaflex™**
Product Code:	40040
Alternate Name(s):	Uniline, B-Line, Trunkline, Powercord 100, Powercord 150, Powercord 200, Powercord O 200, Boostercord, Primaflex, Anoline, X-245, X-247, Cordtex 7.5, Cordtex SHD, Cordtex 15, Cordtex LT, Cordtex AP, Cordtex 18, Cordtex 25, Cordtex Premium, Cordtex 40, Cordtex TL, Cordtex 50, Cordtex XTL, Cordtex 60, T-line, Special, 4400 M/S, Poly, Low Flash 25
UN-No:	UN0065
Recommended Use:	Used for initiation of explosive mixtures.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
Danger. Explosive. Risk of explosion by shock, friction, fire or other sources of ignition. This product is an article. No exposure to hazardous chemicals is expected to occur during intended product use. Misuse of the product may result in exposure to hazardous chemicals.

Appearance:	**Physical State:**	**Odor:**
Cords covered with PVC or polyethylene plastic and/ or wax textiles	Solid	Odorless

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Pentaerythritol Tetranitrate (PETN)	115-77-5	60-100

SECTION 4 – FIRST AID MEASURES

General Advice:	Not applicable; this is a packaged product that will not result in exposure to the contents under normal conditions of use. In the event of contact, administer first aid appropriate for symptoms present.
Eye Contact:	Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.
Skin Contact:	Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.
Inhalation:	Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is not breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Ingestion:	Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.

Notes to physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Product burns if ignited, with possible transition to detonation. May ignite or explode if heated under confinement.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could leat to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Specific hazards arising from the chemical: This product is a high explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: No information available.

Methods for cleaning up: Review fire and explosion hazards before proceeding with clean up. Remove and protect ignition sources. Wear protective equipment during clean up. Mop up water using non-sparking tools. It is suggested that only personnel trained in Emergency Response should respond. Verify complete account of product(s). Notify authorities and follow applicable spill reporting requirements.

SECTION 7 – HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. Protect containers from physical damage. Keep away from incompatible materials, heat, sparks, flames and other ignition sources. Avoid rough handling.

Storage: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles.

SECTION 8 – EXPOSURE CONTROLS/ PERSONAL PROTECTION

Engineering Measures: Full-handling precautions should be taken at all times.

Personal Protective Equipment

- **Eye/Face Protection:** Tightly fitting safety goggles
- **Skin Protection:** Long sleeved clothing.
- **Respiratory Protection:** No special protective equipment required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Cords covered with PVC or polyethylene plastic and/or wax and textiles	**Odor:**	None
Physical State:	Solid	**Viscosity:**	No information available
pH:	No data available	**Flash Point:**	Not applicable
Autoignition Temperature:	No data available	**Boiling Point/Range:**	Not applicable
Melting Point/Range:	No data available	**Flammable Limits (Upper):**	Not applicable
Flammable Limits (Lower):	Not applicable	**Explosion Power:**	No data available
Specific Gravity:	No data available	**Water Solubility:**	Negligible
Other Solubility:	Not applicable	**Vapor Pressure:**	No data available
Oxidizing Properties:	Not available	**Partition Coefficient (n-octanol/water):**	No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Can explode from impact, heat or friction. PETN explodes at 190 - 210°C (374 410°F). Stable up to approximately 70°C.

Conditions to avoid: Keep away from heat, impact, and friction. Some cords have limited tensile strength and abrasion resistance. Refer to the Product Bulletin for proper applications and use procedures. Damaged cords can lead to misfired holes - potentially, the most hazardous of all blasting situations. Avoid abrasion of cord on hole collars or casing pipes.

Incompatible materials: Strong oxidizing agents, The PVC/polyethylene plastic or wax covering will, in time, be affected by diesel oil.

Hazardous decomposition products: Carbon oxide. Nitrogen oxides (NOx). Hydrocarbons.

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chronic Toxicity: Not available.

Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by T\NTP (National Toxicology Program).

Mutagenic effects: There is no evidence of mutagenic potential.

Irritation: Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.

Reproductive effects: No information is available and no adverse reproductive effects are anticipated.

Developmental effects: No information is available and no adverse developmental effects are anticipated.

Target Organ: Eyes, skin, respiratory system, blood, liver, urinary tract, gastrointestinal tract (GI), endocrine system, & immune system.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects: There is no known ecological information for this product.

Persistence/Degradability: Not applicable.

Mobility in Environmental media: Not applicable.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at an explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name:	Cord, Detonating
Hazard Class:	1.1D
UN-No:	UN0065
Packing group:	II
TDG Proper Shipping Name:	Cord, Detonating
Hazard Class:	1.5D
UN-No:	UN0065
Packing group:	II

SECTION 15 – REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements,

SARA 311/312 Hazardous Categorization

Acute Heath Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Reactive Hazard:	Yes
Sudden Release of Pressure Hazard:	No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: No information available.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 21-May-2005
Revision Date: 22-Oct-2008

REFERENCES:

RTECS-Registry of Toxic Effects of Chemical Substances, CCINFOdisc, Canadian Centre for Occupational Health and Safety, National Institute for Occupational Safety and Health, U.S. Dept. of Health & Human Services, Cincinnati, 1998.

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End of MSDS

Material Safety Data Sheet

Preparation Date: 07-Nov-2005 **Revision Date:** 22-Oct-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY INFORMATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc
33101 E Quincy Ave
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Product Name:	**ElectricCoal™, ElectricMS™, ElectricLP™, Electric Seismic, Electric Instant**
Product Code:	20147
Alternate Name(s):	Not available
UN-No:	UN0255 or UN0030 (depending on packaging)
Recommended Use:	Electric detonators and accessory products.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** ORICA CANANDA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636**. IN US CALL: CHEMTREC **1-800-424-9300**. **IN THE U.S**. FOR LOST, STOLEN OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
The following information is the potential hazards associated with the ingredient(s) in this product. It is our belief that, under conditions of normal occupational exposure, this product should pose no such hazards to the user. Main risk is that of explosion by shock, friction, fire or other sources of ignition. Read the entire MSDS for a more thorough evaluation of the hazards.

Appearance:	**Physical State:**	**Odor:**
A metal cylinder with varying length attached plastic coated wires.	Solid	None

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Pentaerythritol Tetranitrate (PETN)	78-11-5	1-5
Barium	7440-39-3	1-5
Chromium	7440-47-3	1-5
Barium Chromate	10294-40-3	1-5

SECTION 4- FIRST AID MEASURES

General Advice:	General: Not applicable; this is a packaged product that will not result in exposure to the contents under normal conditions of use. In the event of contact, administer first aid appropriate for burns, laceration and bruises. If detonation fumes are inhaled, remove to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation, but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY.
Eye Contact:	No applicable information.
Skin Contact:	No applicable information.
Inhalation:	In the event those workers are overexposed to fumes and vapour resulting from detonation, remove victim from exposure and provide artificial respiration if not breathing.
Ingestion:	No applicable information.
Notes to Physician:	No applicable information.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Product burns if ignited, with possible transition to detonation. May ignite or explode if heated under confinement.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate. Water may be used on small fires.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. This product is a high explosive with a mass detonation hazard. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for fire fighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MESURES

Methods for containment: No information available.

Methods for cleaning up: Not required. If detonators are damaged, contact an Orica Canada Inc. or Orica USA Inc. Technical Representative. If detonators are broken, contact product advisor.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. Protect containers from physical damage. Keep away from incompatible materials, heat, sparks, flames and other ignition sources. Avoid rough handling. Keep upwind of discharging unit. Post detonation: Avoid breathing post detonation reside; avoid getting into eyes or on skin. Utilize recommended exposure controls/protective clothing when working with post detonation residue or the contents of a damaged detonator.

Storage: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles. Meet all legal requirements for shipping and magazining.

Storage temperature: It is recommended that detonators not be stored or used at temperatures exceeding 70°C (158°F) without approved procedures to address the elevated temperatures.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Other exposure guidelines: Recommendations listed in this section indicate the type of equipment that will provide protection against exposure to this product under normal conditions of use. Conditions of use, adequacy of engineering or other control measures, and actual exposure situations will dictate the need for specific protective devices at your workplace.

Engineering Measures: Full-handling precautions should be taken at all times.

Personal Protective Equipment

Eye/Face Protection: Safety glasses with side-shields are recommended to prevent eye contact.

Skin Protection: Gloves and protective clothing made from cotton should provide adequate protective.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Metal cylinder with varying length of attached plastic coated wires	**Odor:**	None
Physical State:	Solid	**Viscosity:**	No information available
pH:	No data available	**Melting Point/Range:**	PETN melts @ 140°C/ 284°F
Flammable Limits (upper):	No data available	**Flammable Limits (lower):**	No data available
Explosion Power:	No data available	**Specific Gravity:**	Not available
		Oxidizing Properties:	No information available

Vapor Pressure: Not available

Partition Coefficient (n-octanol/water): No data available

SECTION 10 - STABILITY AND REACTIVITY

Stability: Can explode from impact, heat or friction. If detonators are broken, contact product advisor. PETN explodes at 190 - 210°C (374 - 410°F).

Conditions to avoid: Impact or shock. Static discharge.

Incompatible materials: Acids, Bases.

Hazardous decomposition products: Thermal decomposition products are toxic and may include lead, hydrocarbons, oxides of carbon and nitrogen. To a lesser degree, decomposition products may include oxides of lead, chromium, barium, boron and hydrogen cyanide.

Hazardous Polymerization: None under normal processing.

SECTION 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity

Product information: This product is an article. The following information is the potential hazards associated with the Ingredient(s) in this product. Under conditions of normal occupational exposure, this product should pose no such hazards to the user. Main risk is that of explosion by shock, friction, fire or other sources of ignition.

Subchronic Toxicity (28 days): Organic nitrates act as vasodilators; signs and symptoms of poisoning include headache, dizziness, increased heart rate, postural weakness and hypotension. Dermatitis or "drug rash" of the skin may also be observed.

Chronic toxicity: Contains a substance that is a known carcinogen. May cause cardiac effects.

Carcinogenicity: The table below indicates whether each agency has listed and ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Barium Chromate	A1	Group 1	X	X

Legend: A1: Confirmed human carcinogen. Group 1: Some evidence of carcinogenity was noted in humans. X: Acknowledged in NTP and OSHA carcinogen lists.

Mutagenic effects: Substances which should be regarded as being mutagenic to man. Lead.

Reproductive effects: It is our belief that under normal conditions of use, this product should pose no reproductive hazard to the worker. Lead exposure may cause reproductive effects based on studies in laboratory animals and on human epidemiological studies.

Developmental effects: It is our belief that under normal conditions of use, this product should pose no reproductive hazard to the worker. Lead has been shown to cause congenital abnormalities and behavioral deficits in experimental animals in addition to its ability to increase the number of miscarriages, stillbirths and abortions in lead-exposed women.

Target Organ: Eyes, Skin, Cardiovascular system, Immune system.

Other adverse effects: Prolonged or repeated exposure to organic nitrates may develop a tolerance due to chronic dilation of the blood vessels. This tolerance disappears rapidly after a few days away from exposure and withdrawal symptoms consisting of angina and heart attack have been reported in chronically exposed workers. Another type of tolerance loss is the "Monday morning disease", where workers experience headaches, dizziness, postural weakness and other symptoms.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity effects: Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, in accordance with applicable local, provincial and federal laws. Call upon the services of an Orica Canada Inc. or Orica USA Inc. technical representative.

SECTION 14 - TRANSPORT INFORMATION

DOT Proper Shipping Name:	Detonator, Electric
Hazard Class:	1.4B or 1.1 B (depending on packaging)
UN-No:	UN0255 or UN0030 (depending on packaging)
Packing Group:	II
TDG Proper Shipping Name:	Detonator, Electric
Hazard Class:	1.4B or 1.1 B (depending on packaging)
UN-No:	UN0255 or UN0030 (depending on packaging)
Packing Group:	II

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Barium Chromate (10294-40-3), Barium (7440-39-3), & Chromium (7440-47-3).

SARA 311/312 Hazardous Categorization

Acute Health Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Reactive Hazard:	Yes
Sudden Release of Pressure Hazard:	No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents.

Other Regulations/Legislations which apply to this product: Massachusetts Right-to-Know, Pennsylvania Right-to-Know, New Jersey Right-to-Know, Rhode Island Right-to-Know.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

SECTION 16 - OTHER INFORMATION

Prepared By: **Safety, Health & Environment**
303-268-5000

Preparation Date: 07-Nov-2005
Revision Date: 22-Oct-2008

The information contained herein is offered as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

Material Safety Data Sheet

Preparation Date: 19-Jul-2007 **Revision Date:** 22-Oct-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY INFORMATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc
33101 E Quincy Ave
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Product Name:	**Exel™ Detonator Assemblies Non-Electric**
Product Code:	20080
Alternate Name(s):	Exel™ Constadet™, Exel™ Handidet™, Exel™ Handidet™ LP, Exel™ XE MS, Exel™ LP (W), Exel™ MS (W), Exel™ XT, & Exel™ T&D
UN-No:	UN0360 or UN 0361 (Depending on packaging)
Recommended Use:	Non-Electric detonators and accessory products.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** ORICA CANANDA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636**. IN US CALL: CHEMTREC **1-800-424-9300**. **IN THE U.S**. FOR LOST, STOLEN OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:

The following information is the potential hazards associated with the ingredient(s) in this product. It is our belief that, under conditions of normal occupational exposure, this product should pose no such hazards to the user. Main risk is that of explosion by shock, friction, fire or other sources of ignition. Read the entire MSDS for a more thorough evaluation of the hazards.

Appearance:	**Physical State:**	**Odor:**
A signal line (solid core/shock/tube) containing an explosive charge and a detonator.	Solid	None

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Pentaerythritol Tetranitrate (PETN)	78-11-5	0-10
Lead Azide	13424-46-9	0-5
Cyclotetramethylenetetranitramine (HMX)	2691-41-0	0.2 – 0.4
Aluminum	7429-90-5	<0.1

Also- may contain a lead sheathed delay element(s); may include a delay composition.

SECTION 4- FIRST AID MEASURES

General Advice: General: Not applicable; this is a packaged product that will not result in exposure to the contents under normal conditions of use.
In the event of contact, administer first aid appropriate for burns, laceration and bruises. If detonation fumes are inhaled, remove to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation, but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY.

Eye Contact: No applicable information.
Skin Contact: No applicable information.

Inhalation: In the event those workers are overexposed to fumes and vapour resulting from detonation, remove victim from exposure and provide artificial respiration if not breathing.
Ingestion: No applicable information.
Notes to Physician: No applicable information.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: High explosive with mass detonation hazard. Expected to be sensitive to mechanical impact. Not expected to be sensitive to static discharge.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate. Water may be used on small fires.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. This product is a high explosive with a mass detonation hazard. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for fire fighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: No information available.

Methods for cleaning up: Not required. If detonators are damaged, contact an Orica Canada Inc. or Orica USA Inc. technical representative. Deactivating Chemicals: Not required. If detonators are broken, contact product advisor.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. Protect containers from physical damage. Keep away from incompatible materials, heat, sparks, flames and other ignition sources. Avoid rough handling.

Storage: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles. Meet all legal requirements for shipping and magazining.

Storage Temperature: It is recommended that detonators not be stored or used at temperatures exceeding 70°C (158°F) without approved procedures to address the elevated temperatures.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Other exposure guidelines: Recommendations listed in this section indicate the type of equipment that will provide protection against exposure to this product under normal conditions of use. Conditions of use, adequacy of engineering or other control measures, and actual exposure situations will dictate the need for specific protective devices at your workplace.

Engineering Measures: Full-handling precautions should be taken at all times.

Personal Protective Equipment

Eye/Face Protection: Safety glasses with side-shields are recommended to prevent eye contact.

Skin Protection: Gloves and protective clothing made from cotton should provide adequate protective.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	A signal line (solid core/shock/tube) Containing an explosive charge and A detonator.	**Odor:**	None
Physical State:	Solid	**Viscosity:**	No Information Available
pH:	No data available	**Melting Point/Range:**	PETN melts at 140°C / 284°F
Flammable Limits (upper):	No data available	**Flammable Limits (lower):**	No data available

Explosion Power:	No data available	**Specific Gravity:**	Not available
Vapor Pressure:	Not available	**Oxidizing Properties:**	No information available
Partition Coefficient (n-octanol/water):	No data available		

SECTION 10 - STABILITY AND REACTIVITY

Stability: Can explode from impact, heat or friction. If detonators are broken, contact product advisor. PETN explodes at 190 - 210°C (374 - 410°F).

Conditions to avoid: Impact or shock. Static discharge.

Incompatible materials; Acids. Bases.

Hazardous decomposition products: Thermal decomposition products are toxic and may include lead, hydrocarbons, oxides of carbon and nitrogen. To a lesser degree, decomposition products may include oxides of lead, chromium, barium, boron and hydrogen cyanide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity

Subchronic Toxicity (28 days): Organic nitrates act as vasodilators; signs and symptoms of poisoning include headache, dizziness, increased heart rate, postural weakness and hypotension. Dermatitis or "drug rash" of the skin may also be observed.

Chronic toxicity: Contains no substance that is a known carcinogen.

Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (occupational Safety and health Administration), and not listed as carcinogens by NTP (National Toxicology Program).

Reproductive effects: It is our belief that under normal conditions of use, this product should pose no reproductive hazard to the worker. Lead exposure may cause reproductive effects based on studies in laboratory animals and on human epidemiological studies.

Developmental effects: It is our belief that under normal conditions of use, this product should pose no reproductive hazard to the worker. Lead has been shown to cause congenital abnormalities and behavioral deficits in experimental animals in addition to its ability to increase the number of miscarriages, stillbirths and abortions in lead-exposed women.

Target Organ: Eyes, Skin, cardiovascular system, Immune system.

Other adverse effects: Prolonged or repeated exposure to organic nitrates may develop a tolerance due to chronic dilation of the blood vessels. This tolerance disappears rapidly after a few days away from exposure and withdrawal symptoms consisting of angina and heart attack have been reported in chronically exposed workers. Another type of tolerance loss is the "Monday morning disease", where workers experience headaches, dizziness, postural weakness and other symptoms.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity effects: Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, in accordance with applicable local, provincial and federal laws. Call upon the services of an Orica Canada Inc. or Orica USA Inc. technical representative.

SECTION 14 - TRANSPORT INFORMATION

DOT Proper Shipping Name:	Detonator assemblies, Non-Electric
Hazard Class:	1.1B or 1.4B (depending on packaging)
UN-No:	UN0360 or UN0361 (depending on packaging)
Packing Group:	II
TDG Proper Shipping Name:	Detonator assemblies, Non-Electric
Hazard Class:	1.1B or 1.4B (depending on packaging)
UN-No:	UN0360 or UN0361 (depending on packaging)
Packing Group:	II

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements,

SARA 311/312 Hazardous Categorization

Acute Health Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Reactive Hazard:	Yes
Sudden Release of Pressure Hazard:	No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: Massachusetts Right-to-Know, Pennsylvania Right-to-Know, New Jersey Right-to-Know, Rhode Island Right-to-Know.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

SECTION 16 - OTHER INFORMATION

Prepared By: **Safety, Health & Environment**
303-268-5000

Preparation Date: 19-Jul-2007
Revision Date: 22-Oct-2008

The information contained herein is offered as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

Material Safety Data Sheet

Preparation Date: 22-Mar-2006 **Revision Date:** 28-Oct-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1 303-268-5000

Product Name: **POWERDITCH™ 1000, POWERPRO™, POWERFRAC™, GELDYNE™, COALITE™ 8SU, DYNASHEAR™, GEL COALITE™ Z, & XACTEX™**
Product Code: 40053
Alternate Name(s): Not available
UN-No: UN0081
Recommended Use: A detonator-sensitive gelatin explosive.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
Risk of explosion by shock, fire of other sources of ignition. Very toxic if swallowed. Irritating to eyes, respiratory system and skin. Oxidizing agent.

Appearance:	**Physical State:**	**Odor:**
Light pink	Semi-Solid	Characteristic

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Ammonium Nitrate	6484-52-2	0-75
Sodium Nitrate	7631-99-4	0-50
Ethylene glycol, Dinitrate	628-96-6	8-76
Sulphur	7704-34-9	0-4
Nitroglycerin	55-63-0	1-20
Nitrocellulose	9004-70-0	0-6

SECTION 4 – FIRST AID MEASURES

General Advice: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).

Eye Contact: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.

Skin Contact: Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.

Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Ingestion: Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.

Notes to physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Not itself combustible but assists fire in burning materials. The product does not flash. Explosive power: 337 kJ/100 g.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas to a predetermined safe location no less than 2500 feet (800 meters) in all directions. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Specific hazards arising from the chemical: This product is a high explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: Contain or absorb leaking putty with sand or earth or other suitable substance.

Methods for cleaning up: Avoid the use of metal tools containing iron and/or copper. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.

SECTION 7 – HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. The use of coveralls is recommended. Use good industrial hygiene and housekeeping practices. Keep away from open flames, hot surfaces and sources of ignition.

Storage: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials; combustibles, and sources of heat. Keep away from incompatibles. Ideal storage temperature is 10-27℃ (50-80℉). Do not expose sealed containers to temperatures above 40℃ (104℉).

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sodium Nitrate	10 mg/cu m (nuisance dust)	NA	
Ethylene glycol, Dinitrate	TWA: 0.05 ppm Skin	Ceiling: 0.2 ppm Ceiling: 1 mg/ m³ Skin	
Nitroglycerin	(TWA skin) 0.46 mg/ cu m	Ceiling: 0.2 ppm Ceiling: 2 mg/ m³ Skin	

Other exposure guidelines: Ammonium Nitrate: ORICA Guideline 5 mg/m^3 (internal TWA)

Engineering Measures: No information available.

Personal Protective Equipment

Eye/Face Protection: Face-shield. Tightly fitting safety goggles.

Skin Protection: User should verify impermeability under normal conditions of use prior to general use. Impervious gloves. Nitrile Rubber.

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment. A NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice. Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Light pink	**Odor:**	Characteristic
Physical State:	Semi-Solid	**Viscosity:**	No information available
pH:	7	**Flash Point:**	> 100℃
Autoignition Temperature:	-222℃ (liquid NG) >=100>=212	**Boiling Point/Range:**	Not available
Melting Point/Range:	Not available	**Flammable Limits (Upper):**	Not applicable
Flammable Limits (Lower):	Not applicable	**Explosion Power:**	No data available
Specific Gravity:	085- 1.48 g/cc	**Water Solubility:**	In soluble in water
Other Solubility:	Slightly soluble in standard organic solvents	**Vapor Pressure:**	Not applicable
Oxidizing Properties:	Oxidizer	**Partition Coefficient (n-octanol/water):**	No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Decomposition Temperature: Ammonium Nitrate will spontaneously decompose at 210℃ (410℉). NG explodes at 222℃ (431.6℉)

Conditions to avoid: Keep away from open flames, hot surfaces and sources of ignition.

Incompatible materials: Avoid oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous decomposition products: The following toxic decomposition products may be released. At temperatures above 210℃, decomposition may be explosive, especially if confined. Nitrogen oxides (NOx). Carbon oxide. Hydrocarbons.

Hazardous Polymerization: None under normal processing. Hazardous polymerization does not occur. Explosive material under shock conditions.

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium Nitrate	2217 mg/kg Rat	3000 mg/kg Rabbit	88.8 mg/L Rat 4 h
Sodium Nitrate	1267-4300 mg/kg Rat		
Ethylene glycol, Dinitrate	460 mg/ kg Rat 540 mg/ kg Mouse		
Nitroglycerin	105 mg/ kg Rat 115 mg/ kg Mouse	280 mg/ kg Rabbit	
Nitrocellulose	5 g/ kg Mouse 5 g/ kg Rat		

Subchronic Toxicity (28 Days): Sodium Nitrate; Ammonium Nitrate: Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Toxicity: May cause methemoglobinemia.
Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by T\NTP (National Toxicology Program).
Mutagenic effects: There is no evidence of mutagenic potential.
Irritation: Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.
Reproductive effects: No information is available and no adverse reproductive effects are anticipated.
Developmental effects: No information is available and no adverse developmental effects are anticipated.
Target Organ: Eyes, skin, respiratory system, blood, liver urinary tract, & gastrointestinal tract (GI).
Other Adverse Effects: Prolonged or repeated exposure to organic nitrates may develop a tolerance due to chronic dilation of the blood vessels. This tolerance disappears rapidly after a few days away from exposure and withdrawal symptoms consisting of angina and heart attack have been reported in chronically exposed workers. Another type of tolerance loss is the "Monday morning disease", where workers experience headaches, dizziness, postural weakness and other symptoms.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Chemical Name	Freshwater Algae Data	Freshwater Fish Species Data	Microtox Data	Water Flea Data	log Pow
Sodium Nitrate					-3.8

Persistence/Degradability: Nitroglycerin is water-insoluble and remains explosive.
Mobility in Environmental media: Dissolves slowly in water.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at an explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.
US EPA Waste Number: No data available on product.

Chemical Name	RCRA	RCRA- Basis for listing	RCRA- D Series Wastes	RCRA- U Series Wastes
Nitroglycerin –55-63-0	Waste number P081			

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name: Explosive Blasting Type A
Hazard Class: 1.1D
UN-No: UN0081
Packing group: II
TDG Proper Shipping Name: Explosive Blasting Type A
Hazard Class: 1.1D
UN-No: UN0081
Packing group: II

Transportation Emergency Telephone Number: 1-877-561-3636 or CHEMTREC: 1-800-424-9300

SECTION 15 – REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.
USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Ammonium Nitrate (6484-52-2), Sodium Nitrate (7631-99-4), Nitroglycerin (55-63-0), Nitrocellulose (9004-70-0), Sulphur (7704-34-9), & Ethylene Glycol, Dinitrate (628-96-6)

SARA 311/312 Hazardous Categorization

Acute Heath Hazard: Yes
Chronic Health Hazard: Yes
Fire Hazard: Yes
Reactive Hazard: Yes
Sudden Release of Pressure Hazard: No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: New Jersey Right-to-Know, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, California Proposition 65.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

The components in the product are on the following international inventory lists:

Chemical Name	TSCA	DSL	NDSL	ENCS	EINECS	ELINCS	CHINA	KECL	PICCS	AICS
Ammonium Nitrate	X	X	-	X	X	-	X	X	X	X
Sodium Nitrate	X	X	-	X	X	X	X	X	X	X
Ethylene Glycol, Dinitrate	X	X	-	-	X	-	-	X	-	X
Sulphur	X	X	-	X	X	X	X	X	X	X
Nitroglycerin	X	X	-	X	X	-	-	X	X	X
Nitrocellulose	X	X	-	X	-	-	X	X	X	X

Legend: X – Listed

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 22-Mar-2006
Revision Date: 28-Oct-2008

The information contained herein is offered only as guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **XD-3 EXTRA ENGINE OIL 0W-30**
Product Description: Synthetic Base Stocks and Additives
MSDS Number: 8044
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 210C (410F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist

before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

Storage

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Substance Name	Form	Limit/Standard			Note	Source
Phosphorus		TWA	0.1 mg/m3			ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Form: clear
Colour: Amber
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.844
Flash Point [Method]: 210C (410F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316C (600F)
Vapour Density (Air = 1): > 2 at 101 kPa
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): < 0.1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 11 cSt (11 mm²/sec) at 100C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -48°C (-54°F)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies. Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:

Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitising in test animals and humans.

Additional information is available by request.

CMR Status: None.

Chemical Name	CAS Number	List Citations
Phosphorus	7723-14-0	4

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 05: Fire Fighting Measures - Fire Fighting Instruction was modified.
Section 06: Notification Procedures - Header was modified.
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Color was modified.
Section 09: Boiling Point C(F) was modified.
Section 08: Hand Protection was modified.
Section 07: Handling and Storage-Storage was modified.
Section 11: Dermal Lethality Test Data was modified.
Section 11: Oral Lethality Test Data was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09 Viscosity was modified.
Section 09: Relative Density was modified.
Section 15: List Citation Table - Header was modified.

Section 08: Exposure Limits Table was added.
Section 11: Chemical Name - Header was added.
Section 11: CAS Number - Header was added.
Section 11: List Citation - Header was added.
Section 11: Tox List Cited Table was added.
Composition: No components was added.
Section 08: OEL Table - Substance Name Column - Header was added.
Section 08: OEL Table - Form Column - Header was added.
Section 08: OEL Table - Limit Column - Header was added.
Section 08: OEL Table - Notation Column - Header was added.
Section 08: OEL Table - Source Column - Header was added.
Section 13: Regulatory Disposal Information - Header was added.
Section 13: Regulatory Disposal Information - Header was deleted.
Composition: No components was deleted.
Section 15: Canadian List Citations Table was deleted.
Section 15: Chemical Name - Header was deleted.
Section 15: CAS Number - Header was deleted.
Section 15: List Citations -Header was deleted.

WHMIS Classification: Not controlled

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DGN: 5006929 (1002607)

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **XD-3 EXTRA ENGINE OIL 10W**
Product Description: Base Oil and Additives
MSDS Number: 8046
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 230°C (446°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: brown
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.876
Flash Point [Method]: 230°C (446°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: N/D
Vapour Density (Air = 1): N/D
Vapour Pressure: [N/D at 20°C] | < 1 kPa (7.5 mm Hg) at 38°C
Evaporation Rate (N-Butyl Acetate = 1): < 1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 6.5 cSt (6.5 mm^2/sec) at 100°C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -36°C (-33°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies. Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status:

--REGULATORY LISTS SEARCHED--

1 = IARC 1	3 = IARC 2B	5 = ACGIH A1
2 = IARC 2A	4 = ACGIH ALL	6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
No revision information is available.

WHMIS Classification: Not controlled

The information and recommendations contained herein are, to the best of Imperial Oil's knowledge and belief, accurate and reliable as of the date issued. Imperial Oil assumes no responsibility for accuracy of information unless the document is the most current available from an official Imperial Oil distribution system. The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted.

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **XD-3 EXTRA ENGINE OIL 15W-40**
Product Description: Base Oil and Additives
MSDS Number: 8043
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulphur Oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: 215C (419F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 330°C (626°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist

before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: dark brown
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.87
Flash Point [Method]: 215C (419F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 330°C (626°F)
Boiling Point / Range: 310C (590F) - 600C (1112F)
Vapour Density (Air = 1): N/D
VAPOUR PRESSURE: [N/D at 20°C] | < 1 kPa (7.5 mm Hg) at 38C
Evaporation Rate (N-Butyl Acetate = 1): < 0.1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 15.4 cSt (15.4 mm²/sec) at 100C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

Pour Point: -27°C (-17°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies. Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1	3 = IARC 2B	5 = ACGIH A1
2 = IARC 2A	4 = ACGIH ALL	6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

Regulatory Disposal Information

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

National Chemical Inventory Listing: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 05: Fire Fighting Measures - Fire Fighting Instruction was modified.
Section 06: Notification Procedures - Header was modified.
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Boiling Point C(F) was modified.
Section 08: Hand Protection was modified.
Section 09: Vapour Pressure was modified.
Section 09: Vapour Pressure - Header was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09 Viscosity was modified.
Section 15: National Chemical Inventory Listing - Header was modified.

Section 09: Relative Density was modified.
Section 15: List Citation Table - Header was modified.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 11: Chronic Tox - Component - WHMIS was added.
Section 11: Chronic Tox - Component - Header was added.
Section 11: Other Health Effects Header was added.
Composition: No components was added.
Section 13: Regulatory Disposal Information - Header was added.
Section 13: Regulatory Disposal Information - Header was deleted.
Section 11: Other Health Effects Header was deleted.
Composition: No components was deleted.
Section 11: Chronic Tox - Component was deleted.
Section 11: Chronic Tox - Component - Header was deleted.
Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.
Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.
Section 15: Canadian List Citations Table was deleted.
Section 15: Chemical Name - Header was deleted.
Section 15: CAS Number - Header was deleted.
Section 15: List Citations -Header was deleted.
Section 09: Form - Header was deleted.
Section 09: Physical State was deleted.

WHMIS Classification: Not controlled

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DGN: 5006927 (1004630)

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Prepared By: Imperial Oil Limited, IH and Product Safety

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: November 08, 2003
Supersedes: January 25, 2001
MSDS Number: 8407

1. PRODUCT INFORMATION

Product Identifier: OBRA 30W

Application and Use:
Lubricating grease

Product Description:

A grease, a mixture of lubricating oil, soap and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD):
Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS		MANUFACTURER/SUPPLIER:
Emergency 24 hr.	(519) 339-2145	IMPERIAL OIL
Technical Info.	(800) 268-3183	Products Division
		240 4th Avenue S.W.
		Calgary, Alberta
		T2P 3M9

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: not available
Viscosity: 30.40 cSt at 100 deg C
Vapour Density: not available
Boiling Point: not available
Evaporation rate: <1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: 90 deg C DROP
Odour Threshold: not available
Vapour Pressure: <1 kPa at 38 deg C
Density: 0.94 g/cc at 15 deg C
Appearance/odour: White granules or prills, slight ammonia odor.

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.
High pressure greasing equipment is capable of injecting grease under the skin which may have severe health consequences.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products,
the acute toxicity of this product is expected to be:
Oral : LD50 > 5000 mg/kg (Rat)
Dermal : LD50 > 3160 mg/kg (Rabbit)
Inhalation : LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In case of adverse exposure to vapours, mists and/or fumes formed at elevated temperature, or by mechanical action, immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.
Consult a physician immediately if the material is injected under the skin from the misuse of high pressure greasing equipment.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye

contact is avoided.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials.
In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Store and load at normal (up to 38 deg C) temperature and at atmospheric pressure.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Allow material to solidify and scrape up. Place material in suitable containers for recycle or disposal.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 220 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide under thermal decomposition.

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:
Since 25 January 2001, this MSDS has been revised in Section(s):
3, 6, 7

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10. PREPARATION

Date Prepared: November 08, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL
Products Division
240 4th Avenue S.W.
Calgary, Alberta
T2P 3M9
(800) 268-3183

CAUTION: " The information contained herein relates only to this product or material and may not be valid when used in combination with any other product or material or in any process. If the product is not to be used for a purpose or under conditions which are normal or reasonably foreseeable, this information cannot be relied upon as complete or applicable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier. The information contained herein is based on the information available at the indicated date of preparation. This MSDS is for the use of Imperial Oil customers and their employees and agents only. Any further distribution of this MSDS by Imperial Oil customers is prohibited without the written consent of Imperial Oil."

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: ESSO GEAR OIL GX 75W-80W
Product Description: Base Oil and Additives
MSDS Number: 8063
Intended Use: Gear oil

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Sulphur Oxides, Aldehydes, Smoke, Fume, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 160C (320F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly affect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: yellow
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.856
Flash Point [Method]: 160C (320F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: 230C (446F) - 535C (995F)
Vapour Density (Air = 1): N/D
Vapour Pressure: [N/D at 20°C] | < 1 kPa (7.5 mm Hg) at 38C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 7.8 cSt (7.8 mm²/sec) at 100C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -39°C (-38°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status:

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes: Not Applicable

WHMIS Classification: Not controlled

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: ESSO GEAR OIL GX 80W-90
Product Description: Base Oil and Additives
MSDS Number: 8064
Intended Use: Gear oil

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Incomplete combustion products, Oxides of carbon, Sulphur Oxides, Smoke, Fume, Aldehydes

FLAMMABILITY PROPERTIES

Flash Point [Method]: 210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Form: N/D
Colour: dark brown
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.885
Flash Point [Method]: 210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: N/D
Vapour Density (Air = 1): > 2 at 101 kPa
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 15 cSt (15 mm²/sec) at 100°C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -24°C (-11°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
No revision information is available.

WHMIS Classification: Not controlled

The information and recommendations contained herein are, to the best of Imperial Oil's knowledge and belief, accurate and reliable as of the date issued. Imperial Oil assumes no responsibility for accuracy of information unless the document is the most current available from an official Imperial Oil distribution system. The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted.

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: AROX EP 100
Product Description: Base Oil and Additives
MSDS Number: 8296
Intended Use: Lubricant

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

This product may be used in certain applications where misting can occur. Excessive exposure to liquids and mists may cause skin and eye irritation. In addition, excessive exposure to mists may cause respiratory irritation and damage and aggravate pre-existing emphysema or asthma. Low order of toxicity. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek

immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurised mists may form a flammable mixture.

Hazardous Combustion Products: Smoke, Fume, Sulphur Oxides, Aldehydes, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 230C (446F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid breathing mists or vapour. Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Particulate air-purifying respirator approved for dust or oil mist is recommended.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended. Chemical-type goggles should be worn during misting operations.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: Amber
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density: 0.89
Flash Point [Method]: 230C (446F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316C (600F)
Vapour Density (Air = 1): N/D
Vapour Pressure: [N/D at 20°C] | < 1 kPa (7.5 mm Hg) at 38C
Evaporation Rate (N-Butyl Acetate = 1): < 1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: 100 cSt (100 mm^2/sec) at 40°C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -6°C (21°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Oil Mist (highly refined oils): Animals exposed to high concentrations of mist developed oil retention, inflammation, and oil granulomas in the respiratory tract. Oils exposed to high temperatures, cracking conditions, or mixing with tramp / used oils may introduce polycyclic aromatic compounds or microbial contaminants that could result in cancer or severe respiratory hazards.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1	3 = IARC 2B	5 = ACGIH A1
2 = IARC 2A	4 = ACGIH ALL	6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 05: Fire Fighting Measures - Fire Fighting Instruction was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Color was modified.
Section 09: Boiling Point C(F) was modified.
Section 09: Vapour Pressure was modified.
Section 03: Health Hazards was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Flash Point C(F) was modified.

WHMIS Classification: Not controlled

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DGN: 5007243 (1012879)

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Prepared By: Imperial Oil Limited, IH and Product Safety

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: August 28, 2003
Supersedes: May 24, 2000
MSDS Number: 8388

1. PRODUCT INFORMATION

Product Identifier: ARGON EP 1 GREASE

Application and Use:
Lubricating grease

Product Description:

A grease, a mixture of lubricating oil, soap and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD):
Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS		MANUFACTURER/SUPPLIER:
Emergency 24 hr.	(519) 339-2145	IMPERIAL OIL
Technical Info.	(800) 268-3183	Products Division
		240 4th Avenue S.W.
		Calgary, Alberta
		T2P 3M9

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a)(i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: 0.920 at 15.6 deg C/15.6 deg C
Viscosity: 175.00 cSt at 40 deg C
Vapour Density: not available
Boiling Point: not available
Evaporation rate: < 0.01 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: 130 deg C DROP
Odour Threshold: not available
Vapour Pressure: <0.01 kPa at 20 deg C
Appearance/odour: Brown paste, petroleum odour

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.
High pressure greasing equipment is capable of injecting grease under the skin which may have severe health consequences.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products,

the acute toxicity of this product is expected to be:
Oral : LD50 > 5000 mg/kg (Rat)
Dermal : LD50 > 3160 mg/kg (Rabbit)
Inhalation : LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In case of adverse exposure to vapours, mists and/or fumes formed at elevated temperature, or by mechanical action, immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.
Consult a physician immediately if the material is injected under the skin from the misuse of high pressure greasing equipment.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.

Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials.
In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Do not handle or store near an open flame, sources of heat, or sources of ignition.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Allow material to solidify and scrape up. Place material in suitable containers for recycle or disposal.
If liquid is too viscous for pumping, scrape up.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 180 deg C COC ASTM D92, BASEOIL

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Fumes, smoke, carbon monoxide, sulfur oxides, nitrogen oxides, phosphorus oxides, aldehydes and other decomposition products, in the case of incomplete combustion
Various metal oxides

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc., as this presents a serious explosion hazard.

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:
Since 24 May 2000, this MSDS has been revised in Section(s):
3, 6, 7

10. PREPARATION

Date Prepared: August 28, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL
Products Division
240 4th Avenue S.W.
Calgary, Alberta
T2P 3M9
(800) 268-3183

CAUTION: " The information contained herein relates only to this product or material and may not be valid when used in combination with any other product or material or in any process. If the product is not to be used for a purpose or under conditions which are normal or reasonably foreseeable, this information cannot be relied upon as complete or applicable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier. The information contained herein is based on the information available at the indicated date of preparation. This MSDS is for the use of Imperial Oil customers and their employees and agents only. Any further distribution of this MSDS by Imperial Oil customers is prohibited without the written consent of Imperial Oil."

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: UNIREX EP 2
Product Description: Base Oil and Additives
MSDS Number: 8382
Intended Use: Grease

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Under normal conditions of intended use, this material is not expected to be an inhalation hazard.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the

body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Aldehydes, Oxides of carbon, Smoke, Fume, Sulphur Oxides, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: >200C (392F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Allow spilled material to solidify and shovel it up into a suitable container for recycle or disposal. Scrape up spilled material with shovels into a suitable container for recycle or disposal.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Skim from surface

Water spill and land spill recommendations are based on the most likely spill scenario for this material;

however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS
See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION
Physical State: Solid
Form: semi-fluid
Colour: dark green
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION
Relative Density: 0.89
Flash Point [Method]: >200C (392F) [EST. FOR OIL, ASTM D-92 (COC)]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/D
Boiling Point / Range: N/D
Vapour Density (Air = 1): N/D
Vapour Pressure: < 0.01 kPa (0.08 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 220 cSt (220 mm²/sec) at 40°C | 18.5 cSt (18.5 mm²/sec) at 100C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: >260°C (500°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

Note: Most physical properties above are for the oil component in the material.

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1	3 = IARC 2B	5 = ACGIH A1
2 = IARC 2A	4 = ACGIH ALL	6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Suitable routes of disposal are supervised incineration, preferentially with energy recovery, or appropriate recycling methods in accordance with applicable regulations and material characteristics at the time of disposal .

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: TSCA, EINECS, DSL

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations
DIPHENYLAMINE	122-39-4	1
ZINC DIALKYL DITHIOPHOSPHATE	68457-79-4	6

--REGULATORY LISTS SEARCHED--

1 = TSCA 4
2 = TSCA 5a2
3 = TSCA 5e
4 = TSCA 6
5 = TSCA 12b
6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 05: Fire Fighting Measures - Fire Fighting Instruction was modified.
Section 06: Notification Procedures - Header was modified.
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 08: Hand Protection was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Flash Point C(F) was modified.
Section 09 Viscosity was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 15: Canadian List Citations Table was modified.
Section 11: Chronic Tox - Component - WHMIS was added.
Section 11: Chronic Tox - Component - Header was added.
Section 11: Other Health Effects Header was added.
Composition: No components was added.
Section 13: Regulatory Disposal Information - Header was added.
Section 13: Regulatory Disposal Information - Header was deleted.
Section 11: Other Health Effects Header was deleted.
Composition: No components was deleted.
Section 15: Special Cases - Header was deleted.

Section 15: Special Cases Table was deleted.
Section 15: Inventory - Header was deleted.
Section 15: Status - Header was deleted.
Section 11: Chronic Tox - Component was deleted.
Section 11: Chronic Tox - Component - Header was deleted.
Section 11: Chemical Name - Header was deleted.
Section 11: CAS Number - Header was deleted.
Section 11: List Citation - Header was deleted.
Section 11: Tox List Cited Table was deleted.

WHMIS Classification: Not controlled

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **ESSO HD ANTIFREEZE 60/40 PREMIX**
Product Description: Glycol
MSDS Number: 8514
Intended Use: Antifreeze/coolant

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*	Acute Toxicity
Ethylene Glycol	107-21-1	55 - 65%	Dermal Lethality: LD50 9.53 g/kg (Rabbit); Inhalation Lethality: LC50 4300 ppm (Rat); Oral Lethality: LD50 4.70 g/kg (Rat)

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

HEALTH EFFECTS

May cause harm to the unborn child. Ingestion of ethylene glycol may result in nausea, vomiting, abdominal cramps, blindness, liver damage, irritation, reproductive effects, nerve damage, convulsions, edema of the lung, cardiopulmonary effects (metabolic acidosis), pneumonia and kidney failure which could result in death. The single lethal dose for humans is about 100 ml. Inhalation of high levels of vapour or mists for prolonged periods of time may also result in toxic effects. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

Target Organs: Kidney | Reproductive system |

NFPA Hazard ID:	Health:	1	Flammability: 0	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability: 0	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention.

NOTE TO PHYSICIAN

This product contains ethylene and/or diethylene glycol which, if ingested, is metabolised to toxic metabolites by the enzyme alcohol dehydrogenase, for which ethanol and 4-methylpyrazole {US drug name Fomepizole, trade name Antizol} are antagonists. Administration of oral or intravenous ethanol or intravenous 4-methylpyrazole may arrest further metabolism of this material and thereby ameliorate the toxicity. Use of ethanol or 4-methylpyrazole does not affect toxic metabolites that are already present and is not a substitute for haemodialysis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, alcohol-resistant foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water or standard foam

FIRE FIGHTING

Fire Fighting Instructions: Material will not burn. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply.

Hazardous Combustion Products: Incomplete combustion products, Oxides of carbon, Smoke, Fume, Aldehydes

FLAMMABILITY PROPERTIES

Flash Point [Method]: N/A
Flammable Limits (Approximate volume % in air): LEL: N/A UEL: N/A
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Do not touch or walk through spilled material. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Consult an expert. Warn other shipping. Material will sink. Remove material, as much as possible, using mechanical equipment.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Remove debris in path of spill and remove contaminated debris from shoreline and water surface. Dispose of according to local regulations. Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid breathing mists or vapour. Avoid contact with skin. Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Substance Name	Form	Limit/Standard			Note	Source
Ethylene Glycol	Aerosol.	Ceiling	100 mg/m3			ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly affect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

If prolonged or repeated contact is likely, chemical-resistant gloves are recommended. If contact with forearms is likely, wear gauntlet-style gloves.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Form: clear
Colour: green
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 16 C): 1.07 - 1.08
Flash Point [Method]: N/A
Flammable Limits (Approximate volume % in air): LEL: N/A UEL: N/A
Autoignition Temperature: N/D
Boiling Point / Range: 132C (270F)
Vapour Density (Air = 1): 2.1 at 101 kPa
Vapour Pressure: 0.008 kPa (0.06 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): 0.01
pH: 9 - 11
Log Pow (n-Octanol/Water Partition Coefficient): < 2
Solubility in Water: Complete
Viscosity: [N/D at 40°C]
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/D
Pour Point: -52°C (-62°F)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers, Acids, Alkalies

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	Negligible hazard at ambient/normal handling temperatures. Based on test data for structurally similar materials.
INGESTION	
Toxicity (Human): LDLo 100 ml	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	

Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

Contains:

ETHYLENE GLYCOL (EG): Repeated high oral exposure has caused kidney damage, neurological effects, degeneration of the liver and changes in blood chemistry and circulating blood cells in laboratory animals. Repeated overexposure has the potential to cause similar toxic effects in humans. EG causes developmental and reproductive effects at high dose levels in laboratory animals. The relevance of these findings to humans is uncertain. However, as a precaution, avoid exposure during pregnancy.

Additional information is available by request.

CMR Status: None.

Chemical Name	CAS Number	List Citations
Ethylene Glycol	107-21-1	4

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Material -- Expected to remain in water or migrate through soil.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be readily biodegradable.

Atmospheric Oxidation:

Material -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Material -- Potential to bioaccumulate is low.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Even though this product is readily biodegradable, it must not be indiscriminately discarded into the

environment. Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT)

Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (Ethylene Glycol)
Hazard Class & Division: 9
ID Number: 3082
Packing Group: III
ERG Number: 171
Label(s): 9
Transport Document Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S., 9, UN3082, PG III, RQ (ETHYLENE GLYCOL)

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Class D, Division 2, Subdivision A: Very Toxic Material

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = TSCA 4 3 = TSCA 5e 5 = TSCA 12b

2 = TSCA 5a2 4 = TSCA 6 6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Boiling Point C(F) was modified.
Section 08: Hand Protection was modified.
Section 11: Oral Lethality Test Data was modified.
Section 06: Accidental Release-Spill Management-Land was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Relative Density - Header was modified.
Hazard Identification: Health Hazards was modified.
Hazard Identification: Emergency Overview Target Organs was modified.
Section 16: Health Hazards was modified.
Section 16: Target Organs was modified.
Section 16: Land Spill was modified.
Section 16: Water Spill was modified.
Section 16: Fire Fighting Media - Header was added.
Section 16: Fire Fighting Media - Header was added.
Section 16: Precautions was added.
Section 16: Precautions - Header was added.
Section 11: Chronic Tox - Component - WHMIS was added.
Section 11: Chronic Tox - Component - Header was added.
Section 11: Other Health Effects Header was added.
Section 11: Other Health Effects Header was deleted.
Section 11: Chronic Tox - Component was deleted.
Section 11: Chronic Tox - Component - Header was deleted.

Precautionary Label Text:
WHMIS Classification: Class D, Division 2, Subdivision A: Very Toxic Material

HEALTH HAZARDS
Danger of serious damage to health by prolonged exposure. May cause harm to the unborn child.

Target Organs: Kidney | Reproductive system |

PRECAUTIONS
Avoid breathing mists or vapour. Avoid contact with skin.

FIRST AID
INHALATION: Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

Eye: Flush thoroughly with water. If irritation occurs, get medical assistance.

Oral: Seek immediate medical attention.

Skin: Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

FIRE FIGHTING MEDIA
Use water fog, alcohol-resistant foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SPILL/LEAK
Land Spill: Stop leak if you can do so without risk. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Recover by pumping or with suitable absorbent. Do not touch or walk through spilled material.

Water Spill: Stop leak if you can do so without risk. Report spills as required to appropriate authorities. Material will sink. This product emulsifies, disperses or is miscible in water. Consult an expert.

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Prepared By: Imperial Oil Limited, IH and Product Safety

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: HYDRAUL 56
Product Description: Base Oil and Additives
MSDS Number: 8058
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Products Division**
240 4th Avenue
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone	519-339-2145
Transportation Emergency Phone Number	519-339-2145
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines see Section 15.

HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurised mists may form a flammable mixture.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Oxides of carbon, Incomplete combustion products, Sulphur Oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: 220C (428F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 330°C (626°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

Notification Procedures

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other

shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

Personal Protection

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate,

gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Colour: Amber
Odour: Characteristic
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.885
Flash Point [Method]: 220C (428F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 330°C (626°F)
Boiling Point / Range: > 322C (612F)
Vapour Density (Air = 1): > 2 at 101 kPa
Vapour Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40°C] | 9.9 cSt (9.9 mm^2/sec) at 100C
Oxidizing properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D

Melting Point: N/A
Pour Point: -36°C (-33°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

Route of Exposure	Conclusion / Remarks
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available by request.

CMR Status: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG) : Not Regulated for Land Transport

LAND (DOT) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Not controlled

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

National Chemical Inventory Listing: DSL, TSCA

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations
ZINC C1-C14 ALKYLDITHIOPHOSPHATE	68649-42-3	6

--REGULATORY LISTS SEARCHED--

1 = TSCA 4
2 = TSCA 5a2
3 = TSCA 5e
4 = TSCA 6
5 = TSCA 12b
6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 05: Fire Fighting Measures - Fire Fighting Instruction was modified.
Section 06: Notification Procedures - Header was modified.
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Boiling Point C(F) was modified.
Section 08: Personal Protection - Header was modified.
Section 08: Hand Protection was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release- Spill Management- Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09 Viscosity was modified.
Section 15: National Chemical Inventory Listing - Header was modified.
Section 09: Relative Density was modified.
Section 16: MSN,MAT ID was modified.
Section 15: List Citation Table - Header was modified.
Section 15: Canadian List Citations Table was added.
Section 15: Chemical Name - Header was added.

Section 15: CAS Number - Header was added.
Section 15: List Citations -Header was added.
Section 11: Chronic Tox - Component - WHMIS was added.
Section 11: Chronic Tox - Component - Header was added.
Section 11: Other Health Effects Header was added.
Composition: No components was added.
Section 11: Other Health Effects Header was deleted.
Composition: No components was deleted.
Section 11: Chronic Tox - Component was deleted.
Section 11: Chronic Tox - Component - Header was deleted.
Section 09: Form - Header was deleted.
Section 09: Physical State was deleted.

WHMIS Classification: Not controlled

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Prepared By: Imperial Oil Limited, IH and Product Safety

CYTEC

MATERIAL SAFETY DATA

MSDS No: 01787
CAS No: 013360-78-6
Date: 03/13/2001
Supersedes: 10/14/1997

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **AEROPHINE® 3418A Promoter**

SYNONYMS: Sodium diisobutyldithiophosphinate, 50% aqueous solution

CHEMICAL FAMILY: Dithiophosphinate

MOLECULAR FORMULA: C8H18PS2.Na

MOLECULAR WGT: 232

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WEST PATERSON, NEW JERSEY 07424, USA
For Product Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.
EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800/424-9300. Outside the USA and Canada call 1-703/527-3887.

2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA REGULATED COMPONENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
Sodium diisobutyl-di thiophosphinate	013360-78-6	50-52	not established	

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE AND ODOR: Colorless to light yellow mobile liquid; odorless

STATEMENTS OF HAZARD:

WARNING! CAUSES EYE IRRITATION
MAY CAUSE SKIN IRRITATION

POTENTIAL HEALTH EFFECTS

EFFECTS OF OVEREXPOSURE:
The acute oral (rat) and acute dermal (rabbit) LD50 values for this material are 3.35 g/kg and greater than 5.0 g/kg, respectively. Mild skin and moderate eye irritation were produced during primary irritation studies in rabbits. Skin irritation was increased after repeated exposures in rabbit studies.

4. FIRST AID MEASURES

If quantities greater than 15 cc are swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth or induce vomiting in an unconscious person.
In case of skin contact, immediately wash affected areas with soap and plenty of water. Remove contaminated clothing and shoes. Obtain medical attention. Destroy or thoroughly clean shoes before reuse. Do not reuse contaminated clothing without laundering.
In case of eye contact, immediately irrigate with plenty of water for 15 minutes. Obtain medical attention if irritation persists or if otherwise necessary.
Material is not expected to be harmful if inhaled. If inhaled, remove to fresh air.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: >200 F; 93 C
METHOD: Pensky-Martens Closed Cup

FLAMMABLE LIMITS
(% BY VOL): Not applicable

AUTOIGNITION TEMP: 819 F; 437 C

DECOMPOSITION TEMP: >662 F; 350C

EXTINGUISHING MEDIA AND FIRE FIGHTING INSTRUCTIONS

Use water spray, carbon dioxide or dry chemical to extinguish fires. Use water to keep containers cool. Wear self-contained, positive pressure breathing apparatus and full fire-fighting protective clothing. See Section 8 (Exposure Controls/Personal Protection) for special protective clothing.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Where exposure level is not known, wear NIOSH approved, positive pressure, self-contained respirator. Where exposure level is known, wear NIOSH approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impervious boots. Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush area with water.

7. HANDLING AND STORAGE

Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure. Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands with soap and water. Avoid skin contact. Protective clothing such as impervious gloves, apron, workpants, long sleeve work shirt, or disposable coveralls are recommended to prevent skin contact. For operations where eye or face contact can occur, wear eye protection such as chemical splash proof goggles or face shield. Eyewash equipment and safety shower should be provided in areas of potential exposure. For operations where inhalation exposure can occur, a NIOSH approved respirator recommended by an industrial hygienist may be necessary. A full facepiece respirator also provides eye and face protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Colorless to light yellow mobile liquid; odorless

BOILING POINT: 223 F; 106 C

MELTING POINT: 23-32 F; -5-0 C; (crystallization point)

VAPOR PRESSURE: 17.5 mm Hg @ 20 C; (value for water)

SPECIFIC GRAVITY: 1.14 @ 24 C

VAPOR DENSITY: Not applicable

% VOLATILE (BY WT): ~50; (water)

pH: Slightly alkaline

SATURATION IN AIR (% BY VOL): Not applicable

EVAPORATION RATE: Not applicable

SOLUBILITY IN WATER: Complete

10. STABILITY AND REACTIVITY

STABILITY: Stable
CONDITIONS TO AVOID: None known

POLYMERIZATION: Will Not Occur
CONDITIONS TO AVOID: None known

INCOMPATIBLE MATERIALS: Strong mineral acids and strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: oxides of carbon; oxides of phosphorus; oxides of sulfur (includes sulfur di and tri oxides)

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION. Toxicological information on the OSHA regulated components of this product is as follows:

Sodium diisobutyldithiophosphinate causes moderate eye and mild skin irritation.

12. ECOLOGICAL INFORMATION

Algae (Selenastrum capricornutum), 96 hr EbC50 = 35.1 mg/L; 96 hr ErC50 = 115 mg/L

LC50

BLUEGILL, 96 HOUR: 375 mg/L

DAPHNIA, 48 HOUR: 149 mg/L

BOD

28 Day: 78.8 %

OCTANOL/H_2O PARTITION COEF.: Not applicable

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the Cytec product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA "listed hazardous waste" or has any of the four RCRA "hazardous waste characteristics." Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA "listed hazardous waste"; information contained in Section 15 of this MSDS is not intended to indicate if the product is a "listed hazardous waste." RCRA Hazardous Waste Characteristics: There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 5 of this MSDS (flash point). For Corrosivity, see Sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent than the federal regulations, may also apply to the classification of the material if it is to be disposed. Cytec encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. Cytec recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. Cytec has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

	D.O.T. SHIPPING INFORMATION	IMO SHIPPING INFORMATION
SHIPPING NAME:	NOT APPLICABLE/NOT REGULATED	NOT APPLICABLE/NOT REGULATED
HAZARD CLASS/ PACKING GROUP:	Not Applicable	Not Applicable
UN NUMBER:	Not Applicable	Not Applicable
IMDG PAGE:	Not Applicable	Not Applicable
D.O.T. HAZARDOUS SUBSTANCES:	(PRODUCT REPORTABLE QUANTITY) Not Applicable	Not Applicable
TRANSPORT LABEL REQUIRED:	None Required	None Required

	ICAO/IATA	TRANSPORT CANADA
SHIPPING NAME:	NOT APPLICABLE/NOT REGULATED	NOT APPLICABLE/NOT REGULATED
HAZARD CLASS:	Not Applicable	Not Applicable
SUBSIDIARY CLASS:	Not Applicable	Not Applicable
UN / ID NUMBER:	Not Applicable	Not Applicable
PACKING GROUP:	Not Applicable	Not Applicable
TRANSPORT LABEL REQUIRED:	None Required	None Required
PACKING INSTR:	PASSENGER Not Applicable CARGO Not Applicable	Not Applicable
MAX NET QTY:	PASSENGER Not Applicable CARGO Not Applicable	Not Applicable

ADDITIONAL TRANSPORT INFORMATION

TECHNICAL NAME (N.O.S.):	Not Applicable

15. REGULATORY INFORMATION

INVENTORY INFORMATION

US TSCA:	All components of this product are included on the TSCA Inventory in compliance with the Toxic Substances Control Act, 15 U. S. C. 2601 et. seq.
CANADA DSL:	Components of this product have been reported to Environment Canada in accordance with subsection 25 of the Canadian Environmental Protection Act and are included on the Domestic Substances List.

EEC EINECS: All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments.

OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

COMPONENT	CAS. NO.	%	TPQ(lbs)	RQ(lbs)	S313	TSCA 12B
This product does not contain any components regulated under these sections of the EPA						

PRODUCT CLASSIFICATION UNDER SECTION 311 OF SARA				
ACUTE (Y)	CHRONIC (N)	FIRE (N)	REACTIVE (N)	PRESSURE (N)

16. OTHER INFORMATION

NFPA HAZARD RATING (National Fire Protection Association)

Fire
1
Health 2 0 Reactivity
—
Special

FIRE: Materials that must be preheated before ignition can occur.

HEALTH: Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

REACTIVITY: Materials that in themselves are normally stable, even under fire exposure conditions.

REASON FOR ISSUE:

Revised Section 15

Randy Deskin, Ph.D., DABT

This information is given without any warranty or representation. We do not assume any legal responsibility for same, nor do we give permission, inducement, or recommendation to practice any patented invention without a license. It is offered solely for your consideration, investigation and verification. Before using any product, read its label.

OLD BRIDGE CHEMICALS, INC.
OLD WATERWORKS ROAD
OLD BRIDGE, NJ 08857

Telephone: 732-727-2225
Facsimile: 732-727-2653
info@oldbridgechem.com
www.oldbridgechem.com

MATERIAL SAFETY DATA SHEET

Product Name: COPPER SULFATE CRYSTALS

Manufacturer: Old Bridge Chemicals, Inc.
P.O. Box 194
Old Bridge, New Jersey 08857

Telephone: (732) 727-2225
Emergency Telephone: (800) 275-3924
24-hour Emergency Telephone: (800) 424-9300 Chemtrec

HAZARD CLASSIFICATION: NFPA: Health-3 / Fire-0 / Reactivity-0
HMIS: Health-3 / Fire-0 / Reactivity-0

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200).

SECTION I. MATERIAL IDENTIFICATION

Common Name:	Copper Sulfate
Synonyms:	Blue Vitrol, Bluestone, Cupric Sulfate
Molecular Formula:	$CuSO_4 \cdot 5H_20$
EPA Reg. Number:	46923-4
EPA Signal Word:	**DANGER**
CAS Number:	7758-99-8
SIC Number:	28199 C 29

SECTION II. COMPOSITION/INFORMATION ON INGREDIENTS

Exposure Limits: ACGIH TLV TWA: 1.0 mg/m^3 (as copper dust/mist)
OSHA PEL TWA: 1.0 mg/m^3 (as copper dust/mist)

SECTION III. HAZARD INFORMATION

Emergency overview: Odorless blue crystals. Can cause irreversible eye damage and severe skin irritation. Harmful if swallowed or absorbed through the skin. Avoid

breathing dust or mist. Avoid contact with the skin, eyes or clothes. May cause skin sensitization in certain individuals.

Swallowing:	Toxic orally in accordance with FHSLA regulations. Acute oral LD50 (male rats) = 472 mg/Kg. Can cause irritation to the digestive tract and abdominal pain.
Skin :	Slight skin irritant. Excessive exposure may cause skin irritation. Repeated exposure may cause allergic dermititis. May cause irritation or burns on wet skin.
Eyes:	Can cause severe eye irritation and may result in irreversible eye damage.
Inhalation:	Inhalation of dust may cause irritation to the mucous membranes and upper respiratory tract
Carcinogenicity:	None as per NTP, OSHA, and IARC.

SECTION IV. FIRST AID PROCEDURES

Ingestion:	Give large amounts of milk, egg white, gelatin solution, or if they are not available, large quantities of water. Do not induce vomiting or give anything to an unconscious person. Avoid alcohol. Call Poison Control Center or a physician.
Skin:	Wash thoroughly with soap and water. Remove and wash contaminated clothing before reuse.
Eyes:	Immediately flush eyes with plenty of water for 15 minutes. Hold eyelids apart during irrigation. Call a physician.
Inhalation:	Remove person to fresh air. If not breathing, administer artificial respiration. Get medical attention.
Carcinogenicity:	None.

SECTION V. FIRE AND EXPLOSION DATA

Flash Point:	Not applicable.
Flammable Limits:	Not flammable. If heated above 400^{o} C it can decompose to emit toxic fumes of oxide and sulfur.
Auto Ignition Temperature:	Not determined.
Extinguishing Media:	Copper Sulfate does not burn nor will it support combustion. If stored with other combustible products use water, CO_2 or dry chemical.
Special Fire Fighting Instructions:	If dry heated above 600^{o} C, SO_2 is evolved. If water is used it will solubalize the Copper Sulfate and care should be taken to keep such water out of streams or other water bodies.
Fire Fighting Equipment:	Wear self-contained breathing apparatus.

Fire and Explosion Hazards: None.

SECTION VI. ACCIDENTAL RELEASE MEASURES

Use clean-up measures that avoid dust generation. Wear NIOSH or MSHA approved respirator if dust will be generated. Cover spill with absorbent material such as seeping compound or lime. Sweep up and put into an appropriate container for proper disposal in an approved method. Prevent accidental entry of solution into streams or other bodies of water. Shovel spills into plastic bags and seal with tape.

SECTION VII. HANDLING AND STORAGE

Signal Word:	**DANGER**
Handling Information:	Avoid breathing dust or mist. Sweep up crystals. Eye wash stations should be available in work areas. Users should wash hands before eating, drinking, smoking or using the toilet. Remove PPE immediately after handling this product. Wash outside of gloves before removing. Wash and change into clean clothing as soon as possible.
Storage Information:	Store in closed containers in a cool, dry, well-ventilated area away from heat sources and reducing agents. Store in original containers. Keep away from galvanized pipe, aluminum and nylon. Place damaged containers in plastic bags.

SECTION VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation:	TWA = 1 mg/l. for Copper Sulfate. When TWA exceeds this limit in the workplace, provide appropriate ventilation.
Respiratory Protection:	Wear an approved respirator for dusts or mists: MSHA/NIOSH approved number prefix TC-21C, or a NIOSH approved respirator with any R, P or HE filter. Alternatively, provide respiratory protection equipment in accordance with Paragraph 1910.134 of Title 29 of the Code of Federal Regulations.
Eye Protection:	Use safety glasses with side shields or goggles.
Skin Protection:	Applicators and other handlers should wear long-sleeved shirts and long pants, waterproof gloves, shoes plus socks and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Keep and wash PPE separately from other laundry.

SECTION IX. PHYSICAL DATA

Physical State:	Blue crystals or powder
Boiling Point:	NA

Melting Point:	Decomposition above 110°C with $-4H_2O$
Vapor Density:	NA
Specific Gravity:	2.284
Solubility in H_20:	22.37% @ 0°C 117.95% @ 100°C
Solubility in Other Solvents:	Soluble in methanol, glycerol and slightly soluble in ethanol.
Molecular Weight:	249.68
Appearance:	Transparent blue crystals
Odor:	Odorless

SECTION X. REACTIVITY DATA

Stability:	Stable
Conditions to Avoid:	Product is highly soluble, but does not react with water.
Incompatibility:	Solutions are mildly corrosive to steel. Store solutions in plastic or rubber or 304, 347 or 316 stainless steel. Iron and moisture should be avoided. Store in a dry area. Incompatible with aluminum powder, acetylene gas, hydroxylamine, magnesium and moisture. Contact with magnesium can generate dangerous levels of hydrogen gas. With exposure to air it will oxidize and turn whitish.
Hazardous Decomposition Products:	None at normal production temperatures and pressures. If dry heated above 600°C toxic sulfur may evolve.
Polymerization:	Will not occur.

SECTION XI. TOXICOLOGICAL INFORMATION

Inhalation:	LC_{50} > 2.95 mg/L (rat) Inhalation of dust can result in irritation of nasal mucous membranes and sometimes of the pharynx, on occasion ulceration with perforation of the nasal septum.
Skin:	LD_{50} > 8.0 g/kg (rabbit)
Ingestion:	LD_{50} > 472.5 mg/kg (rat)
Primary Eye Irritation:	Corrosive, irreversible eye damage.
Primary Skin Irritation:	No skin irritation.

Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed. Wilson's disease can be aggravated by excessive exposure. Symptoms include nausea, vomiting, epigastria pain, diarrhea, dizziness, jaundice, and general debility.

SECTION XII. ENVIRONMENTAL AND DISPOSAL INFORMATION

Aquatic LC_{50},:	Daphnia magna 0.182 mg/L.

	Rainbow Trout 0.17 mg/L. Blue Gill 1.5 mg/L. All values are expressed as Copper Sulfate Pentahydrate. Test water was soft. Period 24 hours
Spills and Leaks:	Comply with Federal, State and local regulations on reporting spills. Do not wash away crystals or powder. Recover dry if possible. If product is in a confined solution, react with soda ash to from an insoluble Copper Carbonate solid that can be scooped up.
Waste Disposal:	Do not reuse container. Comply with Federal, State and local environmental control regulations. Sweep up crystals, powder or insoluble Copper Carbonate and dispose of in an approved landfill.
Environmental Effects:	May be dangerous if it enters the public water systems. Follow local regulation. Toxic to fish and plants. Fish toxicity critical concentration is 235 mg/l. and plant toxicity is 25 mg/l.

SECTION XIII. REGULATORY INFORMATION

NOTICE: The information herein is presented in good faith and believed to be accurate. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with Federal, State, and local laws.

SARA 313 Information; This product contains the following substance subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372: COPPER COMPOUND > 1.0%

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following category:

ACUTE HEALTH HAZARD

OSHA: This product is considered hazardous under the OSHA Hazardous Communication Standard (29 CFR 1910.1200).

TSCA: Listed on the Chemical Inventory

CERCLA Hazardous Substances: RQ is not assigned to the broad class of copper compounds.

RCRA: When discarding this material as supplied, it does not meet RCRA characteristic definition if ignitability, corrosiveness, reactivity, and is not listed in 40CFR 261.33.

This product contains Copper Sulfate and is subject to the reporting requirements of Section 13 of the Emergency Planning and Community-Right-to-Know-Act of 1986 (40 CFR 372).

SECTION XIV. SHIPPING INFORMATION

DOT Shipping Name RQ, Environmentally Hazardous Substance, Solid, NOS, (CUPRIC SULFATE), 9, UN3077, PGIII, ERG 171
Reportable Quantity (RQ): 10 pounds (4.54 kg)
Not hazardous when shipping less than 10 pounds
Note: Marine pollutant

SECTION XV. MISCELLANEOUS INFORMATION

This is an NSF Certified Product to ANSI/NSF 60. Maximum use in potable water is not to exceed 2 mg. per liter.

SECTION XVI. MSDS PREPARATION INFORMATION

Prepared By: Joel L. Goldschmidt
Vice President

PREPARATION INFORMATION / RENSEIGNEMENTS SUR LA PRÉPARATION:
Prepared for use in Canada by: / Pour utilisation au Canada, préparé par:
EH&S Product Regulatory Management Department
Dow Chemical Canada Inc. P.O. Box 1012, Sarnia, Ontario N7T 7K7 (800) 363-3500 EXT.2241

M A T E R I A L S A F E T Y D A T A S H E E T

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

IN CASE OF EMERGENCY: Fort Saskatchewan, Alberta: (780) 998-8282
Sarnia, Ontario: (519) 339-3711
Varennes, Quebec: (450) 652-1000

Product: DOWFROTH* 250 FLOTATION FROTHER

Product Code: 23586

Effective Date: 01/15/99 Date Printed: 07/17/00 MSD: 002010

Dow Chemical Canada Inc.
P.O. Box 1012, Sarnia, Ontario N7T 7K7

Prepared for use in Canada by the EH&S Product Regulatory Management Department; Phone: (800) 363-3500 EXT. 2241

2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene oxide methanol adduct	CAS# 037286-64-9	99%
Potassium hydroxide	CAS# 001310-58-3	1%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

****
*
* Yellow to dark brown liquid. Low odor. Causes eye burns. *
*
****

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

(Continued on page 2)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

EYE: Due to the pH of the material, it is assumed that exposure may cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness.

SKIN: Short single exposure not likely to cause significant skin irritation. Prolonged or repeated exposure may cause moderate skin irritation. May cause more severe response if confined to skin or skin is abraded (scratched or cut). Prolonged or repeated exposure to very large amounts of component(s) in this mixture may cause narcosis (drowsiness).

INGESTION: Single dose oral toxicity is considered to be low. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury. Observations in animals include tremors and convulsions.

INHALATION: At room temperature, vapors are minimal due to physical properties; a single exposure is not likely to be hazardous. If material is heated or mist is produced, concentrations may be attained that are sufficient to cause respiratory irritation and other effects. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

TERATOLOGY (BIRTH DEFECTS): Contains component(s) which did not cause birth defects in laboratory animals.

4. FIRST AID

(Continued on page 3)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

EYE: Wash eyes immediately and continuously for 30 minutes. Seek medical attention immediately. Wash eyes enroute if possible.

SKIN: Wash off in flowing water or shower.

INGESTION: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN: Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: 300F, 149C
METHOD USED: Setaflash
AUTOIGNITION TEMPERATURE: Not determined.

FLAMMABILITY LIMITS
LFL: Not determined.
UFL: Not determined.

(Continued on page 4)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

HAZARDOUS COMBUSTION PRODUCTS: Under fire conditions polymers decompose. The smoke may contain polymer fragments of varying compositions in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to: carbon monoxide and carbon dioxide.

OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. Will spread fire.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

(Continued on page 5)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

PROTECT PEOPLE: Clear non-emergency personnel from area.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: Soak up with suitable, non-reactive absorbent material. Collect into suitable containers for disposal.

7. HANDLING AND STORAGE

HANDLING: Avoid contact with vapors from head space of containers.

STORAGE: To avoid uncontrolled emissions vent vapor from container to storage tank.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guideline.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use chemical goggles. Eye wash fountain should be located in immediate work area.

SKIN PROTECTION: When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as faceshield,

(Continued on page 6)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

gloves, boots, apron, or full-body suit will depend on operation. If hands are cut or scratched, use gloves impervious to this material even for brief exposures.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved air-purifying respirator.

EXPOSURE GUIDELINE(S): Dipropylene glycol methyl ether: ACGIH TLV and OSHA PEL are 100 ppm TWA, 150 ppm STEL.

Potassium hydroxide: ACGIH TLV and OSHA PEL are 2 mg/m3 Ceiling.

PELs are in accord with those recommended by OSHA, as in the 1989 revision of PELs.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow to dark brown liquid.
ODOR: Not available.
VAPOR PRESSURE: <0.01 mmHg @ 20C
VAPOR DENSITY: Low
BOILING POINT: 473F, 245C
SOLUBILITY IN WATER: Completely miscible.
SPECIFIC GRAVITY: 0.98 25/25

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under recommended storage conditions. See Storage Section.

(Continued on page 7)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

CONDITIONS TO AVOID: None known.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)

SKIN: The dermal LD50 has not been determined.

INGESTION: The oral LD50 for rats is between 1260 - 2520 mg/kg.

MUTAGENICITY: In vitro mutagenicity studies were negative for component(s) tested.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Log octanol/water partition coefficient (log Pow) is estimated to be low. Based largely or completely on information for similar material.

DEGRADATION & PERSISTENCE: 20-Day biochemical oxygen demand

(Continued on page 8)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

(BOD20) is 0.18 p/p. Biodegradation under aerobic static laboratory conditions is low (BOD20 or BOD28/ThOD between 2.5 and 10%)

ECOTOXICITY: Acute LC50 for fathead minnow (Pimephales promelas) is > 100 mg/L. Material is practically non-toxic to fish on an acute basis (LC50 greater than 100 mg/L).

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 517-832-1556 for further details.

14. TRANSPORT INFORMATION

(Continued on page 9)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

DEPARTMENT OF TRANSPORTATION (D.O.T.): For DOT regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

CANADIAN TDG INFORMATION: For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

CANADIAN REGULATIONS
==========

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

E - corrosive to metal or skin
Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

(Continued on page 10)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

REGULATORY INFORMATION (CONTINUED)

- - - - -

CPR STATEMENT: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

- - - - -

HAZARDOUS PRODUCTS ACT INFORMATION: This product contains the following ingredients which are Controlled Products and/or on the Ingredient Disclosure List (Canadian HPA section 13 and 14):

COMPONENTS:	CAS #	AMOUNT(%w/w)
Polypropylene glycol methyl ether	CAS# 037286-64-9	98%
Potassium hydroxide	CAS# 001310-58-3	1%

.

U.S. REGULATIONS
==========

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

(Continued on page 11)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

REGULATORY INFORMATION (CONTINUED)

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
POTASSIUM HYDROXIDE	001310-58-3	NJ1 NJ3 PA1 PA3
DIPROPYLENE GLYCOL METHYL ETHER	034590-94-8	NJ3 PA1

NJ1=New Jersey Special Health Hazard Substance (present at greater than or equal to 0.1%).
NJ3=New Jersey Workplace Hazardous Substance (present at greater than or equal to 1.0%).
PA1=Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).
PA3=Pennsylvania Environmental Hazardous Substance (present at greater than or equal to 1.0%).

STATE RIGHT-TO-KNOW: This product is not known to contain any

(Continued on page 12)
* OR (R) INDICATES A TRADEMARK OF THE DOW CHEMICAL COMPANY

REGULATORY INFORMATION (CONTINUED)

substances subject to the disclosure requirements of

New Jersey
Pennsylvania

OSHA HAZARD COMMUNICATION STANDARD:

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

16. OTHER INFORMATION

MSDS STATUS: Revised Sections 3, 4, 8, 11, 12, 13, 15.
Canadian regulatory information revised.

(R) Indicates a Trademark of The Dow Chemical Company
The Information Herein Is Given In Good Faith, But No Warranty, Express Or Implied, Is Made. Consult The Dow Chemical Company For Further Information.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50	--	A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^oF). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^oF); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
	* CHRONIC		

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute (202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Material Safety Data Sheet

308166
Rev. D
Updated: 5/02

INSTRUCTIONS
This Data Sheet contains important information.
READ AND KEEP FOR REFERENCE.

First choice when quality counts.

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Emergency Overview

Physical State Liquid.
Color Clear to light amber. **Odor** Mild petroleum odor

WARNING!
Oil injected into the skin from high-pressure leaks in hydraulic systems can cause severe injury.
Most damage occurs during the first few hours.
Seek medical attention immediately.
Surgical removal of oil may be necessary.
Spills may create a slipping hazard.

Hazard Rankings

	HMIS	NFPA
Health Hazard	1	0
Fire Hazard	1	1
Reactivity	0	0

* = Chronic Health Hazard

Protective Equipment

Minimum Requirements
See Section 8 for Details

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydraulic Fluid
Chemical Name: Industrial Oils

Graco Inc.
P.O. Box 1441
60 11th Ave. NE
Minneapolis, MN 55440–1441

Part Number(s): 218-797

Use: Hydraulic Fluid used in PT2500 electric driver hydraulic pump.

Emergency Information
Health Emergency (RMPC): (303)– 623–5716

Chemical Spills (Chemtrec): (800)– 424–9300

2.0 COMPOSITION / INFORMATION ON INGREDIENTS

Component %	CAS#	% by Weight
1)Distillates, petroleum, solvent-refined light paraffinic	64741-89-5	30 – 50
2)Distillates, petroleum, solvent-refined heavy paraffinic	64741-89-5	40 – 60
3) Proprietary Ingredients	Proprietary Mixture	0 – 2
4) Zinc alkyldithiophosphate	68649-42-3	0 - 1

For exposure data, see **8.0, Exposure Controls / Personal Protection.**

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3.0 HAZARDS IDENTIFICATION

Emergency Overview: **Physical State:** Liquid **Odor:** Mild petroleum odor **Color:** Clear to light amber

Potential Health Effects:

Eye Contact	This product can cause transient mild eye irritation with short-term contact with liquid sprays or mists
Skin Contact	This material can cause mild skin irritation from prolonged or repeated skin contact. Injection under the skin can cause inflammation, swelling and mild central nervous system depression. Injection of pressurized hydrocarbons can cause severe, permanent tissue damage. Initial symptoms may be minor. Injection of petroleum hydrocarbons requires immediate medical attention.
Inhalation	At elevated temperatures or in enclosed spaces, product mist or vapors may irritate the mucous membranes of the nose, the throat, bronchi, and lungs
Ingestion	If swallowed, large volumes of material can cause generalized depression, headache, drowsiness, nausea, vomiting and diarrhea. Smaller doses can cause a laxative effect. If aspirated into the lungs, liquid can cause lung damage.
Chronic Health Effects Summary	Contains a petroleum-based mineral oil. Prolonged or repeated skin contact can cause mild irritation and inflammation characterized by drying, cracking, (dermatitis) or oil acne. Repeated or prolonged inhalation of petroleum-based mineral oil mists at concentrations above applicable workplace exposure levels can cause respiratory irritation or other pulmonary effects.
Conditions Aggravated by Exposure	Medical conditions aggravated by exposure to this material may include pre-existing skin disorders.
Target Organs	This material may cause damage to the following organs: skin.
Carcinogenic Potential	This product does not contain any components at concentrations above 0.1% which are considered carcinogenic by OSHA, IARC or NTP.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification						**OSHA Physical Hazard Classification**					
Irritant	☐	**Toxic**	☐	**Combustible**	☐	**Explosive**	☐	**Pyrophoric**	☐		
Sensitizer	☐	**Highly Toxic**	☐	**Flammable**	☐	**Oxidizer**	☐	**Water-reactive**	☐		
Corrosive	☐	**Carcinogenic**	☐	**Compressed Gas**	☐	**Organic Peroxide**	☐	**Unstable**	☐		

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4.0 FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Eye	Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water while occasionally lifting and lowering eyelids. Seek medical attention if excessive tearing, redness, or pain persists.
Skin	Remove contaminated shoes and clothing. Wipe off excess material. Wash exposed skin with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Thoroughly clean contaminated clothing before reuse. Discard contaminated leather goods. If material is injected under the skin, seek medical attention immediately.
Inhalation	Move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. Keep the affected individual warm and at rest.
Ingestion	Do not induce vomiting unless directed to by a physician. Do not give anything to drink unless directed to by a physician. Never give anything by mouth to a person who is not fully conscious. Seek medical attention immediately
Notes to Physician	In the event of injection in underlying tissue, immediate treatment should include extensive incision, debridement and saline irrigation. Inadequate treatment can result in ischemia and gangrene. Early symptoms may be minimal.

. **NOTES:** NA = Not Applicable; NE = Not Established; UN = Unavailable

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5.0 FIREFIGHTING MEASURES

Flashpoint	OPEN CUP: 212°C (414°F) (Cleveland.).
UFL	No Data
LFL	No Data
Autoignition Temperature	Not Available
Flammability Classification	NFPA Class-IIIB combustible material. Slightly combustible!
Extinguishing Media	Use dry chemical, foam, Carbon Dioxide or water fog
Special Properties	This material can burn but will not readily ignite. This material will release vapors when heated above the flash point temperature that can ignite when exposed to a source of ignition. In enclosed spaces, heated vapor can ignite with explosive force. Mists or sprays may burn at temperatures below the flash point.
Firefighting Equipment	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies.
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and trace oxides of sulfur, phosphorus, zinc and/or nitrogen.

6.0 ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Do not touch damaged containers or spilled material unless wearing appropriate protective equipment. Slipping hazard; do not walk through spilled material. Stop leak if you can do so without risk. For small spills, absorb or cover with dry earth, sand, or other inert non-combustible absorbent material and place into waste containers for later disposal. Contain large spills to maximize product recovery or disposal. Prevent entry into waterways or sewers. In urban area, cleanup spill as soon as possible. In natural environments, seek cleanup advice from specialists to minimize physical habitat damage. This material will float on water. Absorbent pads and similar materials can be used. Comply with all laws and regulations.

7.0 HANDLING AND STORAGE

Handling	Avoid water contamination and extreme temperatures to minimize product degradation. Empty containers may contain product residues that can ignite with explosive force. Do not pressurize, cut, weld, braze solder, drill, grind or expose containers to flames, sparks, heat or other potential ignition sources. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers and/or waste residues of this product
Storage	Keep container closed. Do not store with strong oxidizing agents. Do not store at temperatures above 120° F or in direct sunlight for extended periods of time. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers or waste residues of this product.

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8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

Eye	Safety glasses equipped with side shields should be adequate protection under most conditions of use. Wear goggles and/or face shield if splashing or spraying is anticipated. Wear goggles and face shield if material is heated above 125°F (51°C). Have suitable eye wash water available
Personal Protective Equipment	Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.
Hand Protection	Use gloves constructed of chemical resistant materials such as neoprene or heavy nitrile rubber if frequent or prolonged contact is expected. Use heat-protective gloves when handling product at elevated temperatures.
Body Protection	Use clean and impervious protective clothing (e.g., neoprene or Tyvek ®) if splashing or spraying conditions are present. Protective clothing may include long-sleeve outer garment, apron, or lab coat. If significant contact occurs, remove oil-contaminated clothing as soon as possible and promptly shower. Launder contaminated before reuse or discard. Wear heat protective boots and protective clothing when handling material at elevated temperatures
Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of mists and/or vapors below the recommended exposure limits (see below). An eye wash station and safety shower should be located near the work-station
Respiratory Protection	Vaporization is not expected at ambient temperatures. Therefore, the need for respiratory protection is not anticipated under normal use conditions and with adequate ventilation. If elevated airborne concentrations above applicable workplace exposure levels are anticipated, a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter should be used. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).
General Comments	Use good personal hygiene practices. Wash hands and other exposed skin areas with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities, or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners. Since specific exposure standards/control limits have not been established for this product, the "Oil Mist, Mineral" exposure limits shown below are suggested as minimum control guidelines.
Occupational Exposure Guidelines	**Substance** 1) Oil Mist, Mineral **Applicable Workplace Exposure Levels** **ACGIH (United States).** TWA: 5 mg/m ^{3} STEL: 10 mg/m ^{3} **OSHA (United States).** TWA: 5 mg/m ^{3}

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9.0 CHEMICAL AND PHYSICAL PROPERTIES

Appearance and Odor	Mild petroleum odor
pH	Not Applicable
Vapor Pressure (mm Hg)	<0.001 kPa (<0.01 mmHg) (at 20°C)
Vapor Density (Air = 1)	>1 (Air = 1)
Boiling Point	Not available
Melting Point	Not available
Solubility in Water	Insoluble in cold water.
Specific Gravity (Water = 1)	0.87 (Water = 1)
Physical State	Liquid
Color	Clear to light amber
Viscosity (cST @ 40°C)	33
Volatile Characteristics	Negligible volatility
Additional Properties	Gravity, °API (ASTM D287) = 31.3 @ 60° F Density = 7.42 Lbs/gal. Viscosity (ASTM D2161) = 170 SUS @ 100° F

10.0 STABILITY AND REACTIVITY

Stability	Stable.
Conditions to Avoid	Keep away from extreme heat, sparks, open flame, and strongly oxidizing conditions.
Materials to Avoid	Strong oxidizers.
Hazardous Decomposition	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS
Hazardous Polymerization	Not expected to occur

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11.0 TOXILOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 of the Hazards Identification in Section 3 of this MSDS.

Distillates, petroleum, solvent-refined light paraffinic:
ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].
Distillates, petroleum, solvent-refined heavy paraffinic:
ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].

Distillates, petroleum, solvent-refined light paraffinic:
Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

Distillates, petroleum, solvent-refined heavy paraffinic:
Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

Hydraulic Oils:
Repeated or prolonged skin contact with certain hydraulic oils can cause mild skin irritation characterized by drying, cracking (dermatitis) or oil acne. Injection under the skin, in muscle or into the blood stream can cause irritation, inflammation, swelling, fever, and systemic effects, including mild central nervous system depression. Injection of pressurized hydrocarbons can cause severe, permanent tissue damage.

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12.0 ECOLOGICAL INFORMATION

Ecotoxicity
Analysis for ecological effects has not been conducted on this product. However, if spilled, this product and any contaminated soil or water may be harmful to human, animal, and aquatic life. Also, the coating action associated with petroleum and petroleum products can be harmful or fatal to aquatic life and waterfowl.

Environmental Fate
An environmental fate analysis has not been conducted on this specific product. Plants and animals may experience harmful or fatal effects when coated with petroleum-based products. Petroleum-based (mineral) lube oils will normally float on water. In stagnant or slow-flowing waterways, an oil layer can cover a large surface area. As a result, this oil layer might limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can result in a loss of marine life or create an anaerobic environment. This material contains phosphorus which is a controlled element for disposal in effluent waters in most sections of North America. Phosphorus is known to enhance the formation of algae. Severe algae growth can reduce oxygen content in the water possibly below levels necessary to support marine life.

13.0 DISPOSAL INFORMATION

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a "hazardous waste" at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specific disposal issues. Empty drums and pails retain residue. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose this product's empty container to heat, flame, or other ignition sources. DO NOT attempt to clean it. Empty drums and pails should be drained completely, properly bunged or sealed, and promptly sent to a reconditioner.

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14.0 TRANSPORTATION INFORMATION

U.S. Dept. of Transportation: Not a US Department of Transportation regulated material.

Hazard Class - Not regulated
Packing Group(s) – Not applicable
UN/NA ID – Not regulated
Reportable Quantity – A Reportable Quantity (RQ) has not been established for this material.
Placards

Emergency Response Guide No. Not applicable
Hazmat STCC No. – Not assigned
MARPOL III Status – Not a DOT "Marine Pollutant' Per 49 CFR 171.8

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15.0 REGULATORY INFORMATION

CERCLA Sections 102A/103 Hazardous Substances (40 CFR Part 302.4)	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Zinc and Zinc Compounds, Concentration: 0 - 1%
SARA Title III Section 302 Extremely Hazardous Substances (40 CFR Part 355)	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified
SARA Title III Section 311/312 Hazardous Categorization (40 CFR Part 370)	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: No SARA 311/312 hazard categories identified.
SARA Title III Sections 313 (40 CFR Part 372)	This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: No components were identified.
U.S. Inventory (TSCA)	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
CWA	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Toluene: 0.001%
New Jersey Right-to-Know Label	Petroleum Oil (Hydraulic Fluid)
Additional Regulatory Remarks	No additional regulatory remarks

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16.0 OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

ABBREVIATIONS

AP = Approximately, EQ = Equal, > = Greater Than, < = Less Than, NA = Not Applicable, ND = No Data, NE = Not Established

ACGIH = American Conference of Governmental Industrial Hygienists
IARC = International Agency for Research on Cancer
NIOSH = National Institute of Occupational Safety and Health
NPCA = National Paint and Coating Manufacturers Association
NFPA = National Fire Protection Association
AIHA = American Industrial Hygiene Association
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
HMIS = Hazardous Materials Information System
EPA = Environmental Protection Agency

Prepared By	Graco, Inc.

This Material Safety Data Sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we have received from sources outside our company. We believe that information to be correct, but cannot guarantee its accuracy or completeness. Health and safety precautions in this Data Sheet may not be adequate for all individuals and/or situations. It is the users' obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

NOTES: NA = Not Applicable; NE = Not Established; UN = Unavailable

All written and visual data contained in this document reflects the latest product information available at the time of publication.
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MATERIAL SAFETY DATA SHEET

Hydrochloric Acid

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Hydrochloric acid, inhibited hydrochloric acid

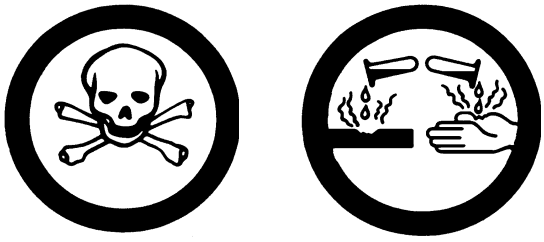
Product Use ..... Acidizing (activation) of petroleum wells, scale removal, ore reduction, metal cleaning, pH adjustment, industrial acidizing, generation of chlorine dioxide, regeneration of ion exchange resins.

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... May 5, 2008

24-Hour Emergency Phone..... 306-664-2522



Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Hydrochloric Acid	15-40%
CAS Number.....	Hydrochloric Acid	7647-01-0
Synonym (s).....	Aqueous hydrogen chloride, muriatic acid	

Section 03 - Hazard Identification

Inhalation..... Vapour or mist can cause irritation to nose, throat, and upper respiratory tract. Symptoms include: coughing, choking, and bleeding of the nose and gums. Severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Skin Contact / Absorption..... Contact may produce severe irritation or corrosive skin damage, depending upon length of contact and amount of acid. Effects range from dermititis, photo sensitization, redness, swelling, pain, permanent scarring, to death.

Eye Contact..... Low concentrations of vapour or mist can be irritating, causing redness. Concentrated vapour, mist or splashed liquid can cause severe irritation, burns and permanent blindness.

Ingestion..... Causes severe burns of the mouth, esophagus, and stomach, with consequent pain, nausea, vomiting, diarrhea, circulatory collapse, and possibly death.

Exposure Limits..... ACGIH/PEL= 5ppm (hydrochloric acid)

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with lukewarm water for 20-30 minutes. Seek medical attention immediately.

Eye Contact..... Flush immediately with lukewarm water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion..... Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Rinse mouth out with water. If the victim can swallow, give 1 cup of water or milk to dilute. If vomiting occurs, rinse the mouth out and give another cup of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information..... Not available

Section 05 - Fire Fighting

Conditions of Flammability……..... Non-flammable

Means of Extinction.....…….... Product does not burn. Where fire is involved, use any fire fighting agent appropriate for surrounding material; use water spray to cool fire-exposed surfaces.

Flash Point...……. Not applicable

Auto-ignition Temperature……. Not applicable

Upper Flammable Limit …….. Not applicable

Lower Flammable Limit...…….. Not applicable

Hazardous Combustible Products... Hydrogen and chlorine gas formed at temperatures over 1500°C.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards……... Normally none, but when in contact with metals explosive hydrogen gas may be evolved.

Section 06 - Accidental Release Measures

Leak / Spill.....…….. Wear appropriate personal protective equipment. Ventilate area. Restrict access to area until clean up is complete. Stop or reduce leak if safe to do so. Prevent material from entering sewers.

Deactivating Materials...…….... Soda ash, lime, limestone

Section 07 - Handling and Storage

Handling Procedures.....…….. Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements.....……..….. Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Store away from incompatible materials such as oxidizing materials, reducing materials and strong bases.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... At concentrations up to 50 ppm, chemical charge respirator or air-purifying respirator is recommended. Above this level, a self-contained breathing apparatus is required.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Liquid

Odor and Appearance..... Colourless or slightly yellow, fuming liquid with a pungent odour.

Odor Threshold..... Detectable at 1-5ppm

Specific Gravity (Water=1)..... 1.16-1.19 (30-35%); 1.08 (15%)

Vapor Pressure (mm Hg, 20C)..... 100mm Hg at 20°C (35%)

Vapor Density (Air=1)..... 1.268

Evaporation Rate..... < 1

Boiling Point..... 90°C (30%), 83°C (31%)

Freeze/Melting Point..... -35°C (35%)

pH..... < 1

Water/Oil Distribution Coefficient.... < 1

Bulk Density..... Not available

% Volatiles by Volume..... 100%

Solubility in Water..... Completely miscible

Molecular Formula..... HCl

Molecular Weight..... 36.46

Section 10 - Stability and Reactivity

Stability..... Stable, heat and contamination could cause decomposition.

Incompatibility..... Incompatible with strong bases, metals, phosphines, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde, hypochlorites, cyanides, sulphides.

Hazardous Products of Decomposition.. Contact with hypochlorites liberates chlorine gas. May react violently with incompatible substances. May release toxic and/or flammable gases such as hydrogen and phosphine gas. Considerable amounts of heat may be evolved.

Polymerization..... Will not occur.

Section 11 - Toxicological Information

Irritancy..... Severe irritant, corrosive to eyes and skin.

Sensitization..... Not available

Chronic/Acute Effects..... Prolonged exposure can cause erosion and discolouration of teeth and chronic imflammation of nose, throat, and airways. Repeated or prolonged contact to dilute solutions can cause dermatitis.

Synergistic Materials..... Not available

Animal Toxicity Data..... LC_{50}(inhalation,mouse,4 hour)= 757ppm
LD_{50}(oral,rabbit)= 900mg/kg

Carcinogenicity..... Not considered to be carcinogenic by IARC, NTP and ACGIH.

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... When released into the soil, this material is not expected to biodegrade.

Environmental Effects..... Extremely toxic to aquatic life by lowering the pH below 5.5. When released into the soil, this material may leach into groundwater.

Section 13 - Disposal Consideration

Waste Disposal..... Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 8

Group..... II

PIN Number..... UN1789

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....D1, E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification.....Product is certified under ANSI/NSF Standard 60 for scale control and pH adjustment at a maximum dosage for the following:

31% hydrochloric acid: 45mg/L
35% hydrochloric acid: 40mg/L

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Material Safety Data Sheet

WHMIS / ANSI Z400.1-2004 Compliant

Date / Revised: 04-17-2007 Release: 1.0

Product: MAGNAFLOC 10

1. Identification of the Substance/Preparation and of the Company/Undertaking

Company Information

Company:	Ciba Canada Ltd. 2626 Argentia Road Mississauga, Ontario L5N 5N2 Canada Customer Service / Product Information: 1-866-679-2422

Emergency information

Emergency 24-Hour Health/Environmental Phone:	+1-800-873-1138
CANUTEC:	(613) 996-6666 (24hrs)

Product information

Product:	MAGNAFLOC 10
Use:	flocculation agent

2. Hazards Identification

Emergency overview

Signal word:	CAUTION: !
Colour:	off-white
Appearance:	powder
State of matter:	solid
Odour:	odourless
Health:	This product has no known adverse effect on human health.
Physical/Chemical hazards:	Organic powders may be capable of generating static discharges and creating explosive mixtures in air. Handle with caution., Slip hazard when wet.

Potential health effects

Primary routes of entry:

Eyes, Skin, Inhalation, Ingestion

Chronic exposure:

Eye contact may cause slight irritation and/or redness. Repeated or prolonged exposure may cause slight skin irritation.

Inhaled dust may cause respiratory irritation.

3. Composition/Information on Ingredients

This material does not contain any hazardous components that are reportable according to WHMIS criteria.

4. First-aid Measures

Inhalation:

Remove to fresh air, if not breathing give artificial respiration. If breathing is difficult, give oxygen and get immediate medical attention.

Skin:

After contact with skin, wash immediately with plenty of water and soap.
Get medical attention if irritation occurs.
If clothing is contaminated, remove and launder before reuse.

Eyes:

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Ingestion:

Do not induce vomiting. If vomiting occurs naturally, have casualty lean forward to reduce the risk of aspiration. Seek medical attention immediately.

5. Fire-fighting Measures

Suitable extinguishing media:

carbon dioxide, dry powder, foam

Unsuitable Extinguishing Media:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Hazardous combustion products:

Carbon and nitrogen oxides.

Hazards during fire-fighting:

Standard procedure for chemical fires.
The product becomes slippery when wet. Restrict pedestrian and vehicular traffic in areas where slip hazard may exist.
Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition.

Protective equipment for fire-fighting:

Wear self-contained breathing apparatus and chemical-protective clothing.

6. Accidental Release Measures

Cleanup:

Sweep up and shovel into suitable containers for disposal.
Avoid raising dust.
Wear suitable protective equipment.
Should not be released into the environment.

7. Handling and Storage

Handling

General advice:

As with all industrial chemicals, use good industrial practices when handling. Avoid eye, skin, and clothing contact. Do not inhale. Do not taste or swallow. Use only with adequate ventilation.

Protection against fire and explosion:

Avoid creating dusty conditions. Risk of explosion if an air-dust mixture forms.

Storage

General advice:

Keep container tightly closed in a dry, cool and well-ventilated place.

> for industrial use only <

8. Exposure Controls and Personal Protection

Engineering Controls:

Work in well ventilated areas. Do not breathe dust.
Ensure good ventilation and local exhaust.

Personal protective equipment

Respiratory protection:

Wear a NIOSH-certified respirator as necessary.

Eye protection:

Wear safety goggles (chemical goggles) if there is potential for airborne dust exposures.

Body protection:

Wear chemical resistant gloves and protective clothing.

General safety and hygiene measures:

There are no OSHA or ACGIH exposure guidelines available for component(s) in this product.

9. Physical and Chemical Properties

Colour:	off-white	
Form:	powder	
State of matter:	solid	
Odour:	odourless	
pH value:	5 - 7	1% solution
Evaporation rate:		Not tested
Flash point:		Not applicable
Melting point:		Not applicable
Boiling point:		Not applicable
Vapour pressure:		Not tested
Density:		Not applicable
Bulk density:	0.8 g/cm3	
Vapour density:		Not tested
Partitioning coefficient n-octanol/water (log Pow):		Not applicable
Viscosity, dynamic:		Not tested
% Volatiles:		not determined
Solubility in water:		Forms a viscous solution
Solubility in other solvents:		Not tested

10. Stability and Reactivity

Stability:

Stable.

Conditions to avoid: Avoid temperature extremes. Avoid humidity.

Substances to avoid: Strong oxidizing agents., (may degrade polymer)

Possibility of Hazardous Reactions: No hazardous reactions known.

Hazardous decomposition products: No decomposition expected under normal storage conditions.

11. Toxicological Information

Acute oral toxicity:

LD50 / oral / rat: > 2,000 mg/kg

Acute inhalation toxicity:

Not determined.

Acute dermal toxicity:

dermal:

Not determined.

Skin irritation:

not determined

Eye irritation:

Not determined.

Skin Sensitization:

Not tested

Chronic toxicity:

not determined

Subacute Toxicity:

not determined

Subchronic Toxicty:

not determined

Genetic toxicity:

Not expected to be mutagenic

Carcinogenicity:

None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

Reproductive toxicity:

No data for product. No effects anticipated

Developmental toxicity/teratogenicity:

No data for product. No effects anticipated.

12. Ecological Information

Toxicity to fish:

Brachydanio rerio/96 h/LC50: 357 mg/l (OECD 203; ISO 7346; 92/69/EEC, C.1)
From tests on a product range

Toxicity to aquatic invertebrates:

Daphnia magna/48 h/EC50: 212 mg/l (OECD 202/EC C.2)
From tests on a product range

Toxicity to aquatic plants:

Chlorella vulgaris/72 h/EC50: > 1,000 mg/l (OECD 201/EC C. 3)
From tests on a product range

Toxicity to microorganisms:

Pseudomonas putida/24 h/EC50: 892 mg/l
From tests on a product range

Biodegradation:

Not tested

13. Disposal Considerations

Waste disposal of substance:

Dispose of in accordance with national, state and local regulations.

14. Transport Information

TDG (Canada) Road transport

Special shipping information: Not classified as a dangerous good under transport regulations.

International Air Transport Association (IATA)

Special shipping information: Not classified as a dangerous good under transport regulations.

International Maritime Dangerous Goods Code (IMDG)

Special shipping information: Not classified as a dangerous good under transport regulations.

15. Regulatory Information

US: Toxic Substances Control Act (TSCA):	All component(s) comprising this product are either exempt or listed on the TSCA inventory
Canada: Domestic Substances List (DSL):	All components either exempt or listed on the DSL

Canada Regulations

Workplace Hazardous Materials Information System (WHMIS Classification):

This product is not WHMIS controlled.

Significant New Activity Conditions (SNAC):

This product does not contain any components subject to a SNAC Notice.

International Regulations

Chemical Weapons Convention:

This product does not contain any component(s) listed under the Chemical Weapons Convention Schedule of Chemicals.

16. Other Information

Product Safety Contact:

Prepared by: Ginette Rambié (905) 812-7280

Phone number of preparer:

Date / Revised: 04-17-2007

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Disclaimer:

The information contained herein is based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to such data or information. The user is responsible for determining whether the product is suitable for its intended conditions of use.

SYSTEM FLOC-360™

Flocculant

Description

SYSTEM FLOC-360™ polymeric flocculant is used to flocculate clays and shales encountered in drilling operations and facilitate disposal of water-based drilling fluids.

Applications/Functions

- Can flocculate and settle out dispersed formation solids in clear fluids and conventional drilling fluids

Advantages

- Product addition creates aggressive water/solids separation
- Residual fluids after treatment have improved clarity
- Effective in low to moderate concentrations

Typical Properties

Appearance	Amber Liquid
Specific gravity	1.14- 1.18
Freeze point, °F, (°C)	20°F (-7°C)
pH of 1% aqueous solution @ 25°C	5.5-6.5
Viscosity* @ 25°C (*Brookfield LVT, 30 rpm, Spindle #1)	80-120 cP
Solubility in water	100% miscible

Recommended Treatment

For flocculation treatment of fluid systems containing PHPA polymer:

- Recommended treatment concentration is between 1.0 - 2.0 % by volume
- Final product concentration can be influenced by method of introduction and efficiency of reaction created.
- SYSTEM FLOC-360 flocculant should be introduced with agitation to optimize speed and efficiency of reaction.
- Disposal of solids and water phase should always be done in accordance with all applicable federal, state and local regulations.
- Responsible handling and disposal of drilling fluids, water phase effluent and produced solids require that these materials should not be allowed to gain entry into any stream, waterway or body of water.

For clean-out of Drilled Shafts using PHPA polymers:

- Using the diameter of the drilled shaft calculate the volume of a 1-2 foot interval of the open hole.
- Add SYSTEM FLOC-360 flocculant at a concentration of 0.5 - 1.0 % by volume and place directly to the bottom of the shaft. Based on calculated volumes, the appropriate amount of SYSTEM FLOC-360 flocculant can be placed in collapsible bags allowing delivery to the bottom of the shaft or material can be tremied into place.
- After proper placement, use of the auger flights to create agitation is necessary for effective dispersion of the SYSTEM FLOC-360 flocculant and incorporation with existing solids.
- Crosslinked polymer and drilled solids can be removed using a vented clean-out bucket

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Rev. 5/2008 · IDP-078

Because the conditions of use of this product are beyond the seller's control, the product is sold without warranty either express or implied and upon condition that purchaser make its own test to determine the suitability for purchaser's application. Purchaser assumes all risk of use and handling of this product. This product will be replaced if defective in manufacture or packaging or if damaged. Except for such replacement, seller is not liable for any damages caused by this product or its use. The statements and recommendations made herein are believed to be accurate. No guarantee of their accuracy is made, however.

Packaging	SYSTEM FLOC-360 flocculant is packaged in 55-gallon (208.2 L) non-returnable steel-drums and 5-gallon (18.9 L) resealable plastic containers.
Availability	SYSTEM FLOC-360 flocculant can be purchased through any Baroid Industrial Drilling Products Retailer. To locate the Baroid IDP retailer nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products
Product Service Line, Halliburton
3000 N. Sam Houston Pkwy E.
Houston, TX 77032

Customer Service	**(800) 735-6075 Toll Free**	**(281) 871-4612**
Technical Service	**(877) 379-7412 Toll Free**	**(281) 871-4613**

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **System Floc-360™**

Revision Date: 08-Aug-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: System Floc-360™
Synonyms: None
Chemical Family: Polymer in Aqueous Solution
Application: Flocculent

Manufacturer/Supplier
Baroid Fluid Services
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Contains no hazardous substances	Mixture	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	> 200
Flash Point/Range (C):	> 100
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Spills produce extremely slippery surfaces.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Material is slippery underfoot.

Storage Information Store in a cool, dry location. Keep container closed when not in use. Store at temperatures between 50 and 100 F (10 and 37.8 C). Do not freeze. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear amber
Odor:	Odorless
pH:	4.8-6.5 (1%)
Specific Gravity @ 20 C (Water=1):	1.14-1.18
Density @ 20 C (lbs./gallon):	9.5-9.8
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	> 212
Boiling Point/Range (C):	> 100
Freezing Point/Range (F):	20
Freezing Point/Range (C):	-7
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	80-85
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	80-120 (25C)
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	None known.
Hazardous Decomposition Products	Hydrogen chloride. Carbon monoxide and carbon dioxide. Oxides of nitrogen.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhalation of mist or heated vapors may cause respiratory irritation.
Skin Contact	May cause mild skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	In normal industrial use, ingestion is not considered a probable route of exposure.
Aggravated Medical Conditions	Skin disorders.
Chronic Effects/Carcinogenicity	Not determined
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: > 2000 mg/kg (Rat)
Dermal Toxicity:	LD50: > 2000 mg/kg (Rat)
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Ames test: negative
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not readily biodegradable.

Bio-accumulation Not expected to bioaccumulate.

Ecotoxicological Information

Acute Fish Toxicity:	LC50:(96 hour) >10 mg/l (Brachidanio rerio)
Acute Crustaceans Toxicity:	EC50(48): > 50 mg/l (Daphnia magna)
Acute Algae Toxicity:	Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

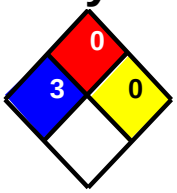
Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

Copper Sulfate Pentahydrate

Date Prepared: May 17, 2002

MATERIAL SAFETY DATA SHEET



NFPA RATING

HEALTH	3	
FLAMMABILITY	0	
REACTIVITY	0	
PROTECTIVE EQUIPM		

HMIS RATING

SECTION I. PRODUCT IDENTIFICATION

Product Name: Copper Sulfate Pentahydrate

Synonyms: Triangle Brand Copper Sulfate; Triangle Brand Copper Sulfate Crystal; Triangle Brand Copper Sulfate Instant Powder; Triangle Brand Copper Sulfate Pentahydrate; Triangle Brand Cupric Sulfate Pentahydrate Technical; Phelps Dodge Copper Sulfate; Phelps Dodge Refining Corporation Triangle Brand Copper Sulfate; Phelps Dodge El Paso Triangle Brand; Cupric Sulfate; Copper Sulfate; Copper Sulfate Pentahydrate; Blue Vitrol; Triangle Brand Cupric Sulphate Pentahydrate Technical; Triangle Brand Copper Sulphate Instant Powder; Triangle Brand Copper Sulphate Crystal

Product Use: Industrial manufacturing, animal feed, algicide, fungicide, herbicide, pesticide or as a fertilizer.

Manufacturer/Vendor Information:
PHELPS DODGE REFINING CORP.
P.O Box 20001
El Paso, Texas

Chemtrec 24-Hour Emergency Phone:
In USA or Canada (800)424-9300
Other Information Phone: (915)778-9881

SECTION II. COMPOSITION / INFORMATION ON INGREDIENTS

CAS No.	Chemical Name	Exposure Limits	% by wt.
7758-99-8	Copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$), (Cupric sulfate), (Blue Vitriol), (Bluestone)	ACGIH TLV TWA: 1.0 mg/m^3 (as copper dust/mist) OSHA PEL TWA: 1.0 mg/m^3 (as copper dust/mist)	99
Anhydrous Cupric Sulfate (CAS# 7758-98-7)	*Phelps Dodge Triangle Brand Copper Sulfate* *Copper Sulfate Pentahydrate (CAS 7758-99-8)* *Contains anhydrous copper sulfate* *Contains water of crystallization* *Metallic copper equivalent*		 *=99%* *=63.3%* *=35.7%* *=25.2%*

SECTION III. HAZARDS IDENTIFICATION

Emergency Overview: Odorless, transparent blue crystals, granules or powder. Can cause irreversible eye damage and slight skin irritation. Harmful if swallowed. Avoid breathing mist or dust and contact with skin, eyes or clothing.
Route(s) of Entry: Inhalation, eye contact, skin contact and ingestion.
Acute Exposure: Can cause skin, eye and respiratory irritation.
Chronic Exposure: Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. Prolonged excessive inhalation of mists containing copper sulfate may cause adverse effects on the liver and kidneys.
Carcinogenicity (NTP) (IARC) (OSHA) (ACGIH): Not listed
Eye: Corrosive and may result in irreversible eye damage.
Skin Contact: Can cause slight skin irritation. May cause localized discoloration of the skin. Product specific tests in accordance with USEPA standards do not indicate skin sensitization is likely to occur.
Inhalation: Can result in irritation of the upper respiratory tract and in excessive quantities may cause ulceration and perforation of the nasal septum.
Ingestion: Can result in digestive tract irritation, nausea, vomiting, diarrhea and abdominal pain.

SECTION IV. FIRST AID MEASURES

Eyes: Immediately flush eyes with plenty of water. Hold eye open and rinse slowly and gently for at least 15-20 minutes. Contact physician for treatment advice.
Skin: Wash skin with soap and plenty of water. If irritation persists contact a physician.

SECTION IV. FIRST AID MEASURES (Continued)

Ingestion: Contact a poison control center or physician for treatment advice. Have person sip a glass of water if able to swallow. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless told to do so by the poison control center or physician. If vomiting occurs spontaneously, avoid aspiration.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

SECTION V. FIRE FIGHTING MEASURES

Flash Pt:	Not applicable
Flammable Limits in Air-Lower:	Not applicable
Flammable Limits in Air – Upper:	Not applicable
Auto Ignition Temperature:	Not applicable
Fire Fighting Extinguishing Media:	Does not burn or support combustion. Use extinguishing media appropriate for surrounding fire (CO_2, dry chemical or water).
Fire Fighting Equipment:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
Fire Fighting Instructions:	Evacuate area and fight fire from a safe distance.
Fire and Explosion Hazards:	Sealed containers may rupture when heated due to release of water from crystals.
Hazardous Combustion Products:	Not applicable
Explosion Data - Mechanical Impact / Static Discharge:	Not available
Unusual Hazards:	Material is acidic when dissolved in water, contact with magnesium metal may evolve hydrogen gas. Anhydrous cupric sulfate formed on water loss (white color). Anhydrous salt will ignite hydroxylamine, if present.

SECTION VI. ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Use clean-up methods that avoid dust generation (vacuum, wet). Wear a NIOSH approved respirator if dust will be generated in clean-up. Use protective clothing if skin contact is likely. If material is diluted in a water solution, and a spill occurs in a confined area, introduce lime or soda ash to form insoluble copper salts and dispose of by approved method. Prevent accidental entry of solution into streams and other water bodies. Shovel any spills into plastic bags and seal with tape. Copper sulfate solution may deteriorate concrete.

SECTION VII. HANDLING AND STORAGE

Signal Word: Danger.

Handling Information: Avoid breathing dust or solution mist. Sweep up crystals or powder, vacuum is preferred. Eye wash stations should be available in work areas. Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Storage Information: Store in closed containers in a cool, dry, well-ventilated area away from heat sources and reducing agents. Store copper sulfate in stainless steel, fiberglass, polypropylene, PVC's or plastic equipment. Keep away from galvanized pipe and nylon equipment. If container or bag is damaged, place the container or bag in a plastic bag. Use good housekeeping practices to prevent dust accumulation.

SECTION VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use adequate general or local ventilation to keep airborne concentrations below the exposure limits.

Eye Protection: Use protective goggles or a face-shield.

Skin Protection: Use protective clothing to prevent repeated or prolonged skin contact. Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with product's concentrate. Do not reuse them. Keep and wash PPE separately from other laundry.

SECTION VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

Respiratory Protection: A respiratory protection program that meets OSHA 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant respirator use. For concentrations up to 10 times the exposure limit, use NIOSH approved half- or full-face, air-purifying respirator. For higher concentrations, consult a professional industrial hygienist.

SECTION IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent blue crystals, granules or powder.
Melting Point:	Not available
Boiling Point:	-5H2O @ 150 °C (760 mmHg)
Decomposition Temperature:	Decomposition above 110 °C with –4 H_20
Density/Specific Gravity:	2.284 @ 15.6 °C
Odor/Odor Threshold:	Not available
Evaporation rate:	Not applicable
pH:	Not available
Coefficient of water/oil distribution:	Not available
Vapor Pressure:	Not applicable
Vapor Density:	Not applicable
Solubility in Water:	83.1 g/100 cc water @ 30 °C
Molecular Weight:	249.68

SECTION X. STABILITY AND REACTIVITY

Stability: Stable.
Incompatibility: Acetylene gas, aluminum powder, hydroxylamine, magnesium, moist air. Contact with magnesium metal can generate dangerous levels of hydrogen gas.
Conditions under which product is chemically unstable: Not applicable
Hazardous decomposition products: At temperatures >600 °C material decomposes to cupric oxide and sulfur dioxide.
Conditions of reactivity: Not applicable
Hazardous Polymerization: Will not occur.

SECTION XI. TOXICOLOGICAL INFORMATION

Toxicology Tests: (Triangle Brand Copper Sulfate Crystal)

Test : 1
LD/LC : LD_{50}
Test Type : Acute
Test Route : Dermal
Test Species : Rabbit
Results Amounts : >5050 mg/kg

Test : 2
LD/LC : LD_{50}
Test Type : Acute
Test Route : Oral
Test Species : Rat
Results Amounts : 352 mg/kg*
*Results based on toxicity evaluation of this product.

Test : 3
LD/LC : LC_{50}
Test Type : Acute, 4 hr
Test Route : Inhalation
Test Species : Rats
Results Amounts : >2.95 mg/L

Primary Eye Irritation: Corrosive, irreversible eye damage
Primary Skin Irritation: Slightly irritating.
Skin Sensitization: Product-specific tests in accordance with USEPA standards did not indicate that this product would cause skin sensitization.
Respiratory Tract Sensitization: Not available.
Carcinogenicity: Not listed as a carcinogen by NTP, IARC, OSHA, or ACGIH.

SECTION XI. TOXICOLOGICAL INFORMATION (Continued)

Mutagenicity: A study performed with copper sulphate on mice showed mutagenicity in a chromosomal aberration test; however, the route of exposure (*i.e.,* intraperitoneal) is not likely to be applicable to workplace use of this product.
Reproductive Toxicity: No reproductive effects were shown in a feeding test performed with copper sulphate on rats and mice.
Teratogenicity: Embryotoxicity was not seen at non-maternally toxic doses of copper sulphate in the relevant studies reviewed.
Toxicologically Synergistic Materials: Not available.
Other Chronic Effects: Long term inhalation of copper sulfate containing mists (*i.e.,* Bordeaux mixture) may cause adverse effects to the liver and kidneys. A sub-chronic test performed on rats and mice showed that at high exposure levels in feed (>4000 ppm) cupric sulfate is toxic to the liver and kidneys.

Additional Information: Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes, sometimes of the pharynx and, on occasion ulceration with perforation of the nasal septum. Exposure to copper dust causes discoloration of the skin.
Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed. Wilson's disease or G6PD deficiency (individual who absorbs, retains and stores copper) can be aggravated by excessive exposure. Symptoms may include nausea, vomiting, epigastric pain, diarrhea, dizziness, jaundice, and general debility.

SECTION XII. ECOLOGICAL INFORMATION

Subacute dietary LC_{50}: >10,000 ppm (quail and duck).
96 hr acute toxicity LC_{50}: 0.65 ppm (bluegill), 0.056 ppm (trout), 16 ppm (pink shrimp)
48 hr EC_{50}: 54 ppb (eastern oysters)
48 hr LC_{50}: 17 ppm (pink shrimp), 600 ppb (daphnia)
24 hr LC_{50}: 6.9 ppm (blue crab), 600 ppb (daphnia)
Bioaccumulation: Not available
Biodegradability: Not applicable

SECTION XIII. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Waste must be disposed of in accordance with federal, state/provincial and local environmental control regulations. Improper disposal is a violation of law. Do not reuse empty container. If allowed by federal, state/provincial and local authorities, dispose of container in a sanitary landfill or by incineration.

SECTION XIV. TRANSPORT INFORMATION

	Proper Shipping Name:	Technical Name (If N.O.S.):	Hazard Class:	ID:	PG:
DOT:	*Environmentally Hazardous Substance, Solid, n.o.s., (Cupric Sulfate)** Reportable Quantity (RQ) = 10 pounds (4.54 kg).		9	UN3077	III

*Applicable when product is shipped in packaging of 10 pounds or greater.

SECTION XV. REGULATORY INFORMATION

US Federal
Federal Drinking Water Standards: *(Copper)* EPA 1300µg/L (action level), 1000 µg/L
Clean Water Act: This product contains compounds identified in 40 CFR 116.4.
TSCA: Listed
EPCRA, SARA Title III, Section 313 (40 CFR 372) Chemicals subject to reporting requirements (see Section II for CAS number and percentage in mixture): Section 312 and/or 313 reporting may be required for this product, depending of the amount used and/or stored on site.
CERCLA Hazardous Substances: RQ is not assigned to the broad class of copper compounds.
DOT: RQ 10 pounds (4.54 kg), See Section XIV TRANSPORT INFORMATION

Canada
This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all of the information required by the *Controlled Products Regulations.*

SECTION XVI. OTHER INFORMATION

Prepared By:	Phelps Dodge Corporation Department of Occupational Health and Safety One North Central Avenue Phoenix, AZ 85004 Telephone number (602.366.8398)
Reason for Revision:	Added use statement in Section I. Revised Section III and XI to reflect recent toxicity tests, Updated/revised information in other Sections with addition of Section XII in accordance with WHMIS.

Disclaimer: This information is based on available scientific evidence known to the Phelps Dodge Corporation. The information contained in the MSDS is being disclosed as required pursuant to applicable law. However, Phelps Dodge does not guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. This information is furnished without warranty, expressed or implicit.

MATERIAL SAFETY DATA SHEET

Date Printed: 07/09/2004
Date Updated: 03/07/2004
Version 1.2

Section 1 - Product and Company Information

Product Name	DEXTRIN
Product Number	260754
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
DEXTRIN	9004-53-9	No

Formula C6H12O6
RTECS Number: HH9450000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Caution: Avoid contact and inhalation.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid breathing dust. Avoid contact with eyes, skin, and clothing.

STORAGE
Suitable: Keep container closed. Store in a cool dry place.

SPECIAL REQUIREMENTS
Hygroscopic.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Wash contaminated clothing before reuse.

Section 9 - Physical/Chemical Properties

Appearance	Color: Faintly yellow Form: Powder

Property	Value	At Temperature or Pressure
Molecular Weight	N/A	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	

Freezing Point	N/A
Vapor Pressure	N/A
Vapor Density	N/A
Saturated Vapor Conc.	N/A
SG/Density	N/A
Bulk Density	N/A
Odor Threshold	N/A
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point	N/A
Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Conditions of Instability: Protect from moisture.
Conditions to Avoid: Protect from moisture.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Multiple Routes: May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Intravenous
Mouse
350 MG(FE)/KG
LD50

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Dissolve or mix the material with a combustible solvent and burn

in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA
Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

US CLASSIFICATION AND LABEL TEXT
US Statements: Caution: Avoid contact and inhalation.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MATERIAL SAFETY DATA SHEET

For Emergency Assistance
Involving Chemicals Call CHEMTREC
(800) 424-9300

WHMIS (Classification)
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

Section I. Chemical Product Identification

Distributed by:
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC
V6X 1W5

Product Name	Methyl Isobutyl Carbinol	Code	LA1277
		CAS#	000108112
Synonym	Methyl Amyl Alcohol MIBC 2-Pentanol-4-Methyl		
		DSL	On the DSL list.
Chemical Name	dimethyl-1,3 butanol-1		
		CI#	Not available.
Chemical Family	Not available.		
Chemical Formula	C6H14O		
Material Uses	Industrial applications: Organic solvent		

Section II. Composition and Information on Ingredients

Name	CAS #	% by Weight	LC50/LD50
Methyl Isobutyl Carbinol	000108112	100	ORAL (LD50): Acute: >2590 mg/kg [Rat]. DERMAL (LD50): Acute: >3.5 mL/kg [Rabbit]. VAPOR (LC50): Acute: >2000 ppm 4 hours [Rat].

Section III. Hazards Identification

Potential Acute Health Effects	Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

Potential Chronic Health Effects	CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section IV. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Flush affected skin with gently flowing lukewarm water for at least 20 minutes and remove contaminated clothing while rinsing. Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.
Hazardous Skin Contact	Flush affected skin with gently flowing lukewarm water for at least 20 minutes and remove contaminated clothing while rinsing. Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Hazardous Inhalation	Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.
Ingestion	Do not induce vomiting. Do not give anything by mouth to an unconscious person. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs. Obtain medical attention immediately.
Hazardous Ingestion	Not available.

Section V. Fire and Explosion Data

The Product is: Flammable.

Auto-Ignition Temperature	338°C (640.4°F)
Flash Points	CLOSED CUP: 44°C (111.2°F). (TAG) OPEN CUP: 51.7°C (125.1°F) (Cleveland).
Flammable Limits	LOWER: 1% UPPER: 5.5%
Products of Combustion	Carbon monoxide and carbon dioxide are produced on combustion.

Fire Hazards in Presence of Various Substances	Flammable in presence of open flames and sparks, of heat, of oxidizing materials.
Explosion Hazards in Presence of Various Substances	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.
Fire Fighting Media and Instructions	Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special Remarks on Fire Hazards	Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup which could result in container rupture. Product will float and can be reignited on surface of water. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Caution - Combustible.
Special Remarks on Explosion Hazards	Not available.

Section VI. Accidental Release Measures

Small Spill	Absorb with an inert material and put the spilled material in an appropriate waste disposal.
Large Spill	Issue warning "Combustible". Eliminate all ignition sources. Handling equipment must be grounded. Isolate hazard area and restrict access. Try to work upwind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. For large spills remove by mechanical means and place in containers. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations. Notify appropriate environmental agency(ies).

Section VII. Handling and Storage

Precautions	Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. DO NOT ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the

	label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids. Hot surfaces may be sufficient to ignite liquid even in the absence of sparks or flames. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers may contain hazardous product residues. Do not pressurize drum containers to empty them. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Do not cut, drill, grind, weld or perform similar operations on or near containers. Air-dry contaminated clothing in a well ventilated area before laundering. Launder contaminated clothing prior to reuse. Use good personal hygiene.
Storage	Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Use explosion-proof ventilation to prevent vapour accumulation.

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where mechanical ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Concentrations in air should be maintained below the recommended threshold limit value if unprotected personnel are involved. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Electrical and mechanical equipment should be explosion-proof. Mechanical ventilation is recommended for all indoor situations to control fugitive emissions. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Personal Protection	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Impervious gloves (neoprene) should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Safety showers should be available for emergency use. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.
Personal Protection in Case of a Large Spill	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Impervious gloves (neoprene) should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Safety showers should be available for emergency

	use. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.
Exposure Limits	TWA: 104 STEL: 167 (mg/m3) from ACGIH (TLV) [United States] SKIN TWA: 25 STEL: 40 (ppm) from ACGIH (TLV) [United States] SKIN Consult local authorities for acceptable exposure limits.

Section IX. Physical and Chemical Properties

Physical State and Appearance	Liquid.	Odor	Sweetish. Alcohol like.
		Taste	Not available.
Molecular Weight	102.17 g/mole		
pH (1% soln/water)	Not available.	Color	Colorless.
Boiling Point	130°C - 133°C (266°F - 271.4°F)		
Melting Point	-90°C (-130°F)		
Critical Temperature	Not available.		
Specific Gravity	0.808 (Water = 1)		
Vapor Pressure	>0.4 kPa (@ 20°C)		
Vapor Density	3.5 (Air = 1)		
Volatility	Not available.		
Odor Threshold	Not available.		
Evaporation rate	0.27		
Viscosity	Not available.		
Water/Oil Dist. Coeff.	The product is more soluble in oil; log(oil/water) = 26.9		
Ionicity (in Water)	Not available.		
Dispersion Properties	Not available.		
Solubility	Very slightly soluble in cold water, hot water. Soluble in Other Solvents: Alcohol, Ether, Organic Solvents		

Section X. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	Do not use with aluminum equipment at temperatures above 49 degrees Celsius. Avoid excessive heat, open flames and all ignition sources.
Incompatibility with various substances	Reactive with oxidizing agents, acids.
Corrosivity	Not available.
Special Remarks on Reactivity	Not available.
Special Remarks on Corrosivity	Not available.
Hazardous Polymerization	Will not occur.

Section XI. Toxicological Information

Routes of Entry	Absorbed through skin. Eye contact. Inhalation. Ingestion.
Toxicity to Animals	Acute oral toxicity (LD50): >2590 mg/kg [Rat]. Acute dermal toxicity (LD50): >3.5 mL/kg [Rabbit]. Acute toxicity of the vapor (LC50): >2000 ppm 4 hours [Rat].
Chronic Effects on Humans	CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.
Other Toxic Effects on Humans	Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.
Special Remarks on Toxicity to Animals	Not available.
Special Remarks on Chronic Effects on Humans	Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Pre-existing Conditions: Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Special Remarks	Vapours are moderately irritating to the respiratory

on	passages.
Other Toxic Effects on Humans	Ingestion of this product may cause headache, dizziness, fatigue and central nervous system depression. Vapours are moderately irritating to the eyes.

Section XII. Ecological Information

Ecotoxicity	Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities. MIBC is practically non-toxic to aquatic organisms and is expected to be slightly toxic to mammalian wildlife. MIBC may deoxygenate surface waters.
BOD5 and COD	Not available.
Products of Biodegradation	Biodegradable. Not likely to bioaccumulate.
Toxicity of the Products of Biodegradation	Not available.
Special Remarks on the Products of Biodegradation	Not available.

Section XIII. Disposal Considerations

Waste Disposal	Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

Section XIV. Transport Information

TDG Classification	Class 3: Flammable liquid.
Shipping name	Methyl isobutyl carbinol
PIN	UN2053
Packing Group	III
Special Provisions for Transport	Not regulated under the Transportation of Dangerous Goods Act when transported by road or rail in packagings or containers of 454 L or less (waste excluded).

Section XV. Other Regulatory Information

Other Regulations	OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Section XVI. Other Information

References -Manufacturer's Material Safety Data Sheet.

Other Special Considerations Not available.

Validated by Hardev Bendick on 12/7/2000. Verified by Hardev Bendick.

Tel. number for non-emergency questions concerning MSDS: 1-866-686-4827

Notice to Reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Univar Canada Ltd. expressly disclaims all expressed or implied warranties of merchantability and fitness for a particular purpose with respect to the product provided.**

========== END OF MSDS ==========

Material Safety Data Sheet

acc. to OSHA and ANSI

Printing date 02/03/2003 Reviewed on 11/01/2002

1 Identification of substance:

- **Product details:**
- **Product name:** Potassium ethyl xanthate
- **Stock number:** A11450
- **Manufacturer/Supplier:**
  Alfa Aesar, A Johnson Matthey Company
  Johnson Matthey Catalog Company, Inc.
  30 Bond Street
  Ward Hill, MA 01835-8099
  Emergency Phone: (978) 521-6300
  CHEMTREC: (800) 424-9300
  Web Site: www.alfa.com
- **Information Department:** Health, Safety and Environmental Department
- **Emergency information:**
  During normal hours the Health, Safety and Environmental Department. After normal hours call Chemtrec at (800) 424-9300.

2 Composition/Data on components:

- **Chemical characterization:**
  Description: (CAS#)
  Potassium ethyl xanthate (CAS# 140-89-6): 100%
- **Identification number(s):**
- **EINECS Number:** 205-439-3

3 Hazards identification

- **Hazard description:** Xn Harmful
- **Information pertaining to particular dangers for man and environment**
  R 22 Harmful if swallowed.
  R 36/37/38 Irritating to eyes, respiratory system and skin.
- **Classification system**
- **HMIS ratings (scale 0-4)**

  (Hazardous Materials Identification System)
  Health (acute effects) = 1
  Flammability = 1

Reactivity = 1

4 First aid measures

- **After inhalation**
  Supply fresh air. If required, provide artificial respiration. Keep patient warm.
  Seek immediate medical advice.
- **After skin contact**
  Immediately wash with water and soap and rinse thoroughly.
  Seek immediate medical advice.
- **After eye contact**
  Rinse opened eye for several minutes under running water. Then consult a doctor.
- **After swallowing** Seek immediate medical advice.

5 Fire fighting measures

- **Suitable extinguishing agents**
  Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Special hazards caused by the material, its products of combustion or resulting gases:**
  In case of fire, the following can be released:
  Carbon monoxide and carbon dioxide
  Sulfur oxides (SOx)
- **Protective equipment:**
  Wear self-contained respirator.
  Wear fully protective impervious suit.

6 Accidental release measures

- **Person-related safety precautions:**
  Wear protective equipment. Keep unprotected persons away.
  Ensure adequate ventilation
- **Measures for environmental protection:**
  Do not allow material to be released to the environment without proper governmental permits.
- **Measures for cleaning/collecting:**
  Dispose contaminated material as waste according to item 13.
  Ensure adequate ventilation.
- **Additional information:**
  See Section 7 for information on safe handling
  See Section 8 for information on personal protection equipment.
  See Section 13 for disposal information.

7 Handling and storage

- **Handling**
- **Information for safe handling:**
  Keep container tightly sealed.
  Store in cool, dry place in tightly closed containers.
  Ensure good ventilation at the workplace.
- **Information about protection against explosions and fires:**
  Keep ignition sources away.

- **Storage**
- **Requirements to be met by storerooms and receptacles:**
  No special requirements.
- **Information about storage in one common storage facility:**
  Store away from oxidizing agents.

- **Further information about storage conditions:**
  Keep container tightly sealed.
  Store in cool, dry conditions in well sealed containers.

8 Exposure controls and personal protection

- **Additional information about design of technical systems:**
  Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

  Components with limit values that require monitoring at the workplace:
  Not required.
- **Additional information:** No data

- **Personal protective equipment**
- **General protective and hygienic measures**
  The usual precautionary measures for handling chemicals should be followed.
  Keep away from foodstuffs, beverages and feed.
  Remove all soiled and contaminated clothing immediately.
  Wash hands before breaks and at the end of work.
  Avoid contact with the eyes and skin.
- **Breathing equipment:**
  Use suitable respirator when high concentrations are present.
- **Protection of hands:**
  Impervious gloves
  Check protective gloves prior to each use for their proper condition.
- **Material of gloves**
  The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
- **Eye protection:** Safety glasses
- **Body protection:** Protective work clothing.

9 Physical and chemical properties:

- **General Information**

- **Form:** Powder
- **Color:** Light yellow
- **Odor:** Not determined

	Value/Range	Unit	Method
Change in condition			
Melting point/Melting range:	213	° C	dec
Boiling point/Boiling range:	Not determined		
Sublimation temperature / start:	Not determined		
Ignition temperature:	Not determined		
Decomposition temperature:	Not determined		

- **Danger of explosion:**
  Product does not present an explosion hazard.

- **Explosion limits:**
- **Lower:** Not determined
- **Upper:** Not determined

- **Vapor pressure:** Not determined

- **Density:** Not determined

- **Solubility in / Miscibility with**
- **Water:** Not determined

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:**
  Decomposition will not occur if used and stored according to specifications.
- **Materials to be avoided:** Oxidizing agents
- **Dangerous reactions** No dangerous reactions known
- **Dangerous products of decomposition:**
  Carbon monoxide and carbon dioxide
  Sulfur oxides (SOx)

11 Toxicological information

- **Acute toxicity:**
  LD/LC50 values that are relevant for classification:
  Oral: LD50: 308 mg/kg (mus)
  LD50: 1700 mg/kg (rat)
- **Primary irritant effect:**
- **on the skin:** Irritant to skin and mucous membranes.
- **on the eye:** Irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Subacute to chronic toxicity:**
- **Subacute to chronic toxicity:**
  The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
  Behavioral - excitement.
  Behavioral - muscle contraction or spasticity.
  Behavioral - antipsychotic.
  Behavioral - somnolence (general depressed activity).
  Lungs, Thorax, or Respiration - respiratory depression
  Blood - changes in erythrocyte (RBC) count.
  Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - catalases.
  Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - other enzymes.
- **Additional toxicological information:**
  To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
  No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

- **General notes:**
  Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

- **Product:**
- **Recommendation**
  Consult state, local or national regulations to ensure proper disposal.

- **Uncleaned packagings:**

- **Recommendation:**
  Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

- **DOT regulations:**
- **Hazard class:** None

- **Land transport ADR/RID (cross-border)**
- **ADR/RID class:** None

- **Maritime transport IMDG:**
- **IMDG Class:** None

- **Air transport ICAO-TI and IATA-DGR:**
- **ICAO/IATA Class:** None

- **Transport/Additional information:**
  Not dangerous according to the above specifications.

15 Regulations

- **Product related hazard informations:**

- **Hazard symbols:** Xn Harmful

- **Risk phrases:**
  22 Harmful if swallowed.
  36/37/38 Irritating to eyes, respiratory system and skin.

- **Safety phrases:**
  26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
  36/37 Wear suitable protective clothing and gloves.

- **National regulations**
  All components of this product are listed in the U.S. Environmental Agency Toxic Substances Control Act Chemical substance Inventory.

- **Information about limitation of use:**
  For use only by technically qualified individuals.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

- **Department issuing MSDS:** Health, Safety and Environmental Department.
- **Contact:** Darrell R. Sanders

Contact Alfa Aesar today!
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26 Parkridge Road
Ward Hill, MA 01835
USA
info@alfa.com

Alfa Aesar is an ISO-9002 certified company.

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VAN WATERS & ROGERS INC., SUBSIDIARY OF UNIVAR
1600 NORTON BLDG. SEATTLE, WA 98104-1564 (408) 435-8700

EMERGENCY ASSISTANCE

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL CHEMTREC (800)424-9300

FOR PRODUCT AND SALES INFORMATION

CONTACT YOUR LOCAL VAN WATERS & ROGERS BRANCH OFFICE

PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM ETHYL XANTHATE CAS NO.: UNASSIGNED
COMMON NAMES/SYNONYMS: AERO(R) 325 VW&R CODE: T1791

FORMULA: ROCS(S) NA OR ROCS(S) K DATE ISSUED: 08/89
HAZARD RATING (MANUFACTURER) SUPERCEDES: 10/87

HEALTH: 1 HAZARD RATING SCALE:
FIRE: 0 0=MINIMAL 3=SERIOUS
REACTIVITY: 0 1=SLIGHT 4=SEVERE
SPECIAL: NONE 2=MODERATE

HAZARDOUS INGREDIENTS

			EXPOSURE LIMITS, PPM			
			OSHA	ACGIH	OTHER	
COMPONENT	CAS NO.	%	PEL	TLV	LIMIT	HAZARD
SODIUM ETHYL XANTHATE	UNREPORTED	UNKNOWN	NONE	NONE	NONE	NONE
ETHANOL	64-17-5	0.5-1	1000	1000	NONE	FLAMMABLE

(R) TRADEMARK OF AMERICAN CYANIMID COMPANY.

PHYSICAL PROPERTIES

BOILING POINT, DEG F: N/A VAPOR PRESSURE, MM HG/20 DEG C: N/A
MELTING POINT, DEG F: 360-493 VAPOR DENSITY (AIR=1): N/A
SPECIFIC GRAVITY (WATER=1): N/A WATER SOLUBILITY, %: APPRECIABLE
APPEARANCE AND ODOR: N/A EVAPORATION RATE (BUTYL ACETATE=1): NIL

FIRST AID MEASURES

IF INHALED: REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF EYE CONTACT: IMMEDIATELY FLUSH EYES WITH LOTS OF RUNNING WATER FOR 15 MINUTES, LIFTING THE UPPER AND LOWER EYELIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF SKIN CONTACT: IMMEDIATELY WASH SKIN WITH LOTS OF SOAP AND WATER. REMOVE CONTAMINATED CLOTHING AND SHOES; WASH BEFORE REUSE. GET MEDICAL ATTENTION IF IRRITATION PERSISTS AFTER WASHING.

IF SWALLOWED: IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING BY GIVING 2 GLASSES OF WATER AND STICKING A FINGER DOWN THE THROAT. GET IMMEDIATE

MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON.

----------HEALTH HAZARD INFORMATION----------

PRIMARY ROUTES OF EXPOSURE: INHALATION, SKIN OR EYE CONTACT.

SIGNS AND SYMPTOMS OF EXPOSURE
    INHALATION: BREATHING DUST MAY IRRITATE THE NOSE AND THROAT AND CAUSE COUGHING AND CHEST DISCOMFORT.

    EYE CONTACT: DUSTS MAY IRRITATE THE EYES.

    SKIN CONTACT: PROLONGED OR REPEATED CONTACT WITH THE DUST MAY IRRITATE THE SKIN.

    SWALLOWED: NONE CURRENTLY KNOWN.

CHRONIC EFFECTS OF EXPOSURE: NO SPECIFIC INFORMATION AVAILABLE.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: NONE REPORTED.

----------TOXICITY DATA----------

ORAL: NO DATA FOUND.

DERMAL: NO DATA FOUND.

INHALATION: NO DATA FOUND.

CARCINOGENICITY: THIS MATERIAL IS NOT CONSIDERED TO BE A CARCINOGEN BY THE NATIONAL TOXICOLOGY PROGRAM, THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, OR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OTHER DATA: NONE

----------PERSONAL PROTECTION----------

VENTILATION: LOCAL MECHANICAL EXHAUST VENTILATION CAPABLE OF MINIMIZING DUST EMISSIONS AT THE POINT OF USE.

RESPIRATORY PROTECTION: IF USE CONDITIONS GENERATE VAPORS OR MISTS, WEAR A NIOSH-APPROVED RESPIRATOR APPROPRIATE FOR THOSE EMISSION LEVELS. APPROPRIATE RESPIRATORS MAY BE A FULL FACEPIECE OR A HALF MASK AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ORGANIC VAPORS/MISTS, A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE, OR A SUPPLIED-AIR RESPIRATOR.

EYE PROTECTION: CHEMICAL GOGGLES. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH CHEMICALS BECAUSE CONTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

PROTECTIVE CLOTHING: LONG-SLEEVED SHIRT, TROUSERS, SAFETY SHOES, AND GLOVES.

OTHER PROTECTIVE MEASURES: AN EYEWASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

--------------------FIRE AND EXPLOSION INFORMATION---------------------

FLASH POINT, DEG F: N/A FLAMMABLE LIMITS IN AIR, %
METHOD USED: N/A LOWER: N/A UPPER: N/A
EXTINGUISHING MEDIA: USE WATER SPRAY, DRY CHEMICAL, CO2, OR ALCOHOL FOAM.

SPECIAL FIRE FIGHTING PROCEDURES: FIRE FIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. USE WATER SPRAY TO COOL NEARBY CONTAINERS AND STRUCTURES EXPOSED TO FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE.

-----------------------HAZARDOUS REACTIVITY--------------------------

STABILITY: UNSTABLE POLYMERIZATION: WILL NOT OCCUR.
CONDITIONS TO AVOID: HEAT, MOISTURE.

MATERIALS TO AVOID: MOISTURE, ACIDS.

HAZARDOUS DECOMPOSITION PRODUCTS: CARBON DISULFIDE.

-----------------SPILL, LEAK, AND DISPOSAL PROCEDURES-------------------

ACTION TO TAKE FOR SPILLS OR LEAKS: WEAR PROTECTIVE EQUIPMENT INCLUDING RUBBER BOOTS, RUBBER GLOVES, RUBBER APRON, AND A FULL FACEPIECE OR A HALF MASK AIR-PURIFYING CARTRIDGE RESPIRATOR WITH PARTICULATE FILTERS. WEAR CHEMICAL GOGGLES IF A HALF MASK IS WORN. FOR SMALL SPILLS, SWEEP UP AND DISPOSE OF IN DOT-APPROVED WASTE CONTAINERS. FOR LARGE SPILLS, SHOVEL INTO DOT-APPROVED WASTE CONTAINERS. KEEP OUT OF SEWERS, STORM DRAINS, SURFACE WATERS, AND SOIL.
COMPLY WITH ALL APPLICABLE GOVERNMENTAL REGULATIONS ON SPILL REPORTING, AND HANDLING AND DISPOSAL OF WASTE.

DISPOSAL METHODS: DISPOSE OF CONTAMINATED PRODUCT AND MATERIALS USED IN CLEANING UP SPILLS OR LEAKS IN A MANNER APPROVED FOR THIS MATERIAL. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.
NOTE: EMPTY CONTAINERS CAN HAVE RESIDUES, GASES AND MISTS AND ARE SUBJECT TO PROPER WASTE DISPOSAL, AS ABOVE.

-----------------------SPECIAL PRECAUTIONS--------------------------

STORAGE AND HANDLING PRECAUTIONS: STORE IN A COOL, DRY, WELL-VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. KEEP BAGS OR FIBER DRUMS DRY AT ALL TIMES. WASH THOROUGHLY AFTER HANDLING. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

REPAIR AND MAINTENANCE PRECAUTIONS: NONE.

OTHER PRECAUTIONS: CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, WILL RETAIN PRODUCT RESIDUE AND VAPORS. ALWAYS OBEY HAZARD WARNINGS AND HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL.

----------------------FOR ADDITIONAL INFORMATION----------------------

CONTACT MSDS COORDINATOR, VAN WATERS & ROGERS INC.
DURING BUSINESS HOURS, PACIFIC TIME (408)435-8700

----------NOTICE----------

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----------REVISION----------

08/89: CHANGED HEADING AND CONTACT INFORMATION.

Material Safety Data Sheet

ORFOM ® SIPX (SODIUM ISOPROPYL XANTHATE)

September 30, 2001
MSDS #: 28990
Revision #0

CHEVRON PHILLIPS CHEMICAL COMPANY LP
10001 Six Pines Drive
The Woodlands, TX 77380

PHONE NUMBERS
HEALTH:
Chevron Phillips Emergency
Information Center 866.442.9628
(North America) and
1.832.813.4984(International)
TRANSPORTATION:
North America: CHEMTREC 800.424.9300
or 703.527.3887
ASIA: 1.703.527.3887
EUROPE: BIG .32.14.584545 (phone)
or .32.14.583516 (telefax)
SOUTH AMERICA SOS-Cotec
Inside Brazil: 0800.111.767
Outside Brazil: 55.19.3467.1600
Technical Services: (832) 813-4862
For Additional MSDSs: (800) 852-5530

A. Product Identification

Synonyms: Not Established
Chemical Name: Sodium Isopropyl Xanthate
Chemical Family: Dithiocarbonate
Chemical Formula: C4H7OS2Na
CAS Reg. No.: 140-93-2
Product No.: Not Established

Product and/or Components Entered on EPA's TSCA Inventory: YES
This product is in U.S. commerce, and is listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals; hence, it may be subject to applicable TSCA provisions and restrictions.

Canadian Inventory Listing Status: DSL
All ingredients are listed in the Domestic Substances List (DSL).

Impurities are exempt in accordance with Section 3 of the Canadian Environmental Protection Act (CEPA).

B. Components

Ingredients	CAS Number	% By Wt.	OSHA PEL	ACGIH TLV
Sodium Isopropyl Xanthate	140-93-2	>84.0	NE	NE
Sodium Hydroxide	1310-73-2	< 3.0	2 mg/m3	2 mg/m3 (C)
Water	7732-18-5	Reminder	NE	NE

C. Personal Protection Information

Ventilation: Use adequate ventilation to control exposure below recommended level.

Respiratory Protection: Not generally required unless needed to prevent respiratory irritation.

Eye Protection: Use safety glasses with side shields.

Skin Protection: No special garments required. Avoid unnecessary skin contamination. Use impervious rubber gloves.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

D. Handling and Storage Precautions

Do not get in eyes, on skin or on clothing. Do not breathe vapors, mist, fume or dust. Wear protective equipment and/or garments described above if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use only with adequate ventilation.

Store in a closed containers. Store in cool, well-ventilated area away from ignition sources. Protect from moisture and oxidants.

E. Reactivity Data

Stability: Stable
Conditions to Avoid: Acid; ignition sources.

Incompatibility (Materials to Avoid): Oxidants, organic or inorganic acids

Hazardous Polymerization: Will Not Occur
Conditions to Avoid: Not Applicable
Hazardous Decomposition Products: Sulfur oxides and carbon disulfides released on heating.

F. Health Hazard Data

Recommended Exposure Limits:

Control as Particulate Not Otherwise Classified (PNOC) or Regulated:

	OSHA PEL	ACGIH TLV*
Respirable Fraction	5 mg/m3	3 mg/m3
Total Dust	15 mg/m3	10 mg/m3

* The value is for inhalable (total) particulate matter containing no asbestos and

Acute Effects of Overexposure:

Eye: Irritation possible.

Skin: Mild irritation. Dermatitis may be possible with prolonged contact.

Inhalation: Dust may cause irritation to the nose, throat, and upper respiratory tract.

Ingestion: Low to moderate toxicity possible.

Subchronic and Chronic Effects of Overexposure:

Xanthates can decompose to release carbon disulfide (CAS # 75-15-0) which may cause dizziness, headache, fatigue, nervousness, loss of appetite, psychosis and nerve, heart, kidney or liver changes.

Other Health Effects:

No known applicable information.

Health Hazard Categories:

Animal	Human		Animal	Human

Known Carcinogen	___	___	Toxic	___	___
Suspect Carcinogen	___	___	Corrosive	___	___
Mutagen	___	___	Irritant	___	___
Teratogen	___	___	Target Organ Toxin	_X_	_X_
Allergic Sensitizer	___	___	Specify - Liver, Kidney, Heart &		
Highly Toxic	___	___	Nerve Toxin		

Canadian WHIMS:

CLASS D: POISONOUS AND INFECTIOUS MATERIAL CATEGORIES

1. Materials Causing Immediate and Serious Toxic Effects

   A. Very Toxic _____
   B. Toxic _____

2. Materials Causing Other Toxic Effects

   A. Very Toxic

      1. Chronic Toxic Effects _____
      2. Teratogen/Embryo Toxin _____
      3. Carcinogen _____
      4. Reproductive Toxin _____
      5. Respiratory Tract Sensitizer _____
      6. Mutagen _____

   B. Toxic

      1. Chronic Toxic Effects __x__
      2. Skin or Eye Irritant _____
      3. Skin Sensitizer _____
      4. Mutagen _____

   Specify: Liver - Toxin; Kidney - Toxin; Heart - Toxin; Nerve - Toxin.

First Aid and Emergency Procedures:

Eye: Flush eyes with running water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

Skin: Wash skin with soap and water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

Inhalation: Remove from exposure. If breathing is difficult, give oxygen. If breathing ceases, administer artificial respiration followed by oxygen. Seek immediate medical attention.

Ingestion: Give two glasses of water and induce vomiting, only if subject is conscious. Seek medical attention.

G. Physical Data

Appearance:	Yellowish Powder or Pellets
Odor:	Slight
Boiling Point:	Not Applicable
Vapor Pressure:	Not Applicable
Vapor Density (Air = 1):	Not Applicable
Solubility in Water:	Appreciable
Specific Gravity (H_2O = 1):	Not Established
Percent Volatile by Volume:	14 maximum
Evaporation Rate (Butyl Acetate = 1):	Not Applicable
Viscosity:	Not Applicable

H. Fire and Explosion Data

Flash Point (Method Used):	Not Applicable (solid or powder)
Flammable Limits (% by Volume in Air):	LEL - Not Applicable UEL - Not Applicable
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide (CO_2)
Special Fire Fighting Procedures:	Evacuate area of all unnecessary personnel. Shut off source, if possible. Use NIOSH/MSHA approved self-contained breathing apparatus and other protective equipment and/or garments described in Section C if conditions warrant. Water fog or spray may be used to cool exposed containers and equipment.
Fire and Explosion Hazards:	Sulfur oxides and carbon disulfide released upon heating.

I. Spill, Leak and Disposal Procedures

Precautions Required if Material is Released or Spilled:

Evacuate area of all unnecessary personnel. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Shut off source, if possible and contain spill. Protect from ignition. Keep out of water sources and sewers. Follow normal clean-up procedures for solid spills. Control dust. Avoid breathing dust. Avoid contact with skin and eyes.

Waste Disposal (Insure Conformity with all Applicable Disposal Regulations):

Incinerate or place in permitted waste management facility.

J. DOT Transportation

Shipping Name: Self-heating, solid, organic, n.o.s., (Sodium isopropyl xanthate)
Hazard Class: 4.2
ID Number: UN 3088
Packing Group: II
Marking: Self-heating, solid, organic, n.o.s., (Sodium isopropyl xanthate), UN 3088
Label: Spontaneously combustible
Placard: Spontaneously combustible/3088
Hazardous Substance/RQ: Not Applicable
Shipping Description: Self-heating, solid, organic, n.o.s., (Sodium isopropyl xanthate), 4.2, UN 3088, PG II
Packaging References: 49 CFR 173.212, 173.241

K. RCRA Classification - Unadulterated Product as a Waste

Reactive (D003)

Prior to disposal, consult your environmental contact to determine if the TCLP (Toxicity Characteristic Leaching Procedure, EPA Test Method 1311) is required. Reference 40 CFR Part 261.

L. Protection Required for Work on Contaminated Equipment

Contact immediate supervisor for specific instructions before work is initiated. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Use NIOSH/MSHA approved respiratory protection, such as air-supplied mask, in confined spaces or other poorly ventilated areas.

M. Hazard Classification

_X_ This product meets the following hazard definition(s) as defined by the Occupational Safety and Health Hazard Communication Standard (29 CFR Section 1910.1200):

___ Combustible Liquid	___ Flammable Aerosol	___ Oxidizer
___ Compressed Gas	___ Explosive	___ Pyrophoric
___ Flammable Gas	_X_ Health Hazard (Section F)	___ Unstable
___ Flammable Liquid	___ Organic Peroxide	___ Water Reactive
___ Flammable Solid		

___ Based on information presently available, this product does not meet any of the hazard definitions of 29 CFR Section 1910.1200.

Canadian WHIMS:

Class D:Poisonous and Infectious Material
Division 2. Materials Causing Other Toxic Effects

N. Additional Comments

SARA 313

This product contains the following chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. (See Section B).

Sodium Hydroxide
Carbon Disulfide

NFPA 704 Hazard Codes - - - - - - - - Signals

		Least - 0
Health	: 1	Slight - 1
Flammability	: 0	Moderate - 2
Reactivity	: 0	High - 3
Special Haz.	: -	Extreme - 4

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by EHS Product Stewardship Group, Chevron Phillips Chemical Company LP, 10001 Six Pines Drive, The Woodlands, TX 77380

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Material Safety Data Sheet
HYDRATED LIME

Rev. Date:5/1/2008

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**Hi-Cal Hydrate**	
Synonym/s:	**Hydrate, High Calcium Hydrated Lime, Type N Hydrated Lime, HL**	
Manufacturer:	**US Operations:** **Chemical Lime Co.** **3700 Hulen St.** **Fort Worth, TX 76107** **817-732-8164**	**Canadian Operations:** **Chemical Lime Co. of Canada Inc.** **20302-102B Ave.** **Langley, BC V1M 3H1** **604-888-4333**
Emergency Phone:	**Chemtrec 1-800-424-9300**	
Chemical Name: **Chemical Family:** **Chemical Formula:**	**Calcium Hydroxide** **Alkaline Earth Hydroxide** **$Ca(OH)_2$**	**WHMIS Classification:** **D2A, E**
Product Use/s:	**Water treatment, pH adjustment, FGT, Construction, Pulp/Paper**	
Prepared By:	**Chemical Lime Co.** **R&D/Technical Services, KSA**	

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS	OSHA PEL, TWA 8/40h (mg/m3)	ACGIH TLV, TWA 8/40h (mg/m3)	NIOSH REL, TWA 8/40h (mg/m3)	NIOSH IDLH (mg/m3)	Conc. (%)
Calcium Hydroxide, $Ca(OH)_2$ (Hydrated Lime)	**1305-62-0**	**15** (total dust) **5** (respirable)	**5**	**5**	**N.A.**	**> 90**
Magnesium Hydroxide, $Mg(OH)_2$ (Brucite)	**1309-42-8**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**< 5**
Magnesium Oxide, MgO (Periclase)	**1309-48-4**	**10**	**10**	**N.A.**	**N.A.**	**< 5**
Calcium Carbonate, $CaCO_3$ (Limestone)	**1317-65-3 (471-34-1)**	**15** (total dust) **5** (respirable)	**10**	**10** (total dust) **5** (respirable)	**N.A.**	**< 3**
Crystalline Silica, SiO_2 (Quartz)	**14808-60-7**	**10/(SiO2% + 2)** (respirable)	**0.025** (respirable)	**0.05** (respirable)	**50**	**< 2**

OSHA Regulatory Status: This material is subject to 29 CFR 1910.1200 (Hazard Communication).

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Hydrate is an odorless white or grayish-white powder. Contact can cause irritation to eyes, skin, respiratory system, and gastrointestinal tract.

Potential Health Effects

Eyes: Contact can cause severe irritation or burning of eyes, including permanent damage.

Skin: Contact can cause irritation of skin.

Ingestion: This product can cause severe irritation of gastrointestinal tract if swallowed.

Inhalation: This product can cause severe irritation of the respiratory system. Long-term exposure may cause permanent damage. Hydrate is not listed by MSHA, OSHA, or IARC as a carcinogen However, this product may contain trace amounts of crystalline silica in the form of quartz or crystobalite, which has been classified by IARC as a Group I carcinogen to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.

Medical Conditions Aggravated by Exposure: Contact may aggravate disorders of the eyes, skin, gastrointestinal tract, and respiratory system.

Potential Environmental Effects: This material is alkaline and if released into water or moist soil will cause an increase in pH.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush eyes with generous amounts of water or eye wash solution if water is unavailable. Pull back eyelid while flushing to ensure that all lime dust has been washed out. Seek medical attention promptly if the initial flushing of the eyes does not remove the irritant. Do not rub eyes.

Skin: Brush off or remove as much dry lime as possible. Wash exposed area with large amounts of water. If irritation persists, seek medical attention promptly.

Inhalation: Move victim to fresh air. Seek medical attention. If breathing has stopped, give artificial respiration.

Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

SECTION 5: FIRE FIGHTING MEASURES

Fire Hazards:	Hydrate is not combustible or flammable. However, hydrate reacts vigorously with acids, and may release heat sufficient to ignite combustible materials in specific instances. Hydrate is not considered to be an explosion hazard, although reaction with acids or other incompatible materials may rupture containers.
Hazardous Combustion Products:	None
Extinguishing Media:	Use dry chemical fire extinguisher. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of hydrate.
Fire Fighting Instructions:	Keep personnel away from and upwind of fire. Avoid skin contact or inhalation of dust. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill / Leak Procedures:	**Do Not** use water on bulk material spills. Use proper protective equipment.
Small Spills:	Use dry methods to collect spilled materials. Avoid generating dust. Do not clean up with compressed air. Store collected materials in dry, sealed plastic or non-aluminum metal containers. Residue on surfaces may be water washed.
Large Spills:	Use dry methods to collect spilled materials. Evacuate area downwind of clean-up operations to minimize dust exposure. Store spilled materials in dry, sealed plastic or non-aluminum metal containers.
Containment:	Minimize dust generation and prevent bulk release to sewers or waterways.
Clean-up:	Residual amounts of material can be flushed with large amounts of water. Equipment can be washed with either a mild vinegar and water solution, or detergent and water.

SECTION 7: HANDLING AND STORAGE

Handling:	Keep in tightly closed plastic or non-aluminum metal containers. Protect containers from physical damage. Avoid direct skin contact with the material.
Storage:	Store in a cool, dry, and well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:	Provide ventilation adequate to maintain PELs.
Respiratory Protection:	Use NIOSH/MSHA approved respirators if airborne concentration exceeds PELs.
Skin Protection:	Use appropriate gloves and footwear to prevent skin contact. Clothing should fully cover arms and legs. Should lime get inside clothing or gloves, remove the clothing and the lime promptly.
Eye Protection:	Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.
Other:	Eye wash fountain/stations and emergency showers should be available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	**Odor:**	**Physical State:**
White or grayish-white powder	Odorless	Solid
Boiling Point (°C/°F):	**Melting Point (°C/°F):**	**Specific Gravity**
2850 / 5162	dec 580 / 1076	(Apparent) g/cc: 0.4 - 0.55 (True) g/cc: 2.2 - 2.4
Vapor Pressure (mm Hg):	**Vapor Density:**	**Evaporation Rate:**
N.A.	N.A.	N.A.
Solubility in Water	**pH (25°C/77°F):**	
Slightly soluble in water.	12.4	

SECTION 10: STABILITY AND REACTIVITY

Stability: Chemically stable, but slowly reacts with carbon dioxide to form calcium carbonate. See also Incompatibility below.

Incompatibility/ Conditions to Avoid: Hydrate should not be mixed or stored with the following materials, due to the potential for vigorous reaction and release of heat:

Acids (unless in a controlled process)	Organic Acid Anhydrides
Reactive Fluoridated Compounds	Nitro-Organic Compounds
Reactive Brominated Compounds	Reactive Phosphorous Compounds
Reactive Powdered Metals	Interhalogenated Compounds

Hazardous Decomposition Products: None

Hazardous Polymerization: None

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for latest MSDS versions

Chemical Lime
A Lhoist Group Company

SECTION 11: TOXICOLOGICAL INFORMATION

ORL-RAT LD50: 7,340 MG/KG
ORL-MUS LD50: 7,300 MG/KG

Hydrated Lime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain trace amounts of crystalline silica, which has been classified by IARC as carcinogenic to humans when inhaled in the form of quartz or crystobalite.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems in high concentrations.

Environmental Fate: This material shows no bioaccumulation effect or food chain concentration toxicity.

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable federal, state, and local environmental regulations. If this product as supplied, and unmixed, becomes a waste, it will not meet the criteria of a hazardous waste as defined under the U.S. Resource Conservation and Recovery Act (RCRA).

SECTION 14: TRANSPORTATION INFORMATION

Hydrate is not classified as a hazardous material by US DOT and is not regulated by the Transportation of Dangerous Goods (TDG) when shipped by any mode of transport.

SECTION 15: REGULATORY INFORMATION

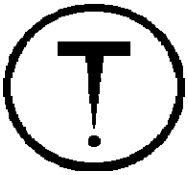
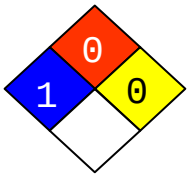
U.S. EPA Regulations:
RCRA Hazardous Waste Number (40 CFR 261.33): not listed
RCRA Hazardous Waste Classification (40 CFR 261): not classified
CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311(b)(4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), not listed
SARA 311/312 Codes: not listed
SARA Toxic Chemical (40 CFR 372.65): not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): not listed, Threshold Planning Quantity (TPQ): not listed
All chemical ingredients are listed on the USEPA TSCA Inventory List.

OSHA/MSHA Regulations:
Air Contaminant (29 CRF 1910.1000, Table Z-1, Z-1-A): 5mg/M^3 TWA-8
MSHA: not listed
OSHA Specifically Regulated Substance (29 CFR 1910): not listed

State Regulations:
Consult state and local authorities for guidance. Components found in this product may contain trace amounts of inherent naturally occurring elements (such as, but not limited to arsenic and cadmium) that may be regulated.

Canada:
WHMIS Classification: "D2A" Materials Causing Other Toxic Effects
WHMIS Classification: "E" Corrosive Materials (listed due to corrosive effect on aluminum)
Canada DSL: Listed

NFPA Hazard Class: Health: 1 Flammability: 0 Reactivity: 0
HMIS Hazard Class: Health: 1 Flammability: 0 Reactivity: 0 Personal Protection: E

SECTION 16: OTHER INFORMATION

Prepared By: **Chemical Lime Company, R&D/Technical Services, KSA**

Chemical Lime Company provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must consult their own technical and legal advisors and/ or exercise their own judgment in determining its appropriateness for a particular purpose. Chemical Lime Company makes no representations or warranties, either express or implied, including without limitation and warranties of merchantability or fitness for a particular purpose with respect to the information set forth herein or the product(s) to which the information refers. Accordingly, Chemical Lime Company will not be responsible or liable for any claims, losses or damages resulting from the use of or reliance upon or failure to use this information.

Cutler-Magner Company
12th Avenue West and Waterfront
P.O. Box 16807
Duluth, Minnesota 55816-0807

Material Safety Data Sheet

PRODUCT IDENTIFICATION	CHEMICAL ABSTRACT NO.	DATE REVISED
CALCIUM OXIDE - Quicklime	**CAS No. 1305-78-8**	**01/03/2006**

Section I

MANUFACTURER		HMIS II SAFETY RATING
Cutler-Magner Company Foot of Hill Avenue Superior, WI 54880	24 Hour Emergency Contact Number: (715) 392-5146 Ask for Supervisor On Call Telephone Number for Information: (800) 232-1302	Health - **3** Flammability - **0** Physical Hazard - **2** Personal Protective Equip - **E**
	Other Common Names: Pebble Lime, Unslaked Lime Trade Names: Rockport	

Section II – Hazardous Ingredients / Identity Information

Specific Chemical Identity; Common Names	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
Calcium Oxide; Lime; Quicklime	5 mg/m^3	2 mg/m^3		
Crystalline Silica (Quartz)	0.1 mg/m^3	0.05 mg/m^3	Respirable	0.1 to 0.3 %

Calcium oxide is not listed on the NTP, IARC, or OSHA lists of carcinogens. Crystalline silica, a component of this product, is listed by IARC and NTP but not by OSHA. In 1997, IARC determined that "crystalline silica inhaled in the form or quartz or crystobalite from occupational sources is carcinogenic to humans (Group 1). OSHA requires that products containing 0.1% of a known carcinogen must be labeled. NTP states that "silica, crystalline (respirable)" may reasonably be anticipated to be a carcinogen (1991). Cutler-Magner Company recommends using personal protection equipment when handling this product.

Section III – Physical / Chemical Characteristics

Boiling Point (Calcium Oxide)	2850 °C	Specific Gravity (H_2O=1)	3.2-3.4
Vapor Pressure (mm Hg)	NA	Melting Point	2570 °C
Vapor Density (Air = 1)	NA	Evaporation Rate	NA
Solubility in Water	Reacts to form calcium hydroxide		
Appearance and Color	White to gray lumps, pebbles, granules, powder; faint earthy odor		

Section IV – Fire and Explosion Hazard Data

Flash Point	NA	Flammable Limits – NA
Extinguishing Method	NA	
Special Fire Fighting Procedures	Reaction with water may produce enough heat to ignite combustible material.	
Unusual Fire and Explosion Hazards	Material is an explosion hazard when wet and confined.	

Section V – Reactivity Data

Stability	Unstable		Conditions to Avoid – NA
	Stable	X	
Incompatibility (Materials to Avoid)		Water, Acid, Interhalogen, Phosphorus (V) Oxide	
Hazardous Decomposition or Byproducts		None	
Hazardous Polymerization	May Occur		Conditions to Avoid – NA
	Will Not Occur	X	

Section VI – Health Hazard Data

Route(s) of Entry	Inhalation? - YES	Absorption Through Skin? – YES	Ingestion (swallowing)? - YES
Health Hazards	Acute	Causes irritation and inflammation to mucous membrane and respiratory passages.	
	Chronic	Long-term exposure can cause irritation, ulceration and perforation of nasal septum.	
Toxicological Information	No LD50 / LC50 have been identified for this product. Quicklime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain trace amounts of crystalline silica, which has been classified by IARC as (Group 1) carcinogenic to humans when inhaled in the form of quartz or crystobalite.		
Signs and Symptoms of Exposure		Irritation of skin, eyes, and respiratory tract.	
Medical Conditions Generally Aggravated by Exposure		Respiratory disease, skin condition.	
Emergency and First Aid Procedures		Remove to fresh air. Wash dust with soap and water. Flush out eyes with generous amounts of water. Drink plenty of water if swallowed. See Physician.	

Section VII – Precautions for Safe Handling

Steps to Be Taken in Case Material is Released or Spilled	Normal clean-up procedures. Care should be taken to avoid causing dust to become airborne. Vacuum cleaning systems are recommended.
Waste Disposal Method	Dispose of product in accordance with Federal, State and Local regulations.
Precautions to Be Taken in Handling	Store away from water and acids.
Other Precautions	Waste should not be discarded with combustible material where the possibility exists of getting the mixture wet – FIRE HAZARD!

Section VIII – Control Measures

Respiratory Protection - Dust filter mask is recommended as minimal protection		
Ventilation	Local Exhaust – To maintain TLV and PEL Mechanical – To maintain TLV' and PEL	Special – None Other – None
Protective Gloves – Cloth or leather gloves will protect skin		
Eye Protection – Fitted goggles will reduce eye injury		
Other Protective Clothing – Long sleeve shirts and pants		
Work / Hygienic Practices – Maintain dust exposure limits below TLV and PEL. If not possible – use respiratory protection		

Section IX – Ecological Information

Ecotoxicity: Because of the high pH of this product, in high concentrations it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.

Environmental Fate: This material shows no bioaccumulation effect or food chain toxicity.

Section X – Regulatory Information

EPA

RCRA Hazardous Waste Classification (40 CFR 261): Not Listed
RCRA Hazardous Waste Number (40 CFR 261.33): Not Listed
ERCLA Hazardous Substance (40 CFR 302.4): Unlisted specific per RCRA, Sec. 3001; CWA, Sec.311 (b)(4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ): Not Listed
SARA 311/312 Codes: Not Listed
SARA Toxic Chemical (40 CFR 372.65): Not Listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not Listed; Threshold Planning Quantity (TPQ): Not Listed
All chemical ingredients are listed on the USEPA TSCA Inventory List

OSHA / MSHA

Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): 5 mg/M^3 TWA-8
MSHA: Not Listed
OSHA Specifically Regulated Substance (29 CFR 1910): Not Listed

Canada

WHIMS Classification: "E" Corrosive Materials (Listed due to corrosive effect of aluminum)
WHIMS Classification: "D2A" Materials Causing Other Toxic Effects
CANADA DSL: Listed

State Regulations

Consult state and local authorities for guidance

Other

HMIS: Health Risk 3, Flammability 0, Reactivity 1, Personal Protection E
NFPA: Health Hazard 3, Fire Hazard 0, Reactivity 1
DOT: For aircraft transport only, Calcium Oxide is classified as Hazard Class 8
- Corrosive, UN 1910, Packing Group 3

The above information is believed to be correct as of the date hereof. However, no warranty of merchantability, fitness for any use, or any other warranty is expressed or is to be implied regarding the accuracy of these data, the results to be obtained from the use of the material, or the hazards connected with such use. Since the information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the data hereof may suggest modification of the information, we do not assume responsibility for the results of its use. This information is furnished on the condition that the person(s) receiving it shall make their own determination as to the suitability of the material for their particular purpose and on the condition that they assume the risk of use thereof.

MATERIAL SAFETY DATA SHEET

Sodium Sulphide

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Sodium Sulphide

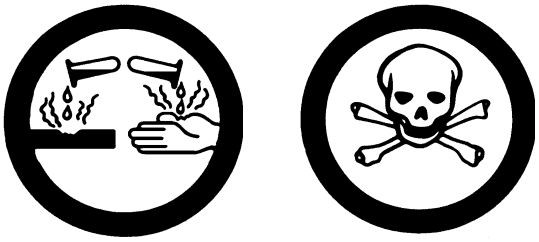
Product Use ..... Depilatory for hides and skins, manufacture of rubber, sulphur dyes, rayon denitrating, paper pulp, ore floatation, metal refining, cotton printing, as chemical intermediate and laboratory reagent.

Supplier Name..... ClearTech Industries Inc.
2303 Hanselman Avenue
Saskatoon SK S7l 5Z3
Canada

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... 10/25/04

24-Hour Emergency Phone..... 306-664-2522



Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Sodium Sulfide	59-62%
CAS Number.....	Sodium Sulfide	1313-82-2
Synonym (s).....	Sodium Monosulfide; Sulfur Compounds; Na_2S	

Section 03 - Hazard Identification

Inhalation..... Hazard is highly toxic (50-100 ppm in air) hydrogen sulfide which may accumulate in confined spaces due to the decomposition of sodium sulfide or from its reaction with acids. Symptoms include painful conjunctivitis, headache, nausea, dizziness, coughing and, in extreme cases, pulmonary edema and possible death.

Skin Contact / Absorption..... Contact with skin can produce serious caustic burns with painful inflammation and possible destruction of tissue. May cause irritation, severe burns and corrosion to the skin. This material may be absorbed through the skin producing toxicity typical of hydrogen sulfide poisoning.

Eye Contact..... Inflammation, tearing and pain may be expected. Severe contact can cause destruction of tissue. This product has similar effects as alkalies following direct exposure to the eye and can cause lacrimation, sensitivity to light, tearing and irreversible damage, including blindness.

Ingestion..... Sodium sulfide is a strong base and can cause severe burns on the mucous membrane. Hydrolysis by gastric fluids releases toxic hydrogen sulfide. The symptoms and effects are similar to those under inhalation, above.

Exposure Limits..... No occupational exposure limits have been established by OSHA & ACGIH for this product. The limits for hydrogen sulphide have been established:

OSHA/TWA: 10ppm
OSHA/STEL: 15ppm
ACGIH/TWA: 10ppm
OSHA/STEL: 15ppm

Section 04 - First Aid Measures

Inhalation..... Hydrogen sulfide has a characteristic "rotten egg" odor. Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention as further treatment will be necessary.

Ingestion..... Gently wipe or rinse the inside of the mouth with water. Sips of water may be given if person is fully conscious. Never give anything by mouth to an unconscious or convulsing person. Do not induce vomiting. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.

Additional Information..... Contact with acid and excessive heat liberates flammable and poisonous hydrogen sulfide gas.

Section 05 - Fire Fighting

Conditions of Flammability..... Non-flammable

Means of Extinction..... Not available

Flash Point..... Not available

Auto-ignition Temperature..... 260°C

Upper Flammable Limit ..... Not available

Lower Flammable Limit..... Not available

Hazardous Combustible Products... Contact with all acids or excessive heat will liberate poisonous, flammable hydrogen sulfide gas.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing. Fire-fighters must wear NIOSH approved, pressure demand, self-contained breathing apparatus with full face piece for possible exposure to hazardous gases. Hydrogen sulfide vapors are heavier than air and may travel a considerable distance to source of ignition and flash back.

Explosion Hazards..... Not available

Section 06 - Accidental Release Measures

Leak / Spill..... Immediately evacuate the area. Remove sources of ignition. Provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and eye/skin protection should be permitted in the area. Carefully shovel or sweep up spilled material and place into closed containers. Spilled material should be reclaimed if possible. Product must not come in contact with acids. After all visible traces have been removed, thoroughly wet vacuum the area. Do not flush to sewer. At the first sign of a hydrogen sulfide leak, a planned emergency program should be put into operation. Emergency drills should be made periodically. If a hydrogen sulfide leak occurs, all persons must promptly leave the area. A wind sock or other wind direction indicator should be within sight. Move crossways to the wind from the contaminated area. Insure that the entire area is evacuated. Only persons wearing NIOSH approved self-contained breathing apparatus or full facepiece airline respirators with auxiliary SCBA`s operated in the pressure/demand mode and eye/skin protection should be permitted in area. Each hydrogen sulfide leak should be dealt with immediately. Lead acetate strips or portable monitoring instruments can be used to locate a hydrogen sulfide leak. If hydrogen sulfide is leaking, the lead acetate paper will turn brown. When working on a leak, employees should take a position so that escaping hydrogen sulfide moves away from them. Supplied air equipment must be working no matter how small the leak.

Deactivating Materials..... Not available

Section 07 - Handling and Storage

Handling Procedures..... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements..... Store away from strong oxidizing agents. Do not allow contact with acids and excessive heat. Will liberate poisonous, flammable hydrogen sulfide gas. Do not store in zinc, aluminum or copper containers. Wear respiratory protection whenever exposure to vapor is likely. Wear appropriate personal protective equipment when handling this product. Store in a cool, dry, well-ventilated place. Store only in closed, properly labeled containers. Keep container closed when not in use.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... If exposure of hydrogen sulfide gas could exceed the exposure limits, use NIOSH approved full face airline and/or self-contained breathing apparatus operated in a positive pressure demand mode. The respiratory use limitations made by NIOSH or the manufacturer must be observed. Respiratory protection programs must be in accordance with 29 CFR 1910.134.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure, and control of process conditions. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Use local exhaust or general room/dilution ventilation as appropriate to control employee exposures in the work place.

Section 09 - Physical and Chemical Properties

Physical State..... Flakes

Odor and Appearance..... Slight rotten egg, white to yellow.

Odor Threshold..... 1-5 ppm for hydrogen sulfide.

Specific Gravity (Water=1)..... 1.858 (flake)

Vapor Pressure (mm Hg, 20C)..... Not available

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Boiling Point..... 174°C

Freeze/Melting Point..... 92°C

pH..... Strongly alkaline

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... 40 lbs/ft^3(flake)

% Volatiles by Volume..... Very low

Solubility in Water..... 15% @ 20°C

Molecular Formula..... Na_2S

Molecular Weight..... 78.04

Section 10 - Stability and Reactivity

Stability..... Stable

Incompatibility..... Avoid contact with strong oxidizing agents and acids. Avoid concentrating solutions, could cause spontaneous ignition. Solutions attack zinc, copper, aluminum and alloys of these metals. Avoid heat, flames, sparks and other sources of ignition.

Hazardous Products of Decomposition.. Oxides of sulfur, oxides of sodium, hydrogen sulfide.

Polymerization..... Will not occur

Section 11 - Toxicological Information

Irritancy..... Strong irritant, corrosive.

Sensitization..... Not available

Chronic/Acute Effects…….…….. ACUTE: Irritation of mucous membranes, eyes, and respiratory tract is possible following exposure to the decomposition product, hydrogen sulfide gas, which is potentially lethal.

CHRONIC: The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures.

Hydrogen sulfide is a toxic and irritant gas whose effects are exerted on the respiratory system, gastrointestinal tract, eyes and central nervous system. Acute effects on the respiratory system, in order of increasing severity, can be a runny nose with anosmia (loss of the sense of smell), tracheobronchitis with pain, cough, pulmonary edema with dyspnea (shortness of breath) , delayed bronchopneumonia, respiratory paralysis and terminal asphyxial convulsion. Acute effects may occur without warning as a result of olfactory fatigue. While the odor of hydrogen sulfide is distinct at 0.3ppm, olfactory fatigue occurs rapidly with continuous inhalation. Gastrointestinal effects can be profuse salivation, nausea, vomiting or diarrhea. Nervous system effects may be giddiness, headache, vomiting, vertigo, amnesia, confusion and unconsciousness. Eye irritation is the most common low exposure effect of hydrogen sulfide and is characterized by irritation of the conjuctiva with photophobia to severe conjunctivitis with keratitis. A possible warning sign of eye exposure is the appearance of halos around light sources and increased sensitivity to light.

Synergistic Materials...…….…….. Not available

Animal Toxicity Data.....…..…….. LD_{50}(Oral, Rat)= 200mg/kg
LD_{50}(Dermal, Rabbit)= 177.8mg/kg

Carcinogenicity.....…….....…….... This product is NOT listed as a carcinogen or suspected carcinogen by NTP, IARC, or OSHA.

Reproductive Toxicity.……..…….... Not available

Teratogenicity.....…....…….... Not available

Mutagenicity.....…….....……. Not available

Section 12 - Ecological Information

Fish Toxicity.....……... LC50(48 hrs, Bluegill Sunfish)= 61ppm

Biodegradability.....…….... Not available

Environmental Effects……. This product is highly toxic to aquatic life.

Section 13 - Disposal Consideration

Waste Disposal.....Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 8

Group..... II

PIN Number..... UN 1849

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....E, D1A

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

ClearTech Industries Inc. - Locations

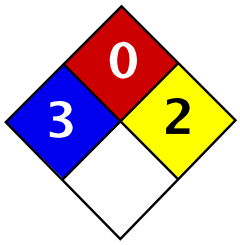
Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond BC	12431 Horseshoe way	V7A 4X6	604-272-4000	604-272-4596
Calgary AB	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton AB	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon SK	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282

Regina SK	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg MB	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga ON	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522



Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid.
White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact.
May ignite other combustible materials.
May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated)
Nitramide decomposes explosively on contact with concentrated sulfuric acid.
1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation
TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation
TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation
TWA: 1 (mg/m3) from NIOSH [United States] Inhalation
TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C
Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water.
Sulfuric is soluble in water with liberation of much heat.
Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases.
Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316).
Highly corrosive in presence of stainless steel(304).
Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product.
Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile+water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene + sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides,
Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.).
Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals.
Attacks many metals releasing hydrogen.
Minor corrosive effect on bronze.
No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 2140 mg/kg [Rat.].
Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH.
May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive).
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L
Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS)
Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis.
Eye: Causes severe eye irritation and burns. May cause irreversible eye injury.
Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis.
Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration).
Chronic Potential Health Effects:
Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion).
Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid
New York release reporting list: Sulfuric acid
Rhode Island RTK hazardous substances: Sulfuric acid
Pennsylvania RTK: Sulfuric acid
Minnesota: Sulfuric acid
Massachusetts RTK: Sulfuric acid
New Jersey: Sulfuric acid
California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid
Tennessee RTK: Sulfuric acid
TSCA 8(b) inventory: Sulfuric acid
SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid
SARA 313 toxic chemical notification and release reporting: Sulfuric acid
CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns.
S2- Keep out of the reach of children.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S30- Never add water to this product.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

Common Name: ZINC SULFATE

Manufacturer: Madison Industries, Inc.
P.O. Box 175
Old Bridge, New Jersey 08857

Telephone: 732-727-2225
Emergency Telephone: 800-275-3924
24 Hour Emergency Telephone: 800-424-9300 (Chemtrec)

HAZARDOUS CLSSIFICATION: NFPA: Health-2 / Fire-0 / Reactivity-0
HMIS: Health-2 / Fire-0 / Reactivity-0

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200).

ATTENTION: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

SECTION I. MATERIAL IDENTIFICATION

Common Name:	Zinc Sulfate
Trade Name:	Zinc Sulfate Monohydrate
Molecular Formula:	$ZnS0_4H_2O$
Molecular Weight:	179
CAS Number:	7446-19-7

SECTION II. HAZARDS

This material or the components of this material are included in the Toxic Chemical Inventory as required in Section 8 (b) of the Toxic Substance Control Act (Public Law 94-469) and is codified in 40 CR 720.

Superfund Amendments & Reauthorization Act - Title III Applicability Section 312 40 CFR 370.40:

Health __X___Acute
Hazard__X___Chronic

Section 313 Zinc Compounds 40 CFR 372-85

SECTION III. PHYSICAL DATA

Physical State:	White powder or granules
Boiling Point:	NA
Melting Point:	No data
Crystallization Point:	70ºF
Vapor Density:	0 (water = 1)
Specific Gravity:	3.28
Solubility in H_20:	30% at 70ºF
Appearance:	White powder or granules
Evaporation Rate:	NA

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point:	Not flammable.
Extinguishing Media:	Dry chemical, Carbon Dioxide or Foam. Water may be ineffective, but water spray or fog may be used as a cooling agent.
Fire and Explosion Hazards:	May release toxic Oxides of Zinc and Sulfur in a fire.

SECTION V. REACTIVITY DATA

Stability:	Stable at normal temperatures and pressures.
Thermal Decomposition:	May release toxic and hazardous Oxides of Zinc and Sulfur.
Polymerization:	Will not occur.

SECTION VI. HEALTH AND HAZARD INFORMATION

Route of Entry:	Ingestion or inhalation.
Target Organs:	Respiratory system, eyes and skin.
Acute Exposure:	May cause skin irritation. May cause eye irritation, possible corneal burn. May cause gastrointestinal disturbance. May cause irritation to nose and throat.
Chronic Exposure:	May cause skin dermatitis. May cause eye conjunctivitis. No known ingestion reaction anticipated. May cause inhalation reflex bronchial constriction.

SECTION VII. FIRST AID PROCEDURES

Swallowing:	If person is conscious induce vomiting. Call Poison Control Center or a physician. Do not give anything by mouth to an unconscious person.
Skin:	Immediately wash skin with soap and plenty of water. Remove contaminated clothing and shoes. Call a physician. Wash contaminated clothing before reuse.
Eyes:	Immediately flush eyes with plenty of water for 15 minutes. Hold eyelids apart during irrigation. Call a physician.
Inhalation:	Immediately remove person to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped administer artificial respiration. Keep person warm and calm. Call a physician.
Carcinogenicity:	None

SECTION VIII. HANDLING PRECAUTIONS

Personal Protective Equipment:	Respirators - If exposure cannot be maintained at or below established OSHA guidelines, respiratory protection must be provided in accordance with 29 CFR 1910.134 requirements. Skin Protection - Wear appropriate protective clothing and chemical resistant gloves as needed to prevent skin contact. Consult manufacturer to determine appropriate type of gloves or clothing for your particular application. Clean contaminated clothing and protective equipment before reuse. Wash thoroughly after handling material. Eye Protection - Wear splash proof or dust proof safety goggles wherever there is a potential for eye contact.
Ventilation:	Provide local exhaust or process enclosing ventilation to maintain exposures below OSHA guidelines 29 CFR 1910.1000 subpart 7.

SECTION IX. SPILL OR LEAK PROCEDURES

Spills or Leaks:	Comply with Federal, State and Local regulations on reporting spills. Flush with plenty of water to an approved chemical sewer.
Waste Disposal:	Comply with Federal, State and Local regulations. Zinc Sulfate can be carefully reacted with Sodium Carbonate to form an insoluble Zinc Carbonate solid that can be scooped up and sent to a disposal contractor.

SECTION X. SPECIAL PRECAUTIONS

Storage:	Heated storage is necessary to prevent crystallization. Keep containers closed.
Other Precautions:	Do not take internally.

SECTION XI. REGULATORY INFORMATION

NOTICE: The information herein is presented in good faith and believed to be accurate. However, no warranty, expressed or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with Federal, State and local laws.

U.S. REGULATIONS: SARA 313 Information; this product contains the following substance subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372: **Zinc Compound 40.5%**

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following category:

AN IMMEDIATE HEALTH HAZARD

SECTION XII. SHIPPING INFORMATION

QUANTITIES OF 1000 POUNDS OR MORE: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS, (Zinc Sulfate) 9, UN3082, PGIII, RQ, ERG 171

QUANTITIES OF LESS THAN 1000 POUNDS: NON-HAZARDOUS AND NON-REGULATED IN THAT PACKAGE

SECTION XIII. MSDS PREPARATION INFORMATION

Prepared by: Joel L. Goldschmidt
Vice President

NOVA Chemicals®

Material Safety Data Sheet

Material Name: Low Sulfur Diesel-S15 **MSDS ID: NOVA-0034**

Section 1 - Product and Company Identification

Synonyms: Ultra-low sulphur diesel, diesel oil, fuel distillate, hydrodesulfurized kerosene
Chemical Name: Kerosine, petroleum, hydrodesulfurized
Chemical Family: Kerosene
Material Use: Fuel for home heating; also for marine and on-road diesel engines
Chemical Formula: Not available; complex mixture

NOVA Chemicals
P.O. Box 2518, Station M
Calgary, Alberta, Canada T2P 5C6

Product Information: 1-412-490-4063
MSDS Information Email:
msdsemail@novachem.com

EMERGENCY Telephone Numbers:
North America (Canada and US):
1-800-561-6682, 1-403-314-8767 (NOVA Chemicals) (24 hours)
1-800-424-9300 (CHEMTREC-USA) (24 hours)
1-613-996-6666 (Canutec-Canada) (24 hours)
Mexico and South America: +44 208 762 8322 (NCEC) (24 hours)

General Comments

This product is a complex mixture of aliphatic, olefinic, naphthenic and aromatic hydrocarbons having a variable boiling range of 160°C to 370°C (320°F to 698°F).

Section 2 - Hazards Identification

HMIS Ratings: Health: 1* **Fire:** 2 **Physical Hazard:** 0 **Personal Protection:** chemical goggles, gloves, respirator
*Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard*

NFPA Ratings: Health: 1 **Fire:** 2 **Reactivity:** 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Emergency Overview

WARNING! COMBUSTIBLE. Product is an amber oily liquid with a kerosene-like odor. This product burns readily when heated to high temperatures, giving off combustible and toxic vapors. This product is harmful and possibly fatal if swallowed. Small amounts of this product, if aspirated into the lungs, may cause mild to severe injury. This product is irritating to the eyes and skin. Ingestion or excessive inhalation of this product may result in headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions coma and possibly death. Contains trace components that may cause cancer. Avoid contact. Pre-existing medical conditions may be aggravated by exposure. Prevent entry into ditches, sewers, and waterways.

Potential Health Effects: Eyes

This product is irritating to the eyes. Pre-existing medical conditions are aggravated by exposure.

Potential Health Effects: Skin

Prolonged and/or repeated skin contact with this product may cause irritation, blistering and severe dermatitis. Product may be partially absorbed through intact skin. Prolonged or repeated contact with this product may cause allergic-like skin reactions and over time may possibly cause skin cancer. Pre-existing medical conditions are aggravated by exposure.

Potential Health Effects: Ingestion

This product is harmful or fatal if swallowed. Ingestion causes gastrointestinal irritation, nausea, vomiting, and cramping; depression of the central nervous system. May also cause central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions coma and possibly death. Ingestion may cause kidney and liver damage and blood disorders. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

Potential Health Effects: Inhalation

This product may be harmful by inhalation. Pre-existing medical conditions are aggravated by exposure. Excessive inhalation of this material may result in heartbeat irregularities and central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions respiratory failure, coma and possibly death. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

Section 3 - Composition / Information on Ingredients

CAS #	Component	Percent by Wt.
64742-81-0	Kerosine, petroleum, hydrodesulfurized	≥99.5
7704-34-9	Sulfur	0-0.0015

Additional Information

This product is considered to be hazardous under 29 CFR 1910.1200 (Hazard Communication).
This material is a controlled product under Canadian WHMIS regulations.
This material is regulated as a hazardous material/dangerous goods for transportation.

See Section 8 for applicable exposure limits. See Section 11 for applicable toxicity data.

Section 4 - First Aid Measures

First Aid: Eyes

Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

First Aid: Skin

For skin contact, wash immediately with soap and water for at least 15 minutes. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

First Aid: Inhalation

Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention. Small amounts which accidentally enter the mouth should be rinsed out until taste is gone.

First Aid: Notes to Physician

For more detailed medical emergency support information call 1-800-561-6682 or 1-403-314-8767 (24 hours, NOVA Chemicals Emergency Response). Ensure thorough eye and skin decontamination. Treat unconsciousness, nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary, use the method least likely to cause aspiration, such as gastric lavage after protecting the airway. Observe hospitalized patients for delayed chemical pneumonia, acute tubular necrosis, encephalopathy and dysrhythmias. Monitor for urinary phenol within 72 hours of acute exposure.

Section 5 - Fire Fighting Measures

See Section 9: Physical Properties for flammability limits, flash point and autoignition information.

General Fire Hazards

Fire and container explosion hazards are serious when this product is exposed to heat, flame or oxidizing materials. Empty containers when heated may pose a fire risk. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Consider need for immediate emergency isolation and evacuation.

Explosion Hazards

Vapors may form explosive mixture with air. Keep containers away from source of heat, fire or oxidizing materials.

Hazardous Combustion Products

Upon decomposition, this product emits carbon monoxide, carbon dioxide, low molecular weight hydrocarbons, acidic gases, nitrogen oxides, sulfur oxides, and other toxic contaminants.

Extinguishing Media

Dry chemical, foam, carbon dioxide, and water fog. Water may be an ineffective extinguishing medium and increase spread of flames. Use water spray to cool fire-exposed containers and to protect personnel. Monitor water run-off for flammability, and prevent from entering drains and sewers, or other confined or underground spaces.

Fire Fighting Equipment/Instructions

Reference 2004 Emergency Response Guidebook, Guide No. 128 for additional details and instructions. Position upwind. Keep unnecessary personnel away. Move containers from fire area if you can do so without risk. Fight fire from maximum distance or use unmanned holders or monitor nozzles. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. If container, rail car or tank truck is involved in a fire, isolate for 800 meters (1/2 mile) in all directions, also consider initial evacuation for 800 meters (1/2 mile) in all directions. Fire fighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion products. Remove and clean or destroy any contaminated clothing. Cool containers with water spray until well after the fire is out. Control runoff waters to prevent entry into sewers, drains, underground or confined spaces and waterways.

Section 6 - Accidental Release Measures

Evacuation Procedures

Isolate area. Keep unnecessary personnel away. Alert stand-by emergency and fire fighting personnel. Monitor surrounding area for build-up of flammable air concentrations.

Spills

Small spill or leak area should be isolated immediately for at least 50 meters (164 feet) in all directions. Eliminate ignition sources. Large spills, isolate and consider downwind evacuation for 300 meters (984 feet). Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Remove liquid material with non-sparking approved pumps, skimmers or vacuum equipment. Absorb with DRY earth, sand or other non-combustible material. Soil remediation may be required. Prevent entry into sewers, drains, underground or confined spaces, water intakes and waterways.

Special Procedures

Contact local police/emergency services and appropriate emergency telephone numbers provided in Section 1. Ensure that statutory and regulatory reporting requirements in the applicable jurisdiction are met.
Wear appropriate protective equipment and clothing during cleanup. Individuals without appropriate protective equipment should be excluded from area of spill until cleanup has been completed

See Section 8 for recommended Personal Protective Equipment and see Section 13 for waste disposal considerations.

Section 7 - Handling and Storage

Handling Procedures

Keep locked up or secured. Handle in fully grounded, properly designed and approved equipment systems that are suitable for flammable liquids. Use with adequate ventilation. Do not ingest or inhale. Keep away from heat and ignition sources. No smoking or open flames permitted in storage, use or handling areas. Dissipate static electricity during transfer by grounding and bonding containers and equipment. An anti-static agent may be added to storage tanks to reduce static charge build-up during loading. Take special precautions when cold cutting or breaking into lines, or when cleaning and disposing of empty containers.
Do not breathe gas, fumes, vapor or spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Keep away from incompatible materials such as oxidizing agents. After handling, always wash hands thoroughly with soap and water.

Storage Procedures

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Adequate security must be provided so that unauthorized personnel do not have access to product. Store in grounded, properly designed and approved vessels and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. An anti-static agent may be added to storage tanks to reduce static charge build-up during loading. Keep absorbents for leaks and spills readily available. Store according to applicable regulations. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers) and flammable gas detectors. Inspect vents during winter conditions for vapor ice build-up.

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipment. See Section 10 for information on Incompatibilities.

Section 8 - Exposure Controls / Personal Protection

Exposure Guidelines

A: General Product Information

Refer to published exposure limits - use effective control measures and PPE to maintain worker exposure to concentrations that are below these limits. Ensure that eyewash stations and safety showers are proximal to work locations.

B: Component Exposure Limits

ACGIH, OSHA, NIOSH, EPA, Alberta, and Ontario exposure limit lists have been checked for major components listed with CAS registry numbers. Other exposure limits may apply, check with proper authorities.

Kerosine, petroleum, hydrodesulfurized (64742-81-0)

ACGIH: 200 mg/m3 TWA (as total hydrocarbon vapor) (application restricted to conditions in which there are negligible aerosol exposures)
Skin - potential significant contribution to overall exposure by the cutaneous route.

Ontario: 200 mg/m3 TWAEV (as total hydrocarbon vapor) (application restricted to conditions in which there are negligible aerosol exposures)
Absorption through skin, eyes, or mucous membranes

Sulfur (7704-34-9)

Alberta: 10 mg/m3 TWA

ENGINEERING CONTROLS

Engineering methods to reduce hazardous exposure are preferred controls. Methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation systems are discharged to outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and use of personal protective equipment may also be required.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear safety glasses; chemical goggles are recommended if splashing is possible, or to prevent eye irritation from vapors.

Personal Protective Equipment: Skin/Hands/Feet

Use impervious gloves. Wear chemical-resistant safety footwear with good traction to prevent slipping. Work clothing that sufficiently prevents skin contact should be worn, such as coveralls and long sleeves. Fire resistant (i.e., Nomex) or natural fiber clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and is not recommended where flammable vapor releases may occur.

Personal Protective Equipment: Respiratory

If engineering controls and ventilation is not sufficient to prevent buildup of aerosols or vapors, appropriate NIOSH/MSHA approved air-purifying respirators or self-contained breathing apparatus (SCBA) appropriate for exposure potential should be used. Air supplied breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

Personal Protective Equipment: General

Personal protective equipment (PPE) should not be considered a long-term solution to exposure control. Employer programs to properly select, fit, maintain, and train employees to use equipment must accompany PPE. Consult a competent industrial hygiene resource, the PPE manufacturer's recommendation, and/or applicable regulations to determine hazard potential and ensure adequate protection.

Section 9 - Physical & Chemical Properties

Physical State and Appearance:	Oily liquid	**Color:**	Amber
Odor:	Kerosene-like; can be detected at low ppm levels	**pH:**	Not available
Vapor Pressure:	1.50 mm Hg at 20°C (68°F)	**Vapor Density @ 0°C (Air=1):**	8
Boiling Point:	Range: 160°C-370°C (320°F-698 °F)	**Melting Point:**	Not applicable
Solubility (H2O):	Insoluble	**Specific Gravity (Water=1):**	≤ 0.881
Freezing Point:	Range: -36°C - 0°C (-32.8°F - 32°F)	**Dispersion Properties:**	Not available
Evaporation Rate (Ethyl Ether):	600	**Viscosity:**	Range: 1.30 -4.10 cSt at 40°C (104°F)
Percent Volatile:	100%	**Auto Ignition:**	257°C (494.6°F)
Flash Point:	≥40°C (≥104°F)	**Flash Point Method:**	Pensky-Martens
Upper Flammable Limit (UFL):	Not available	**Lower Flammable Limit (LFL):**	Not available
Flammability Classification:	Combustible		

Section 10 - Stability & Reactivity Information

Chemical Stability

This product is stable under normal use conditions for shock, vibration, pressure, or temperature.

Instability

Not applicable

Chemical Stability: Conditions to Avoid

Keep away from heat, sparks, or open flame.

Incompatibility

May react with oxidizing agents. Slightly reactive with metals. Heated vapors or mists may form explosive mixture with air.

Hazardous Polymerization

Not likely to occur.

Corrosivity

Not considered to be corrosive.

Hazardous Decomposition

Upon decomposition, this product emits carbon monoxide, carbon dioxide, low molecular weight hydrocarbons, acidic gases, nitrogen oxides, sulfur oxides, and other toxic contaminants.

Section 11 - Toxicological Information

A: Acute Toxicity - General Product Information

Similar fuel oil mixtures have been tested under the EPA's High Production Volume (HPV) program for the Kerosenes/Jet Fuel Category. Kerosene is not considered acutely toxic. Animal tests have produced moderate to severe skin irritation and eye irritation. Eye irritation generally resolved within one to 7 days. Kerosenes did not produce sensitization when tested in guinea pigs. Sulfur component may cause sensitization.

B: Acute Toxicity - LD50/LC50

Kerosene, petroleum, hydrodesulfurized (64742-81-0)

Inhalation LC50 Rat: >5.2 mg/L/4H; Oral LD50 Rat: >5000 mg/kg; Dermal LD50 Rabbit: >2000 mg/kg

Sulfur (7704-34-9)

Inhalation LC50 Rat: >6.23 mg/L/4H; Oral LD50 Rat: >3000 mg/kg; Dermal LD50 Rabbit: >2000 mg/kg

C: Chronic Toxicity - General Product Information

Similar fuel oil mixtures have been tested under the EPA's High Production Volume (HPV) program for the Kerosenes/Jet Fuel Category. Chronic skin exposure causes dermatitis and slight to moderate skin irritation in rabbits. Some animal studies have indicated damage to the heart and spleen. No tests have shown evidence of mutagenicity or teratogenicity. In carcinogenicity tests, kerosene was not an initiator but did show evidence of tumor promoting activity.

D: Chronic Toxicity - Carcinogenic Effects

ACGIH, EPA, IARC, OSHA, and NTP carcinogen lists have been checked for selected similar materials or those components with CAS registry numbers.

Kerosine, petroleum, hydrodesulfurized (64742-81-0))

ACGIH: A3 - Confirmed animal carcinogen with unknown relevance to humans (as total hydrocarbon vapor)

IARC: Monograph 45, 1989 (related to Jet Fuel) (Group 3 (not classifiable))

Section 12 - Ecological Information

Ecotoxicity

A: General Product Information

Similar fuel oil mixtures have been tested under the EPA's High Production Volume (HPV) program for the Kerosenes/Jet Fuel Category. Product is largely insoluble in water. Under ambient conditions, this product absorbs quickly in soil. Kerosene shows moderate toxicity to aquatic organisms.

B: Component Analysis - Ecotoxicity - Aquatic/Terrestrial Toxicity

Kerosene, petroleum, hydrodesulfurized (64742-81-0)

96 Hr LC50 Pimephales promelas: 45 mg/L [flow-through]; 96 Hr LC50 Lepomis macrochirus: 1740 mg/L [static]
96 Hr LC50 Dendronereides heteropoda: 4720 mg/L

Sulfur (7704-34-9)

96 Hr LC50 Brachydanio rerio: 866 mg/L [static]

Environmental Fate/Mobility

Kerosene is not subject to hydrolysis. Partitioning to water is <10% at equilibrium, while partitioning to sediment is 2% and to biota (fish) is 0.1%

Persistence/Degradability

This material is considered biodegradable. Some components biodegrade quickly while other higher molecular weight components will degrade more slowly. Atmospheric half-lives of 0.2 to 1.5 days have been calculated for representative C9 and C16 hydrocarbon components of kerosenes.

Bioaccumulation/Accumulation

Lower molecular-weight, normal hydrocarbons are most readily biodegraded but tend to partition to air rather than water, while more complex, higher molecular weight polynuclear aromatics and substituted aromatics tend to sorb to soil or sediment; both processes limit bioavailability and can slow biodegradation. The hydrocarbons in kerosenes are generally not inhibitory to microbial activity though changes in microbial community composition may occur in spill or impacted areas due to the proliferation of species that can biodegrade the compounds.

Section 13 - Disposal Considerations

U.S./Canadian Waste Number & Descriptions

A: General Product Information

This product may be known to be a hazardous waste according to US and Canadian regulations. The use, mixing or processing of this product may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION. Since emptied containers retain product residue, follow safe handling/label warnings even after container is emptied.

See Section 7: Handling and Storage and Section 8: Exposure Controls/Personal Protection for additional handling information that may be applicable for safe handling and the protection of employees.

Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Section 14 - Transportation Information

US DOT Information

Shipping Name: DIESEL FUEL
UN/NA #: NA1993 **Hazard Class:** 3 **Packing Group:** III
Required Label(s): None
Additional Info.: 2004 Emergency Guidebook, Guide #128.
This classification applies to US domestic shipments only.

This product meets the conditions of 49 CFR 173.120 (b)(2) and may be reclassed as a combustible liquid for shipments within the U.S..

Canadian TDG Information

Shipping Name: DIESEL FUEL
UN #: UN1202 **Hazard Class:** 3 **Packing Group:** III
Required Label(s): FLAMMABLE LIQUID
Additional Info.: 2004 Emergency Guidebook, Guide #128.

International Air Transport Association (IATA) and ICAO Information

Shipping Name: DIESEL FUEL
UN #: UN1202 **Hazard Class:** 3 **Packing Group:** III
Required Label(s): FLAMMABLE LIQUID

International Maritime Dangerous Goods (IMDG) Code

Shipping Name: DIESEL FUEL
UN #: UN1202 **Hazard Class:** 3 **Packing Group:** III
Required Label(s): FLAMMABLE LIQUID
Additional Info.: EmS Code: F-E, S-E
Marine Pollutant: No

Section 15 - Regulatory Information

A: International Regulations

Component Analysis - International Inventory Status

Component	CAS #	US - TSCA	CANADA - DSL	EU - EINECS
Kerosine, petroleum, hydrodesulfurized	64742-81-0	Yes	Yes	Yes
Sulfur	7704-34-9	Yes	Yes	Yes

B: USA Federal & State Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or State regulations. Check for applicable regulations.

USA OSHA Hazard Communication Class

This product/material is considered hazardous under 29 CFR 1910.1200 (Hazard Communication). HCS Classes:
HCS CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F).
HCS CLASS: Irritating substance.
HCS CLASS: Target organ effects.

USA Right-to-Know - Federal

None of this product's components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

USA Right-to-Know - State

The following components appear on one or more of the following state hazardous substances lists. Some components (including those present only in trace quantities, and therefore not listed in this document) may be included on the Right-To-Know lists of other U.S. states. The reader is therefore cautioned to contact his or her

NOVA Chemicals' representative or NOVA Chemicals' Product Integrity group for further U.S. State Right-To-Know information.

Component	CAS	NJ	PA
Sulfur	7704-34-9	Yes	Yes

C: Canadian Regulations - Federal and Provincial

WHMIS Ingredient Disclosure List (IDL)

No components are listed in the WHMIS Ingredient Disclosure List (IDL).

WHMIS Classification

Workplace Hazardous Materials Information System (WHMIS): This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and the MSDS contains all the information required by the CPR.

WHMIS CLASS B3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

WHMIS CLASS D2A: Material causing other toxic effects, very toxic material.

WHMIS CLASS D2B: Material causing other toxic effects, toxic material.

Other Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or Provincial regulations. Check for applicable regulations.

Section 16 - Other Information

Label Information

WARNING COMBUSTIBLE Product is an amber oily liquid with a kerosene-like odor. This product burns readily when heated to high temperatures, giving off combustible and toxic vapors. This product is harmful and possibly fatal if swallowed. Small amounts of this product, if aspirated into the lungs, may cause mild to severe injury. This product is irritating to the eyes and skin. Ingestion or excessive inhalation of this product may result in headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions coma and possibly death. Contains trace components that may cause cancer. Avoid contact. Pre-existing medical conditions are aggravated by exposure. Prevent entry into ditches, sewers, and waterways.

FIRST AID:

SKIN: For skin contact, wash immediately with soap and water for at least 15 minutes. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

EYES: Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

INHALATION: Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

INGESTION: DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention. Small amounts which accidentally enter the mouth should be rinsed out until taste is gone.

IN CASE OF A LARGE SPILL: Consider downwind evacuation for 300 meters (984 feet). Stop discharge if safe to do so. Eliminate ignition sources. Keep upwind and out of low areas. Isolate, contain, and attempt to recover. Absorb with DRY earth, sand or other non-combustible material. Remove material with non-sparking approved pumps, skimmers or vacuum equipment. Soil remediation may be required. Prevent entry into sewers, drains, underground or confined spaces, water intakes and waterways.

References

Available on request.

Special Considerations

The International Agency for Research on Cancer (IARC) has categorized diesel exhaust as carcinogenic to humans (Class 2A).

Diesel exhaust particulates

NTP: Reasonably Anticipated to be a Human Carcinogen (related to Diesel exhaust particulates)

IARC: Monograph 46, 1989 (related to Diesel engine exhaust) (Group 2A (probably carcinogenic to humans))

For additional information on equipment bonding and grounding, refer to the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity".

Material Name: Low Sulfur Diesel-S15

MSDS ID: NOVA-0034

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; BLEVE = Boiling Liquid Expanding Vapor Explosion; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDL = Ingredient Disclosure List; Kow = Octanol/water partition coefficient; LEL = Lower Explosive Limit; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; RCRA = Resource Conservation and Recovery Act; SARA = Superfund Amendments and Reauthorization Act; TDG = Transportation of Dangerous Goods; TSCA = Toxic Substances Control Act.

MSDS Prepared by: NOVA Chemicals
MSDS Information Phone Number: 1-412-490-4063

Other Information

Notice to Reader:

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This is the end of MSDS # NOVA-0034.

Essroc
Italcementi Group

3251 Bath Pike
Nazareth, Pa. 18064

MATERIAL SAFETY DATA SHEET

Section 1 - IDENTIFICATION

Product Name: Portland Cements

CAS Reg. No.: 65997-15-1

Chemical Name and Synonyms: Portland Cement, Cement, Hydraulic Cement

Trade Names: Portland Cement – Types I, IA, II, III, IIIA; SAYLOR'S® Portland Types: I, IA, II, III; PRONTO®, Flamingo Brixment® White Portland Cement

MSDS Information: This MSDS supersedes prior MSDS's for the products noted above. This MSDS covers a number of products with similar applications and occupational exposure hazards. Specific constituents and methods of preparation for these products will vary. The term "Portland Cement", used in the text of this MSDS, refers to the above named products collectively.

Chemical Family: Calcium silicate compounds; calcium compounds containing iron and aluminum; and gypsum are the primary constituents of these products.

Informational Phone Numbers: (800) 437-7762 Customer Service - Nazareth, PA
(800) 336-0366 Customer Service - Speed, IN
(800) 624-8986 Customer Service - Martinsburg, WV
(800) 386-2111 Customer Service - Mississauga, ONT

Emergency Contact Information: (800)-424-9300 Chemtrec

MSDS Prepared by: Essroc MSDS Development Committee - (610) 837-6725 – April 2009

Section 2 - COMPONENTS

Hazardous Ingredients:

Component	CAS No.	OSHA PEL (8-hour TWA)	ACGIH TLV	Other Information
Portland Cement	65997-15-1	15 mg total dust/m^3 5 mg respirable dust/m^3	10 mg/m^3	IDLH: 5000 mg/m^3 LD_{50}: No Data
Gypsum	13397-24-5	15 mg total dust/m^3 5 mg respirable dust/m^3	10 mg/m^3	IDLH: Not Determined LD_{50}: No Data
Limestone	1317-65-3	15 mg total dust/m^3 5 mg respirable dust/m^3	10 mg/m^3	IDLH: Not Determined LD_{50}: No Data
Crystalline Silica (< 0.3%)	14808-60-7	For mineral dusts containing crystalline silica: (10 mg respirable dust/m^3)/(%SiO_2 +2) (30 mg total dust/m^3) /(%SiO_2 + 2)	0.025 mg/m^3	IDLH: 50 mg/m^3 (twa) LD_{50}: ipr rat LD Lo 400 mg/kg
Notes:				

Trace Elements: Portland cement is made from materials mined from the earth and processed using energy provided by fuels. Trace amounts of naturally occurring, potentially harmful chemicals might be detected during chemical analysis. Trace constituents may include calcium oxide (also known as free lime or quick lime), free magnesium oxide, potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Portland Cement is a powder that poses little immediate hazard. A single short-term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet Portland Cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry Portland Cement.

POTENTIAL HEALTH EFFECTS

Relevant Routes of Exposure: Eye contact, skin contact, inhalation and ingestion.

Effects resulting from eye contact: Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet Portland Cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Effects resulting from skin contact: Discomfort or pain cannot be relied upon to alert a person to hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing skin contact, particularly contact with wet Portland Cement. Exposed persons may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry Portland Cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry Portland Cement contacting wet skin or exposure to moist or wet Portland Cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to Portland Cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with Portland Cement products.

Effects resulting from inhalation: Portland Cement may contain free crystalline silica. Prolonged exposure to airborne free crystalline silica may cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease, and/or other diseases. (also see “Carcinogenic potential” below.)

Inhalation may also aggravate other lung conditions. Exposure to Portland Cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Effects resulting from ingestion: Although ingestion of small quantities of Portland Cement is not known to be harmful, ill effects are possible especially if larger quantities are consumed. Portland Cement should not be eaten.

Carcinogenic potential: Portland Cement is not listed as a carcinogen by the National Toxicology Program (NTP), International Agency for Research (IARC) or the Occupational Safety and Health Administration (OSHA). It may, however, contain trace amounts of substances listed as carcinogens by these organizations.

Portland Cement may contain crystalline silica. Crystalline silica is classified by the IARC as a known human carcinogen. Some human studies indicate potential for lung cancer from crystalline silica exposure. Risk depends on duration and level of exposure.

Medical conditions which may be aggravated by inhalation or dermal exposure:

Pre-existing upper respiratory and lung diseases.

Unusual (hyper) sensitivity to hexavalent chromium (chromium^{+6}) salts.

Section 4 - FIRST AID

Eyes: Immediate flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes including under lids, to remove all particles. Call physician immediately.

Skin: Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation of Airborne Dust: Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. ("Inhalation" of gross amounts of Portland Cement requires immediate medical attention.)

Ingestion: Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE AND EXPLOSION DATA

Portland Cement is not combustible.

Flash Point:	Not applicable	Upper Explosive Limit:	Not applicable
Auto ignition temperature:	Not applicable	Lower Explosive Limit:	Not applicable
Auto ignition temperature:	Not applicable	Extinguishing media:	Not applicable
Hazardous combustion products:	Not applicable	Unusual fire and explosion hazards:	None
Special fire fighting procedures:	Portland Cement poses no fire-related hazards. Self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.		

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash Portland Cement down drains.

Dispose of waste material according to local, state, and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep Portland Cement dry until used. Normal temperatures and pressures do not affect the material. Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin protection: Prevention is essential to avoid potentially severe skin injury. Avoid contact with unhardened (wet) Portland Cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened Portland Cement products might occur, wear impervious clothing and gloves to eliminate skin contact. Where required, wear boots that are impervious to water to eliminate foot and ankle exposure.

Do not rely on barrier creams. Barrier creams should not be used in place of gloves.

Periodically wash areas contacted by dry Portland Cement or by wet cement or fluids with a pH neutral soap. Wash again at the end of the work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet cement, it should be removed and replaced with clean dry clothing.

Respiratory protection: Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA-approved (under 30 CFR 11) or NIOSH-approved (under 42 CFR 84) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation.

Ventilation: Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye protection: When engaged in activities where cement dust or wet cement could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with Portland Cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Grey, white powder	Odor:	No distinct odor
Physical state:	Solid (powder)	pH (in water):	12 to 13
Solubility in water:	Slightly soluble (0.1 to 1.0%)	Vapor pressure:	Not applicable
Vapor density:	Not applicable	Boiling point:	Not applicable (>1000^{O} C)
Melting point:	Not applicable	Specific gravity (H_2O=1.0):	2.80 - 3.00
Evaporation Rate:	Not applicable	Coefficient of oil to water distribution:	Not applicable

Section 10 - STABILITY AND REACTIVITY

Stability: Stable

Conditions to avoid: Unintentional contact with water.

Incompatibility: Wet Portland Cement is alkaline. As such it is incompatible with acids, ammonium salts and aluminum metal.

Hazardous decomposition: Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous polymerization: Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

Route of Entry.....Section 3
Effects of acute exposure to product.....Section 3
Effects of chronic exposure to product.....Section 3
Exposure Limits.....Section 2
Irritancy of product.....Section 3
Sensitization to product .....Section 3
Carcinogenicity.....Section 3
Reproductive Toxicity.....Not Applicable
Teratogenicity.....Not Applicable
Mutagenicity.....Not Applicable
Toxicologically synergistic products.....Section 3, Section 16

For a description of available, more detailed toxicological information, call one of the informational phone numbers listed at the end of Section 1.

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity: No recognized unusual toxicity to plants or animals.

Relevant physical and chemical properties: See sections 9 and 10.

Section 13 - DISPOSAL

Dispose of waste material according to local, state, and federal regulations. (Since Portland Cement is stable, uncontaminated material may be saved for future use.)

Dispose of bags in an approved landfill or incinerator.

Section 14 - TRANSPORTATION DATA

Hazardous materials description/proper shipping name: Portland Cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Hazard class: Not applicable.

Identification number: Not applicable

Required label text: Not applicable.

Hazardous substances/reportable quantities (RQ): Not applicable

Section 15 - OTHER REGULATORY INFORMATION

Status under USDOL-OSHA & MSHA Hazard Communication Standards (29CFR 1910.1200 & 30CFR Part 47): Portland Cement is considered a "hazardous chemical" under these regulations, and should be part of any hazard communication program.

Status under CERCLA/Superfund, 40 CFR 117 and 302: Not Listed

Hazard Category under SARA TITLE III, Sections 311- 312: Portland Cement qualifies as a "hazardous substance" with delayed health effects.

Status under SARA Title III, Section 313: This product contains NONE of the substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372 in concentrations above deminimis levels.

Toxic Substance Control Act (TSCA): Some substances in Portland Cement are on the TSCA inventory list.

Status under the Federal Hazardous Substances Act: Portland Cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under Canadian Environmental Protection Act: Not listed.

Status under WHMIS: Portland Cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations (Class D2A – Materials causing other toxic effects and Class E - Corrosive material) and is therefore subject to the labeling and MSDS requirements of the Workplace Hazardous Materials Information System (WHMIS).

SECTION 16 - OTHER INFORMATION

Abbreviations:

ACGIH	American Conference of Government Industrial Hygienists
ASTM	American Society of Testing Materials
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
DOT	Department of Transportation
IARC	International Agency for Research
IDLH	Immediately dangerous to live and health (NIOSH).
m^3	cubic meter
mg	Milligram
mm	millimeter
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicity Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
RQ	Reportable Quantities
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TWA	Time Weighted Average
URT	Upper Respiratory Tract
WHMIS	Workplace Hazardous Material Information System

Other important information:

Portland Cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that Portland Cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while Portland Cement is “setting”) pose a far more severe hazard than does Portland Cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of Portland Cement as it is commonly used, the sheet cannot anticipate and provide all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product.

In particular, the data furnished in this sheet do not address hazards that may be posed by other materials mixed with Portland Cement to produce Portland Cement products. Users should review other relevant material safety data sheets before working with this Portland Cement or working on Portland Cement products, for example, Portland Cement concrete.

SELLER MAKES NO WARRANTY, EXPRESSED OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY ESSROC CEMENT CORP., except that the product shall conform to contracted specifications. The information provided herein was believed by Essroc Cement Corp. to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. Buyer’s exclusive remedy shall be for damages and no claim of any kind, whether as to product delivered or for non-delivery of product, and whether based on contract, breach or warranty, negligence, or otherwise shall be greater in amount than the purchase price of the quantity of product in respect of which damages are claimed. In no event Seller be liable for incidental or consequential damages, whether Buyer’s claim is based on contract, breach of warranty, negligence or otherwise.

Dräger Safety AG & Co. KGaA
Revalstr. 1
D-23560 Lübeck/Germany
Telephone number **+49 451/882-0**
Fax number **+49 451/882-2080**
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Contact for information: Corporate Auditing/Corporate Standards
Telephone number **+49 451/882-3125**

Material Safety Data Sheet

Document: 9030003
Version: 07/2001
Status: released

Date of issue: July 10, 2001
Supersedes: Version 05/98

according to EC Directive 91/155/EEC

1. Product and Company Identification

Trade name: **Drägersorb® 400 S**
Order numbers: 6737228 (40 kg), etc.

Part nos.:

2. Composition / Information on Ingredients

2.1 Chemical Characterization (Constituent):
n. a.

2.2 Chemical Characterization (Preparation):
Soda lime containing calcium dihydroxide, sodium hydroxide and 19 - 23 % water.

CAS No.	Designation acc. to EC Directive	Content	Unit	Symbol	R-Phrases
1305-62-0	Calcium dihydroxide / Calcium hydroxide ($Ca(OH)_2$) (EINECS-Nr. 215-137-3)	78 - 84	w/w per cent	X_i	R 41
1310-73-2	Sodium hydroxide	2 - 4	w/w per cent	C	R 35

2.3 Additional Information:
Drägersorb® 400 S contents no ozone-depleting chemicals and no volatile organic chemicals (VOCs). During the manufacturing process for Drägersorb® 400 S no ozone-depleting chemicals and no volatile organic chemicals (VOCs) were used.

3. Hazards Identification

Nature of Hazard:
X_i, Irritant
Particular Hazards for Man and Environment:
R 41 Risk of serious damage to eyes.

4. First-Aid Measures

After inhalation:
Fresh air. Consult physician.
After skin contact:
Wash with plenty of water, then dab with polyethylene glycol 400.
After eye contact:
Flush open eye with plenty of water (for at least 15 minutes). Consult ophthalmologist immediately. Danger of corneal clouding.
After ingestion:
Administer lemon juice and afterwards plenty of water. Avoid vomiting (Danger of perforation!). Consult physician immediately.
Information to the physician:
After ingestion there is a danger of the oesophagus and the stomach becoming perforated.

5. Fire-Fighting Measures

Appropriate Extinguishing Media:
Drägersorb® 400 S does not burn. Adapt extinguishing media to the environment.
Extinguishing Media Not Appropriate for Reasons of Safety:
n. a.
Special Dangers Due to the Material, Its Products of Combustion or Resulting Gases:
When using water as an extinguishing media, take care of the resulting alkaline firefighting water. In case of high temperatures CaO may be released.
Special Protective Clothing or Equipment:
n. a.

6. Accidental Release Measures

Health Precautions:
Do not inhale released dust. Use dust mask with FFP2 filter. Take care to avoid eye contact, use safety goggles. Avoid skin contact.
Environmental Precautions:
Do not discharge into the sewer system.
Procedures for Cleaning / Collection:
Sweep up dry while avoiding formation of dusts. Wash away residues with large amounts of water.
Additional Information:
n. a.

7. Handling and Storage

7.1 Handling:

Information for Safe Usage:
Use dust extractor device if necessary.
Information for Fire and Explosion Protection:
Drägersorb® 400 S does not burn.

7.2 Storage:

Requirements for Storage and Containers:
Keep containers tightly closed. Drägersorb® 400 S must only be stored in its original containers at temperatures ranging from -30 °C to +50 °C. Drägersorb® 400 S must not be allowed to desiccate!
Information on Storage Together with Other Materials:
Observe VCI concept for storing chemicals.
Additional Information on Storage Conditions:
n. a.
Storage Class:
10 - 13 (VCI concept).

8. Exposure Controls / Personal Protection

Additional information on designing technical plants
Components having workplace-related limit values:

CAS No.	Designation of the Material	Type	Value	Unit
1305-62-0	Calcium dihydroxide	MAK*	5 E**	mg/m³
1310-73-2	Sodium hydroxide	MAK*	2 E**	mg/m³
	Total dust	MAK*	6	mg/m³

*German TLV **measured as inhaleable dust

Additional Information:
n. a.
General Safety and Hygiene Precautions:
Prophylactic skin care to protect faintly acid skin against Drägersorb® 400 S which reacts mildly alkaline.
Respiratory Protection:
Not necessary as Drägersorb® 400 S is delivered in pelletform. When dust occures, use a dustmask with FFP2 filter.
Hand Protection:
Prophylactic skin protection is recommended. Wash thoroughly after handling. Skin care.
Eye Protection:
Safety goggles necessary.
Body Protection:
n. a.

9. Physical and Chemical Properties

9.1 Appearance:

Form:	hemispherical pills
Colour:	white
Odour:	odourless

9.2 Safety-Relevant Data:

Mass Density:			(930 +/- 100) g/l (bulk density)
Solubility of the Pellets:	in water	T = 20 °C	approx. 1 g/l
pH Value of the Pellets: at approx. 1 g/l		T = 20 °C	approx. 12
Further Information:			Decomposition in CaO and H_2O at ~ 500 °C (930 °F)

10. Stability and Reactivity

Conditions to Avoid:
Avoid contact with concentrated acids. With acids vigorous reactions are possible. Do not use with trichloroethylene and chloroform.
Materials to Avoid:
In case of contact with light metals (aluminium) the formation of hydrogen is possible.
Dangerous decomposition products:
In case of high temperatures CaO may be formed.
Additional Information:
Aqueous solutions and suspensions react alkaline.

11. Toxicological Information

11.1 Acute Toxicity

Data for Component $Ca(OH)_2$
Classification-relevant LD/LC_{50} values:

Type	Values/Range of Values	Species	Method
oral	7340 mg/kg	rat	
dermal	./.		
inhalational	./.		

Specific Symptoms in Tests on Animals:
./.
Primary Irritant Action:
Data for Drägersorb® 400 S

Action	Species	Method
on the skin non irritant	rabbit	OECD 404, 91/325 EWG
at the eye > 3 after 72 h cornea opacity	rabbit	OECD 405, 91/325 EWG

Sensitization through skin contact
./.
Additional Information (on experimental toxicology)

NaOH	LD_{50}	oral,	rabbit	-	500 mg/kg

11.2 Subacute to Chronic Toxicity:
Experiments:
Species ./.
11.3 Effects on the Human Body:
$Ca(OH)_2$ may provoke caustic reaction on skin/mucosae, $Ca(OH)_2$ dust provokes irritation of the respiratory organs.
Additional Toxicological Information (esp. for preparation):

12. Ecological Information

12.1 Elimination Information (Persistence and Degradability):
Procedure n. a. Analytical method n. a.
Degree of Elimination ./. Classification ./.
Additional Information ./.
12.2 Behaviour in Environmental Compartments:
12.3 Ecotoxic Action:
Note
Drägersorb® 400 S can be toxic for aquatic organisms.
Behaviour in Waste Treatment Plants:
n. a.
Remark
./.
12.4 Additional Information:
n. a.
Additional Ecological Information:
As an inorganic, non-reducing substance Drägersorb® 400 S has neither a COD nor a BOD. It must not be discharged into lakes and rivers or the sewer system quantities.
12.5 General Information:
Drägersorb® 400 S suspensions react alkaline. Drägersorb® 400 S should not released into water, trouble through increasing pH-value. When handled and used properly Drägersorb® 400 S is not likely to prove detrimental to the environment.

13. Disposal Considerations

13.1 Product / Recommendations:

Unused soda lime can be disposed of as commercial solid waste similar to household waste in accordance with local waste disposal regulations. Utilized soda lime can be disposed of in the same way as unused soda lime.

Waste category (EAK, European waste catalogue):

150201

Waste designation:

Absorbent and filtering material, wiping cloth and protective clothing

Obligation to prove correct disposal:

n. a.

13.2 Not Cleaned Packaging Material / Recommendations:

Rinse PE-HD cans with water and recycle as one-type plastic. Rinse PE bags with water and recycle as one-type plastic. Alternatively the disposal of completely discharged plastic containers and flexible packages is possible by EAK 150102, metal containers by EAK 150104, and fibre board boxes by EAK 150101.

Recommended Cleaning Agent

n. a.

14. Transport Information

14.1 Overland transport ADR/RID and GGVS/GGVE (cross-border/domestic)

ADR/RID-GGVS/E-class

n. a. Figure/Letter ./.

Warning notice:

Hazard No. ./. Substance No. ./.

Designation of the freight:

./.

Remarks:

Drägersorb® 400 S is not a dangerous good. Drägersorb® 400 S is not hygroscopic and contains less than 4 % NaOH. Therefore it is not classified under UN No. 1907.

14.2 Inland waterway transport ADN/ADR

ADN/R class

n. a. Figure/Letter ./. Category ./.

Designation of the freight:

Remarks:

./.

14.3 Maritime transport IMDG/GGVSee

IMDG/GGVSee class

n. a. UN No. PG

EMS No. MFAG

Marine pollutant

Correct technical name

Remarks:

Drägersorb® 400 S is not a dangerous good. Drägersorb® 400 S is not hygroscopic and contains less than 4 % NaOH. Therefore it is not classified under UN No. 1907.

14.4 Air transport ICAO-TI and IATA-DGR

ICAO/IATA class

n. a. UN No. ./. PG ./.

Correct technical name

Remarks:

Drägersorb® 400 S is not a dangerous good. Drägersorb® 400 S contains less than 4 % NaOH and is therefore not classified under UN No. 1907.

14.5 Transport/Further Indications

May be sent by post.

15. Regulatory Information

15.1 Identification in Accordance with EC Directive:

Identification symbol and indication of danger:

X_i, Irritant

Dangerous component determining labelling:

Sodium hydroxide

R-Phrases:

R 41 Risk of serious damage to eyes.

S-Phrases:

S 2 Keep out of the reach of children.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 37/39 Wear suitable gloves and eyes/face protection.

Special identification of certain preparations (acc. to Annex II of the preparations directive 88/379/EWG)

n. a.

15.2 National Regulations:

Additional classification acc. to GefStoffV Annex II No.:

n. a. (only if differing from EC classification)

Information on employment restrictions: n. a.

Störfallverordnung (Accident Regulation): n. a.

Classification acc. to VbF (Flammable Liquids Regulation): n. a.

Technische Anleitung Luft (Technical Instruction Air):

Class n. a. Figure Percentage (in case of liquids)

Water hazard class: 1 (self-classification)

Further regulations, restrictions, and restrictive injunctions

(such as principles of industrial medicine and health and safety regulations (VBG, ZH-1/...instruction sheets etc.)

Instruction Sheet BG-Chemie: M 004 Irritating Substances/Caustic Substances: ZH 1/229

16. Other Information

Reasons for alterations:

Adoption of EC Material Safety Data Sheet format

The above information represents our current state of experience and describes the product only with respect to safety requirements. It is the responsibility of the customer to test whether the product is suitable for the purpose intended by the customer.
Any questions of warranty and liability for this product are subject to our General Terms and Conditions unless legislation imperatively provides otherwise.

Data-sheet issued by: ag-cas Contact: Dr. Hans-Christoph Bechthold

The data in the heading and sections 1, 6, 8, 13 have been changed.

3 Calcite Business Centre, 151 Industrial Road
Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 Fax (867) 633-4882
www.accessconsulting.ca

Memorandum

To: Kai Woloshyn, Jim Harrington, Brad Thrall, Alexco Keno Hill Mining Corp.

From: Ethan Allen, Eri Boye, Access Consulting Group

Date: November 29, 2013

Subject: Geochemical Rock Characterization, Flame & Moth Project, Keno Hill District, Yukon

1 SCOPE

This report summarizes results of a geochemical characterization of geologic materials from the Flame & Moth deposit area within the Keno Hill Silver District (KHSD), Yukon.

1.1 PURPOSE

The purpose of this memorandum is to review the geochemical characteristics of rock in the Flame & Moth area, especially with regard to its potential for the generation of acidic drainage and/or metal leaching (AML). The objective of this study is to provide a technical basis to support the management of rock to be excavated from Flame & Moth deposit during Alexco Keno Hill Mining Corp.'s (AKHM) proposed underground development and operations program.

In order to facilitate underground development and operations, AKHM is proposing to develop a decline from surface under an amendment to its Quartz Mining Licence QML-0009. The majority of waste rock to be permanently excavated as a result of this project will occur from primary development activities including the initial decline and access ramps. The decline and primary access is designed to be developed away from the known mineralized vein structures and is not anticipated to encounter mineralized rock.

1.2 STUDY APPROACH

This evaluation consists of the data analysis of acid base accounting (ABA), ICP trace metals, and shake flask extraction (SFE) test results conducted on selected 2011-2013 Flame & Moth drill core (50 samples) which were obtained from diamond drill core extracted from areas of planned excavation and development for the planned Flame & Moth project.

This analysis builds on geochemical studies conducted within the KHSD in order to define the AML controlling and correlating factors for the KHSD as a whole (Altura 2008a, ACG 2012). Altura

conducted a review of static testing data from a site-wide geochemical sampling program that was conducted during 1995 to 1996 on the weathered rock dump and pit areas. Key geochemical and field diagnostic factors that appear to either control, or correlate to the generation of net acidity and/or metal leaching in the Keno Hill rock suite, were applied in order to predict the relative proportions of potentially AML (P-AML) and non-AML (N-AML) rock. ACG (2012) re-examined, confirmed and refined the AML controlling and correlating factors described by Altura 2008a using additional static testing data (shake flask, ABA, and ICP trace metals) which had become available since 2008.

These studies on the AML controlling/correlating factors in the district have used the available ABA, ICP and SFE geochemistry data to form an increasingly robust understanding of the key geochemical AML controlling and correlating factors which underlie Alexco's waste rock management plan. The data collected and presented in this study are compared with these previous studies and other deposit-specific static rock characterization studies, e.g. Altura 2008b (Bellekeno), ACG, 2011a (Onek), ACG 2011b (Lucky Queen), in order to assess and refine the waste rock segregation and management protocols in order to ensure their appropriateness for use on waste rock to be excavated from the Flame & Moth deposit.

At the Flame & Moth deposit, Alexco has utilized information and observations gathered from its experience within the district to make key changes to its waste rock management strategy. It has been established that within the district, rock with significant P-AML is primarily found in close proximity to the mineralized vein faults which are the economic (mining) targets. Altura 2008b and Access, 2011a showed that sulphur content (primarily present as sulphide-S), acid potential and the concentration of most constituents of potential concern (e.g. Zn, Cd, Pb) increase in mineralized areas and calcium content (and neutralizing potential), decrease within mineralized rock.

Much of the underground development (and rock excavation) required to reach these targets can be designed to avoid these areas and be developed within unmineralized rocks, which generally have favorable N-AML characteristics. In recognition of these geological characteristics, Alexco plans to avoid permanent excavation of material from close proximity with the mineralized vein fault areas and proposes permanent underground disposal (backfill) of uneconomic vein and near-vein material.

Exploration drill cores may provide excellent cross sections across mineralized vein fault structures, showing the contact through the vein from the hanging wall into the foot wall. These cores show that the boundary of the mineralized vein faults varies depending on a number of factors but can range from sharp to a somewhat diffuse fracture zone with mineralized stringers extending away from the vein for a number of meters. A buffer of at least 5 meters (or the presence of stringers, whichever is greater) around the mineralized vein block model is proposed to differentiate between near-vein (subject to more rigorous management criteria and preferentially used for underground backfill) and distal wall rock, which can be permanently excavated for surface disposal.

This study utilizes static and preliminary kinetic testing data that confirm the waste rock management system currently permitted for use by Alexco at the Bellekeno mine (QML-0009 Waste Rock Management Plan, submitted Nov. 2009) is an appropriate management strategy and proposes minor modifications for management of rock proposed to be excavated as part of the Flame & Moth project.

2 METHODOLOGY

2.1 SAMPLE SELECTION

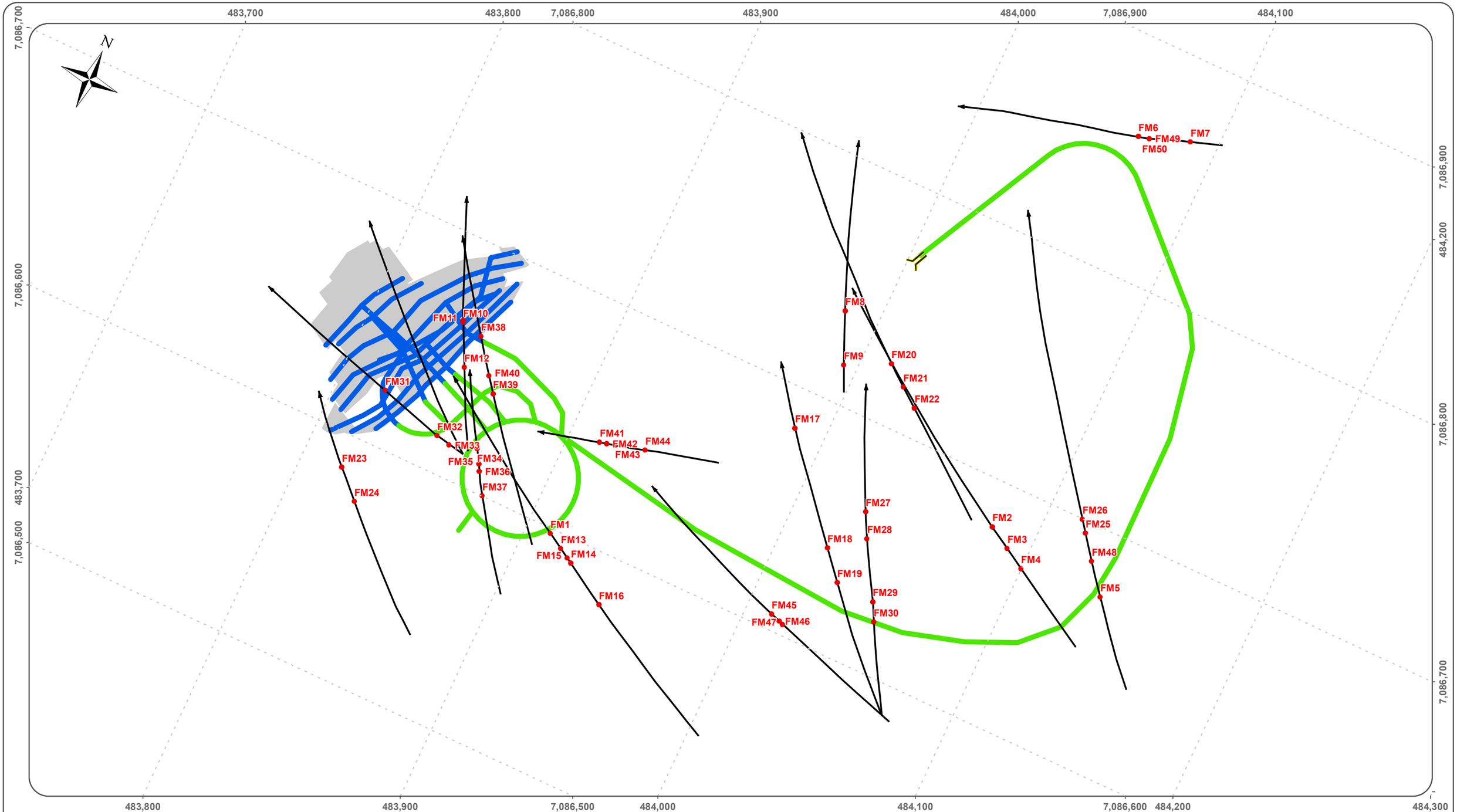
All data for this report were provided by AKHM. AKHM reported that all sample selection was conducted by a qualified person. Samples were selected from diamond drill core intervals. Sample selection was designed to maximize the spatial distribution in the area representing the location of the planned decline, which is located away from the mineralized Flame & Moth structures. All 50 samples used in this study were selected by Alexco personnel from diamond drill core from exploration and cover hole drilling programs conducted during 2010-2012. Samples were selected in order to approximate the relative abundance of rock present within the area of proposed development (and excavation). The relative abundance of lithologies estimated to be encountered by this development was provided by Alexco and listed in Table 1.

Table 1: Relative Abundance of Lithologies Present in the Flame & Moth Deposit Area of Proposed Development

Lithology	Relative Abundance
QTZ (including CQZT)	68%
GSCH (including ICQS, and TQZT)	15%
SSCH	15%
GNST	2%
Total	100%

The spatial distribution and location of samples are shown in plan view (Figure 1 and Figure 2) and oblique 3D view in Figure 3 and Figure 4. For easier viewing Figure 1 and Figure 3 show only the workings and mineralized vein above the 795 level (where the majority of permanent excavation of waste rock is planned) while Figure 2 and Figure 4 show the currently proposed underground workings and mineralized target areas in their entirety.

Because AKHM conducted chemical analyses only on cores in the vicinity of the mineralized fault structures, assay data was not available in order to guide the selection. Samples were selected to provide a representative distribution according to the relative abundance of lithologies present in the area where the proposed excavation (decline) is to be developed.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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Main Map: 1:1,500
(when printed on 11 x17 inch paper)

0 10 20 40 Meters

- Sample Location
- Drill Traces
- Mineralized Vein Fault
- Backfill
- Excavated to Surface (≥ 5M from Mineralized Vein)

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GEOCHEMICAL ROCK CHARACTERIZATION
FLAME AND MOTH PROJECT
KENO HILL DISTRICT, YUKON

FIGURE 1 - SAMPLING LOCATION PLAN VIEW (TRUNCATED BELOW 795M)

NOVEMBER 2013

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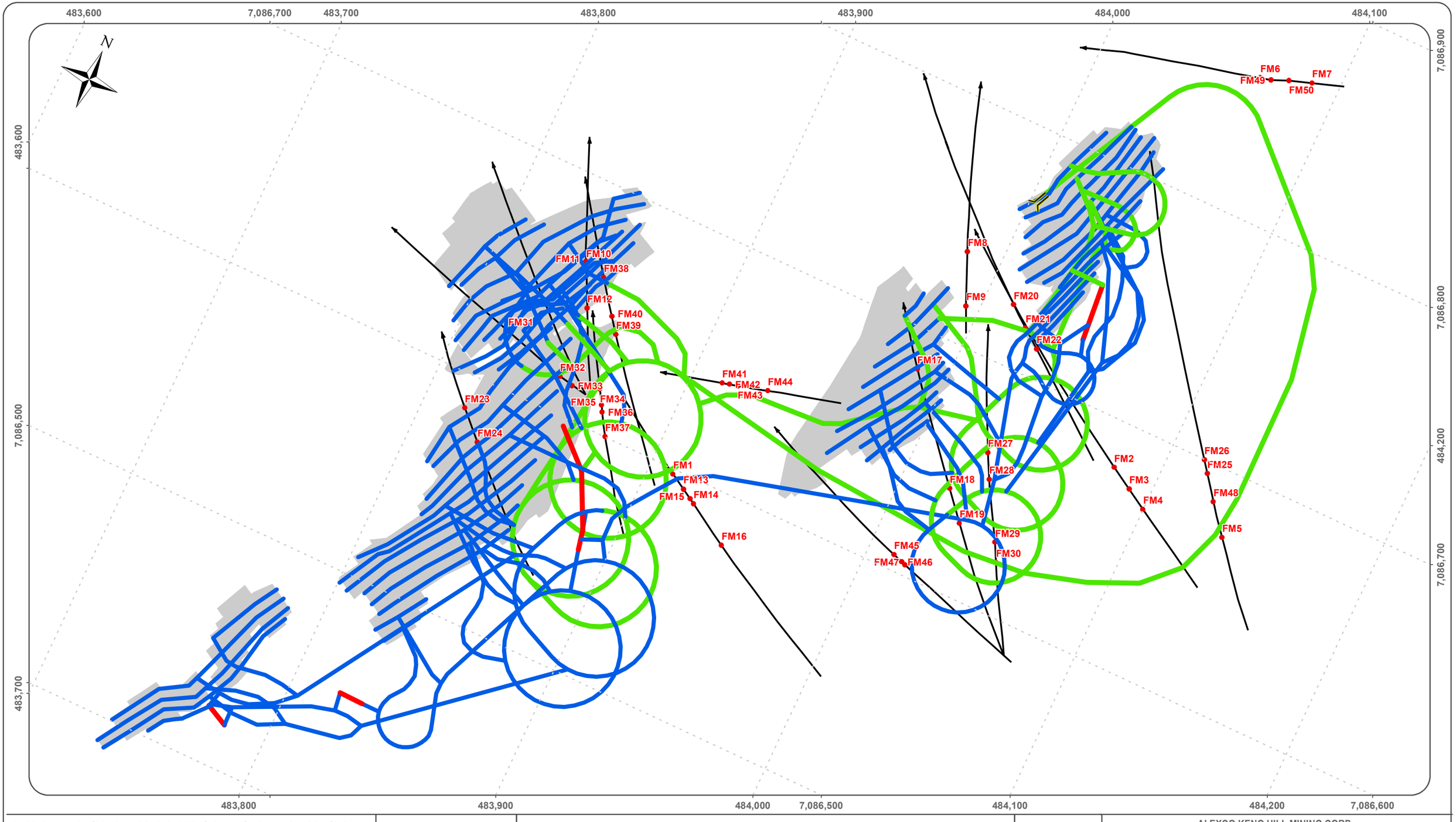

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

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Main Map: 1:1,500
(when printed on 11 x17 inch paper)

0 10 20 40 Meters

- Sample Location
- Drill Traces
- Mineralized Vein Fault
- Underground Backfill
- Excavate to Surface (≥ 5M from Mineralized Vein)
- Vent Raise

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GEOCHEMICAL ROCK CHARACTERIZATION
FLAME AND MOTH PROJECT
KENO HILL DISTRICT, YUKON

FIGURE 2 - SAMPLE LOCATION PLAN VIEW

NOVEMBER 2013

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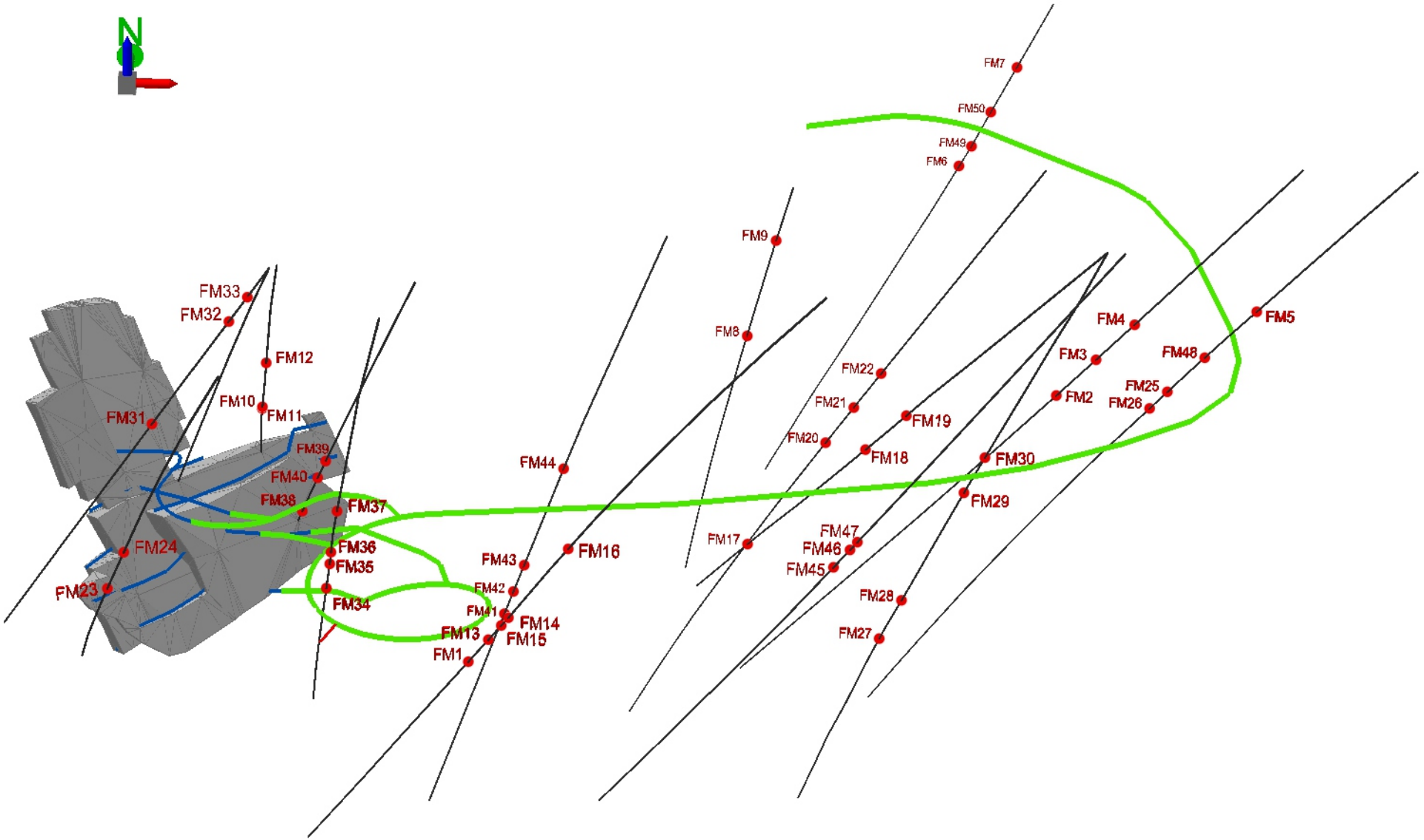

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CONCEPTUAL DRAWING; FEATURES ARE NOT TO SCALE

- Sample Location
- Drill Traces
- Mineralized Vein Fault
- Backfill
- Excavated to Surface (≥ 5M from Mineralized Vein)

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GEOCHEMICAL ROCK CHARACTERIZATION
FLAME AND MOTH PROJECT
KENO HILL DISTRICT, YUKON

FIGURE 3 - SAMPLE LOCATION
3D OBLIQUE VIEW (TRUNCATED BELOW 795M)

SEPTEMBER 2013

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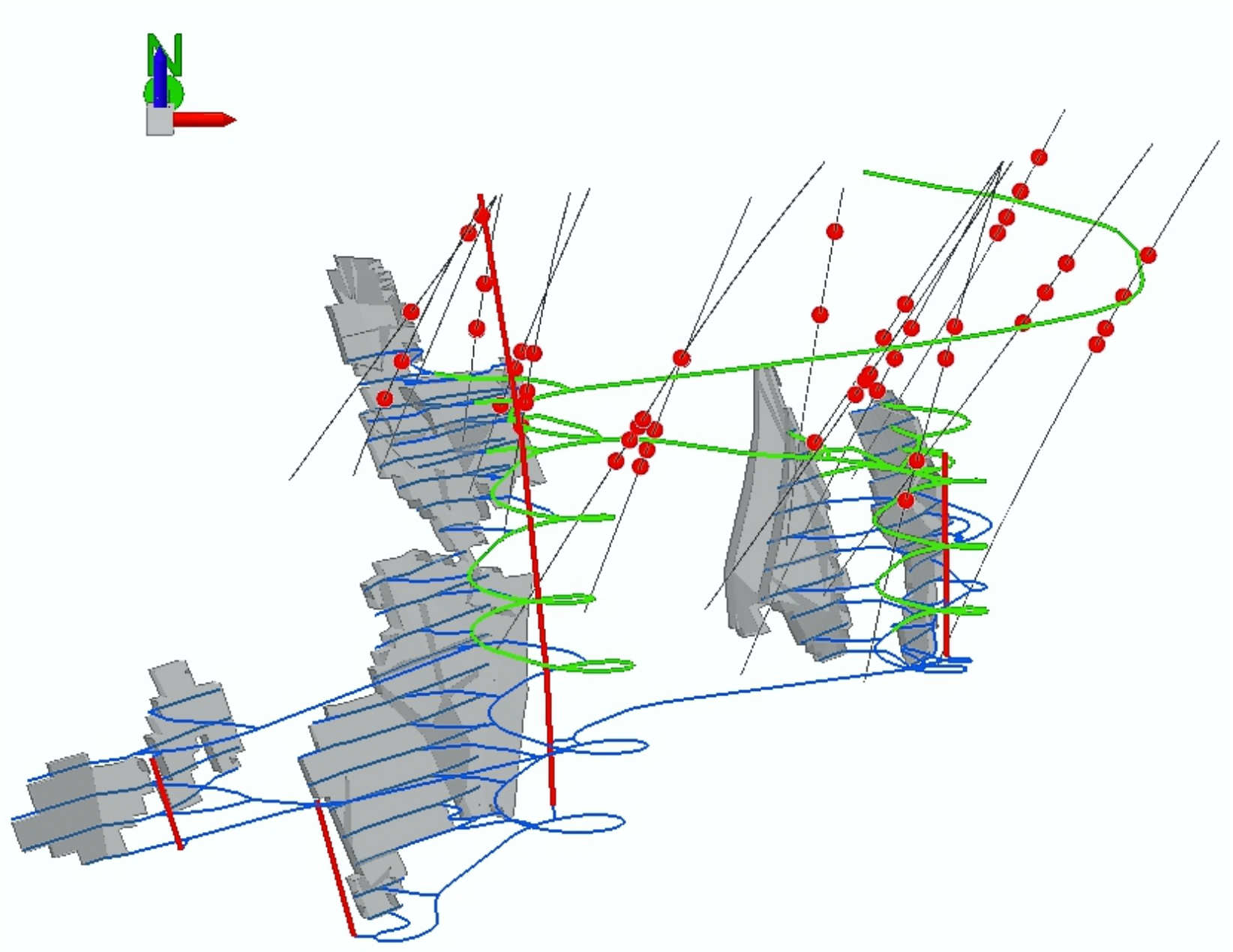

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CONCEPTUAL DRAWING; FEATURES ARE NOT TO SCALE

- Sample Location
- Drill Traces
- Mineralized Vein Fault
- Underground Backfill
- Excavate to Surface (≥ 5M from Mineralized Vein)
- Vent Raise

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GEOCHEMICAL ROCK CHARACTERIZATION
FLAME AND MOTH PROJECT
KENO HILL DISTRICT, YUKON

FIGURE 4 - SAMPLE LOCATION
3D OBLIQUE VIEW

NOVEMBER 2013

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2.2 ANALYTICAL METHODS

A full suite of static testing was conducted on all samples by ALS Minerals in North Vancouver, BC. Acid base accounting (ABA) samples were tested using the standard Sobek method with a siderite correction (using the hydrogen peroxide method of Skousen, 1997). Sulphate was measured via HCl leaching and sulphide sulphur was determined via calculation, as the difference between total sulphur (via Leco) and sulphate. Total inorganic carbon was measured via coulometer and paste pH was measured at a 1:1 solid to water ratio. A standard 24 hour shake flask extraction test was performed on all samples, and was conducted using a 3:1 liquid to solid ratio using deionized water as the extracting fluid. ICP trace ultra-metals analysis for 41 elements was conducted using an aqua regia digestion and combined inductively coupled plasma - atomic emission spectroscopy (ICP-AES) and mass spectrometry (ICP-MS) finish.

2.3 DATA ANALYSIS

Data were compiled for the purposes of statistical analyses and geochemical characterization. Laboratory results reported below the minimum detection limits were assigned a value of one half of the detection limit. Laboratory results above the maximum detection limits were assigned a value equal to the detection limit. Statistical analyses and data manipulations were carried out using MS Excel® and XLStat® software.

Lithologies for each sample were determined by AHKM geologists during routine core logging and sampling. Specific lithologies (schists and quartzites) are intercalated with secondary lithologies noted on the scale of centimeters to meters. Thus, reported lithology over a specific interval represents only the primary lithology and could contain a significant proportion of a secondary lithology. Thin Bedded Quartzite (TQZT) is a reported lithology which reflects a specific interval of mixed quartzite and schist. For the sake of making the results more manageable, several samples which had been reported as a mixed percentage of two lithologies were simplified to the lithology in greater proportion, e.g. QTZ 90%/GSCH 10% was reported at QTZ.

3 OVERVIEW OF FLAME & MOTH ROCKS

3.1 GEOLOGY, MAJOR ROCK TYPES AND MINERALIZATION

The KHSD is comprised principally of Yukon Group metasedimentary rocks, which are described in the Keno Hill Silver District Environmental Conditions Report (Access Consulting Group, 2011c) and from the NI43-101 technical report for the Flame & Moth project (Alexco, 2013) The metasedimentary rocks in the district were deposited in a shelf environment during the formation of the northern Cordilleran continental margin and underwent regional compressive tectonic stresses during the Jurassic and the Cretaceous, which produced thrusts, folds, and penetrative fabrics of various scales.

The district geology is dominated by the Mississippian Keno Hill Quartzite (formerly mapped as the "central quartzite" (Boyle, 1965), which is conformably overlain by the Sourdough Hill Member, which was mapped as the "upper schist formation" (Boyle 1965). The unit is overthrust in the south by the Upper Proterozoic Hyland Group and underlain in the north by the Devonian Earn Group. The Earn Group was formerly mapped as the "lower schist formation" (Boyle, 1965) and is typically composed of recessive weathering grey graphitic schist and green chlorite-sericite schist with an upper siliceous graphitic schist found locally. The Keno Hill Quartzite contains thick and thin-bedded quartzite, massive quartzite, graphitic phyllite, graphitic schist and calcareous schist. This unit is up to 1,100 m thick and hosts most of the silver mineralization on the Keno Hill district. The overlying Sourdough Hill Member is up to approximately 1,050 m in thickness and comprises predominantly graphitic and sericitic phyllite, chloritic quartz augen phyllite, and minor thin limestone.

Conformable Middle Triassic greenstone (altered diorite/gabbro) lenses and sills occur in places and narrow lamprophyre and quartz-feldspar porphyry dykes occur locally. Granite bodies have intruded the metasedimentary – greenstone package at several places to the north and south of the Keno Hill – Galena Hill area. The sequence was metamorphosed to greenschist facies assemblages during the Cretaceous regional deformation.

The Flame & Moth deposit is located near Keno City, YT in the valley between Galena Hill (to the west), Keno Hill (to the northeast) and Sourdough Hill (to the southeast).

The mineralized Flame & Moth vein system occurs in the upper part of the Keno Hill Quartzite. The host rocks predominantly comprise medium to thick bedded quartzite with interbedded graphitic schist. Within this sequence, two distinctive horizons of sericite schist, up to 10 m in thickness, occur 65 m and 90 m respectively below the top of the unit. Up to five greenstone sills, up to 50 m in thickness, are found within the quartzite sequence below these horizons.

The sequence generally strikes to the east to east-southeast and dips moderately to the southwest. The north-northeast striking Flame Vein developed in an environment of competency contrasts caused by the juxtaposition of quartzite, schist, and greenstone along the left lateral Flame vein-fault that has now been traced by drilling along a strike length of approximately 600 m and to a depth of at least 350 m. The structure dips moderately to steeply in an east-southeast direction. In the vicinity of the District Mill, the Flame Vein is offset at surface by approximately 95 m. This apparent right lateral oblique slip movement occurs along the west-northwest trending post-mineral Mill Fault. The Mill Fault dips approximately 66° to the southwest, with the mineralization occurring in the hanging wall section (commonly referred to as the Lightning Zone). It should be noted that the footwall section is commonly referred to as the Christal Zone.

A brief descriptive overview of the major lithology types is summarized below from Boyle (1962), Altura (2008b) and Alexco (2013).

Quartzite (QTZ) is the dominant unit at Flame & Moth and occurs both as thick and thinly bedded sequences with assemblages of schist. Quartzites are comprised primarily of quartz but also contain some mica, carbonate minerals and carbonaceous materials. Accessory minerals include leucoxene,

tourmaline, zircon, apatite and pyrite. Calcareous quartzite (CQTZ) contains disseminated primary calcite that fizzes readily when subjected to dilute HCl.

Schist (SCH): The majority of the schist within Flame & Moth are graphitic schist (GSCH), with less sericite schist (SSCH), and trace chlorite schist (CHSCH). Undifferentiated schists have also been observed within this area. Calcareous schist (CSCH) contains disseminated primary calcite that fizzes readily when subjected to dilute HCl. As previously discussed, interbedded carbonaceous quartzite and schist (ICQS) and thin bedded quartzite (TQTZ) are also included as their own lithologies, but these units are predominantly composed of schist.

Sericite and chlorite schist are usually pale to dark green in colour. Thin sections of sericite schists show primarily quartz and sericite composition, with trace carbonate minerals and leucoxene. Accessory minerals include apatite, zircon, tourmaline and pyrite metacrysts.

Greenstone (GNST): Greenstones vary from massive to schistose and vary in color from greyish green to dark green. Greenstones occur in conformable elongated lenses and sills as a result of boudinage, particularly within the more ductile schist units. Greenstones units are generally more resistant than the quartzites and schists and appear geomorphologically as the prominent hills in the KHSD. Thin sections show significant variety in mineral composition and texture but generally show a high degree of alteration. The primary mineralogy of the greenstones are hornblende, actinolite, saussurite (zoisite, epidote, albite, sericite, carbonate), plagioclase (oligoclase to andesine), chlorite, stilpnomelane, biotite, sericite, leucoxene, and carbonate minerals. Quartz, K-feldspar, ilmenite, magnetite, limonite and apatite are minor constituents with some pyrite. Chlorite is also generally present, which is primarily responsible for this rock's color.

Graphitic schists are black or dark gray due to their significant carbon content, and occur in beds from millimetre to many meters in scale, and can be intercalated with quartzites as well as other lithologies. In addition to graphite; quartz, mica, carbonates, feldspar, chlorite, isotropic colloidal material and pyrite metacrysts have been identified in thin sections within these rocks.

Economic mineralization within the KHSD often occurs within irregular shoots, or in pinch and swell veins which are proximal to a fault systems. Dilation and subsequent development of economic mineralization is favoured in the more brittle (quartzite and greenstone) units, especially where there is a contrasting rheology on each side of the vein fault. Dilation and economic mineralization is usually not well developed in the more ductile lithologies such as the schist and phyllite packages.

The style of mineralization and minerals present at Flame & Moth are typical of the mineralization within the district (KHSD). Two main styles of mineralized veining are noted in the Flame & Moth area. The first is an early phase, which comprises dominantly of quartz gangue with abundant but irregular pyrite, sphalerite and arsenopyrite. The second is a later phase, and is siderite dominant with abundant sphalerite and irregular pyrite and galena development. Other minerals commonly observed include pyrrhotite and chalcopyrite, with trace amounts of the argentian tetrahedrite (freiburgite), pyrargyrite, jamesonite, boulangerite, and cassiterite identified in petrologic samples. The veining systems often displays multiple periods of brecciation and re-healing.

3.2 ELEMENTAL CHARACTERIZATION

ICP metals data were characterized and described according to the major lithological units. Table 2 shows the lithology distribution of the samples selected from the Flame & Moth deposit for this study. It should be noted that the four major lithologies (graphitic schist (GSCH), quartzite, sericite (SSCH) schist, and thin-bedded quartzite (TQZT)) represent 92% of the samples selected, which is consistent with estimates of the relative abundance of lithologies presented in the planned area of excavation (Table 1). These four lithologies were focused on during the elemental characterization portion of this study. The remaining three lithologies (calcareous quartzite (CQZT), calcareous schist (CSCH) and greenstone (GNST)) composed 8% of the total number of samples collected, or a total of 4 samples for the 3 combined units, and were not the focus on for this investigation.

Table 2: Relative Frequency by Lithology for the Rock Samples from the Flame & Moth Deposit

Lithology		Number of Samples	Rel. Freq. per Category (%)
Description	Code		
Calcareous Quartzite	CQZT	2	4
Calcareous Schist	CSCH	1	2
Greenstone	GNST	1	2
Graphitic Schist	GSCH	5	10
Quartzite	QZT	28	56
Sericite Schist	SSCH	6	12
Thin-Bedded Quartzite	TQZT	7	14
	Total	50	100

Quartzite (QZT) is the dominant lithology in the sample set, composing 56% of the total number of samples. Three other major lithologies (graphitic schist (GSCH), sericite schist (SSCH) and thin-bedded quartzite (TQZT)) together make up (10%, 12% and 14%) of all of the Flame & Moth samples.

In previous geochemical characterization reports for AKHM both the rock samples and then the results have been broken into “mineralized” and “non-mineralized” groups. Mineralized groups were designated if either the lead (Pb) or zinc (Zn) content was ≥ 5000 ppm. Because of the spatial locations of the samples collected for this study, and due to the fact that the planned development is away from the mineralized veins at the Flame & Moth project, all of the 50 samples collected contained less than 5000 ppm Pb and Zn, and were therefore classified as non-mineralized.

As the samples collected for this geochemical characterization report were selected from non-mineralized areas where development is planned, no exceedances of the maximum method detection limit (MDL) for the standard ICP metals suite analyses were encountered.

3.2.1 Results

Elemental characterizations were performed on the following constituents of potential concern (COPCs): Arsenic (As), Antimony (Sb), Cadmium (Cd), Copper (Cu), Lead (Pb), Nickel (Ni), Selenium (Se), Silver (Ag), and Zinc (Zn). COPCs were selected based on Alexco and ACG's experience conducting geochemical characterizations within the KHSD and were confirmed by screening of the Flame & Moth ICP metals data by comparing elemental concentrations with established crustal abundance averages. A detailed description of Calcium (Ca) and Sulphur (S) is also included in this section because of their relationship with ABA characteristics, as described further in Section 3.3.

COPC elements were characterized for each of the 4 major lithologies (graphitic schist (GSCH), quartzite, sericite (SSCH) schist, and thin-bedded quartzite (TQZT) which represent 92% of the samples selected. The results of each element within the individual lithologies were compared with their respective elemental 10 times (10x) crustal abundance values. An example of the tables prepared, in this case contained arsenic content by lithology, is presented in Table 3.

The remaining data tables for the 4 common lithologies and their selected elemental results are included in Appendix A1.

Table 3: Arsenic Content by Lithology for the Rock Samples from the Flame & Moth Deposit

Arsenic (As) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Arsenic (10x Crustal Abundance – 18 ppm)		Method Detection Limit = 0.1 ppm		
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	20.7	128.0	5.6	12.5
99%	20.6	95.7	5.5	12.4
95%	20.2	77.9	5.3	12.2
90%	19.8	11.3	5.1	12.0
3rd Quartile 75%	19.9	5.9	5.0	11.9
Median 50%	17.1	3.1	2.9	11.3
1st Quartile 25%	6.9	2.2	0.2	5.9
10%	7.8	1.3	0.2	5.0
5%	5.2	1.0	0.1	3.2
1%	3.0	1.0	0.1	1.7
Minimum 0%	2.5	0.9	0.1	1.3
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Analyses for the selected elements of interest (COPC) within the Flame & Moth samples are summarized below.

Box plots were created for the selected element's (COPC) abundances within each individual lithology sampled. The box plot legend can been seen in Figure 5, and is also shown in Appendix A2. A box plot showing selenium abundances within the individual lithologies can be seen in Figure 6. The remaining box plots can be found in Appendix A2. Complete raw ICP metals data are included in Appendix A3.

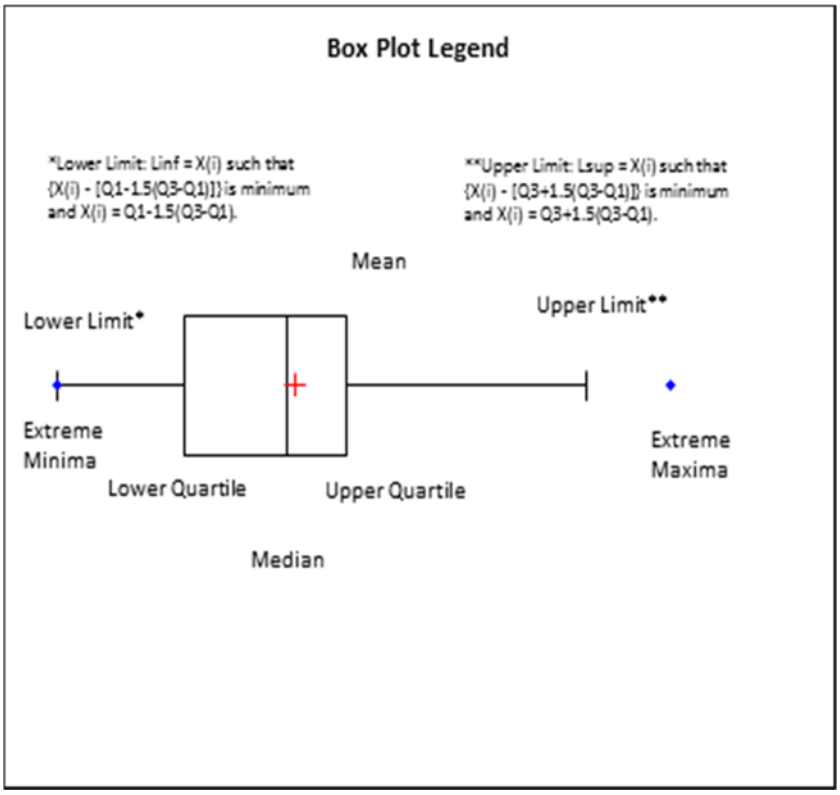


Figure 5: Box Plot Legend

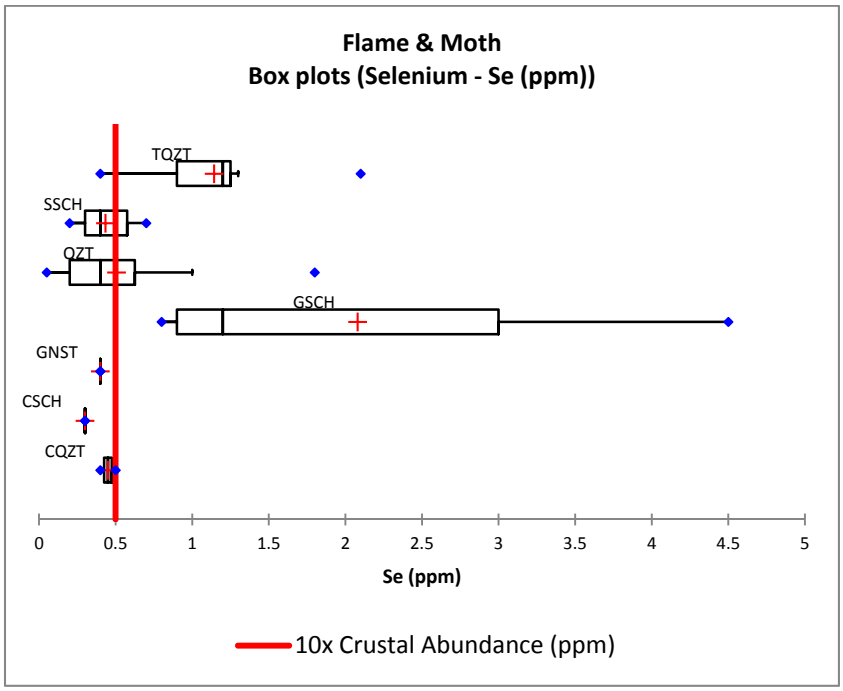


Figure 6: Selenium Contained in all Lithologies Sampled from Flame & Moth, with 10x Crustal Abundance Shown

Graphitic Schist (GSCH):

Graphitic schist makes up 10% of all the samples within this study. Within the graphitic schist samples, the resulting values for the elements of interest are as follows:

- Arsenic content ranges from a minimum value of 2.5 ppm to a maximum value of 20.7 ppm. The 25th percentile is 6.9 ppm and 75th percentile is 19.9 ppm with a median value of 17.1 ppm. The 10 times crustal abundance value for arsenic 18 ppm.
- Antimony content ranges from a minimum of 0.71 ppm to a maximum of 4.48 ppm. The 25th percentile is 0.95 ppm and 75th percentile is 3.16 ppm with a median value of 1.24 ppm. The 10 times crustal abundance value for antimony is 2 ppm.
- Cadmium content ranges from a minimum value of 0.27 ppm to a maximum of 0.83 ppm. The 25th percentile is 0.42 ppm and the median value is 0.63 ppm with the 75th percentile value of 0.79 ppm. The 10 times crustal abundance value for cadmium is 1.5 ppm.
- Calcium content ranges from a minimum value of 0.42 % to a maximum of 2.80 %. The 25th percentile is 0.67 % and the median value is 1.90 % with the 75th percentile value of 2.41 %. The 10 times crustal abundance value for calcium is 0.563 %.
- Copper content ranges from a minimum value of 24.7 ppm to a maximum of 74.7 ppm. The 25th percentile is 25.6 ppm and the median value is 30.2 ppm with the 75th percentile value of 52.6 ppm. The 10 times crustal abundance value for copper is 600 ppm.

- Lead content ranges from a minimum value of 10.0 ppm to a maximum of 27.5 ppm. The 25th percentile is 10.2 ppm and the median value is 12.1 ppm with the 75th percentile value of 21.0 ppm. The 10 times crustal abundance value for lead is 140 ppm.
- Nickel content ranges from a minimum value of 35.5 ppm to a maximum of 61.3 ppm. The 25th percentile is 37.0 ppm and the median value is 38.7 ppm with the 75th percentile value of 53.3 ppm. The 10 times crustal abundance value for nickel is 840 ppm.
- Selenium content ranges from a minimum value of 0.8 ppm to a maximum of 4.5 ppm. The 25th percentile is 0.9 ppm and the median value is 1.2 ppm with the 75th percentile value of 3.8 ppm. The 10 times crustal abundance value for selenium is 0.5 ppm.
- Silver content ranges from a minimum value of 0.29 ppm to a maximum of 0.59 ppm. The 25th percentile is 0.36 ppm and the median value is 0.46 ppm with the 75th percentile value of 0.55 ppm. The 10 times crustal abundance value for silver is 0.75 ppm.
- Sulphur content ranges from a minimum value of 0.19 % to a maximum of 2.38 %. The 25th percentile is 0.56 % and the median value is 0.98 % with the 75th percentile value of 2.03 %. The 10 times crustal abundance value for sulphur is 0.35 %.
- Zinc content ranges from a minimum value of 106.5 ppm to a maximum of 149.0 ppm. The 25th percentile is 107.0 ppm and the median value is 116.5 ppm with the 75th percentile value of 139.8 ppm. The 10 times crustal abundance value for zinc is 700 ppm.

Quartzite (QZT):

Quartzite (QZT) makes up 56% of all the samples selected within this study. Within the quartzite samples, the resulting values for the elements of interest are as follows:

- Arsenic content ranges from a minimum value of 0.9 ppm to a maximum value of 128.0 ppm. The 25th percentile is 2.2 ppm and 75th percentile is 5.9 ppm with a median value of 3.1 ppm. The 10 times crustal abundance value for arsenic 18 ppm.
- Antimony content ranges from a minimum of 0.18 ppm to a maximum of 5.37 ppm. The 25th percentile is 0.47 ppm and 75th percentile is 0.88 ppm with a median value of 0.59 ppm. The 10 times crustal abundance value for antimony is 2 ppm.
- Cadmium content ranges from a minimum value of 0.03 ppm to a maximum of 0.63 ppm. The 25th percentile is 0.07 ppm and the median value is 0.16 ppm with the 75th percentile value of 0.22 ppm. The 10 times crustal abundance value for cadmium is 1.5 ppm.
- Calcium content ranges from a minimum value of 0.22 % to a maximum of 6.22 %. The 25th percentile is 0.69 % and the median value is 1.66 % with the 75th percentile value of 2.39 %. The 10 times crustal abundance value for calcium is 0.563 %.
- Copper content ranges from a minimum value of 2.0 ppm to a maximum of 91.7 ppm. The 25th percentile is 3.2 ppm and the median value is 5.7 ppm with the 75th percentile value of 8.3 ppm. The 10 times crustal abundance value for copper is 600 ppm.
- Lead content ranges from a minimum value of 1.6 ppm to a maximum of 26.4 ppm. The 25th percentile is 3.9 ppm and the median value is 6.3 ppm with the 75th percentile value of 7.6 ppm. The 10 times crustal abundance value for lead is 140 ppm.
- Nickel content ranges from a minimum value of 2.1 ppm to a maximum of 40.4 ppm. The 25th percentile is 3.2 ppm and the median value is 5.9 ppm with the 75th percentile value of 8.8 ppm. The 10 times crustal abundance value for nickel is 840 ppm.

- Selenium content ranges from a minimum value of 0.1 ppm to a maximum of 1.8 ppm. The 25th percentile is 0.2 ppm and the median value is 0.4 ppm with the 75th percentile value of 0.7 ppm. The 10 times crustal abundance value for selenium is 0.5 ppm.
- Silver content ranges from a minimum value of 0.06 ppm to a maximum of 0.89 ppm. The 25th percentile is 0.16 ppm and the median value is 0.23 ppm with the 75th percentile value of 0.38 ppm. The 10 times crustal abundance value for silver is 0.75 ppm.
- Sulphur content ranges from a minimum value of 0.03 % to a maximum of 1.81 %. The 25th percentile is 0.17 % and the median value is 0.33 % with the 75th percentile value of 0.57 %. The 10 times crustal abundance value for sulphur is 0.35 %.

Zinc content ranges from a minimum value of 5.8 ppm to a maximum of 88.2 ppm. The 25th percentile is 10.6 ppm and the median value is 20.1 ppm with the 75th percentile value of 34.8 ppm. The 10 times crustal abundance value for zinc is 700 ppm.

Sericite Schist:

Sericite schist (SSCH) makes up 12% of all the samples selected within this study. Within the sericite schist samples, the resulting values for the elements of interest are as follows:

- Arsenic content ranges from a minimum value of 0.1 ppm to a maximum value of 5.6 ppm. The 25th percentile is 0.2 ppm and 75th percentile is 5.0 ppm with a median value of 2.9 ppm. The 10 times crustal abundance value for arsenic 18 ppm.
- Antimony content ranges from a minimum of 0.09 ppm to a maximum of 2.63 ppm. The 25th percentile is 0.42 ppm and 75th percentile is 2.40 ppm with a median value of 0.74 ppm. The 10 times crustal abundance value for antimony is 2 ppm.
- Cadmium content ranges from a minimum value of 0.05 ppm to a maximum of 0.42 ppm. The 25th percentile is 0.07 ppm and the median value is 0.11 ppm with the 75th percentile value of 0.25 ppm. The 10 times crustal abundance value for cadmium is 1.5 ppm.
- Calcium content ranges from a minimum value of 0.18 % to a maximum of 8.56 %. The 25th percentile is 0.25 % and the median value is 0.39 % with the 75th percentile value of 3.06 %. The 10 times crustal abundance value for calcium is 0.563 %.
- Copper content ranges from a minimum value of 5.0 ppm to a maximum of 177.0 ppm. The 25th percentile is 6.3 ppm and the median value is 91.3 ppm with the 75th percentile value of 120.0 ppm. The 10 times crustal abundance value for copper is 600 ppm.
- Lead content ranges from a minimum value of 2.0 ppm to a maximum of 8.6 ppm. The 25th percentile is 2.3 ppm and the median value is 3.3 ppm with the 75th percentile value of 6.2 ppm. The 10 times crustal abundance value for lead is 140 ppm.
- Nickel content ranges from a minimum value of 3.4 ppm to a maximum of 49.0 ppm. The 25th percentile is 6.7 ppm and the median value is 36.9 ppm with the 75th percentile value of 42.1 ppm. The 10 times crustal abundance value for nickel is 840 ppm.
- Selenium content ranges from a minimum value of 0.2 ppm to a maximum of 0.7 ppm. The 25th percentile is 0.3 ppm and the median value is 0.4 ppm with the 75th percentile value of 0.6 ppm. The 10 times crustal abundance value for selenium is 0.5 ppm.

- Silver content ranges from a minimum value of 0.13 ppm to a maximum of 0.30 ppm. The 25th percentile is 0.13 ppm and the median value is 0.17 ppm with the 75th percentile value of 0.23 ppm. The 10 times crustal abundance value for silver is 0.75 ppm.
- Sulphur content ranges from a minimum value of 0.02 % to a maximum of 0.47 %. The 25th percentile is 0.09 % and the median value is 0.28 % with the 75th percentile value of 0.34 %. The 10 times crustal abundance value for sulphur is 0.35 %.
- Zinc content ranges from a minimum value of 10.3 ppm to a maximum of 144.0 ppm. The 25th percentile is 37.9 ppm and the median value is 83.9 ppm with the 75th percentile value of 104.9 ppm. The 10 times crustal abundance value for zinc is 700 ppm.

Thin-bedded quartzite:

Thin-bedded quartzite (TQZT) makes up 14% of all the samples selected within this study. Within the thin-bedded quartzite the resulting values for the elements of interest are as follows:

- Arsenic content ranges from a minimum value of 1.3 ppm to a maximum value of 12.5 ppm. The 25th percentile is 5.9 ppm and 75th percentile is 11.9 ppm with a median value of 11.3 ppm. The 10 times crustal abundance value for arsenic 18 ppm.
- Antimony content ranges from a minimum of 0.62 ppm to a maximum of 1.91 ppm. The 25th percentile is 0.65 ppm and 75th percentile is 1.54 ppm with a median value of 1.06 ppm. The 10 times crustal abundance value for antimony is 2 ppm.
- Cadmium content ranges from a minimum value of 0.18 ppm to a maximum of 1.01 ppm. The 25th percentile is 0.28 ppm and the median value is 0.37 ppm with the 75th percentile value of 0.47 ppm. The 10 times crustal abundance value for cadmium is 1.5 ppm.
- Calcium content ranges from a minimum value of 0.65 % to a maximum of 3.07 %. The 25th percentile is 0.87 % and the median value is 2.14 % with the 75th percentile value of 2.85 %. The 10 times crustal abundance value for calcium is 0.563 %.
- Copper content ranges from a minimum value of 10.2 ppm to a maximum of 40.8 ppm. The 25th percentile is 12.3 ppm and the median value is 15.6 ppm with the 75th percentile value of 31.4 ppm. The 10 times crustal abundance value for copper is 600 ppm.
- Lead content ranges from a minimum value of 2.5 ppm to a maximum of 15.7 ppm. The 25th percentile is 7.8 ppm and the median value is 8.7 ppm with the 75th percentile value of 9.9 ppm. The 10 times crustal abundance value for lead is 140 ppm.
- Nickel content ranges from a minimum value of 17.2 ppm to a maximum of 37.4 ppm. The 25th percentile is 23.2 ppm and the median value is 25.8 ppm with the 75th percentile value of 34.0 ppm. The 10 times crustal abundance value for nickel is 840 ppm.
- Selenium content ranges from a minimum value of 0.4 ppm to a maximum of 2.1 ppm. The 25th percentile is 0.8 ppm and the median value is 1.2 ppm with the 75th percentile value of 1.3 ppm. The 10 times crustal abundance value for selenium is 0.5 ppm.
- Silver content ranges from a minimum value of 0.16 ppm to a maximum of 0.82 ppm. The 25th percentile is 0.30 ppm and the median value is 0.47 ppm with the 75th percentile value of 0.57 ppm. The 10 times crustal abundance value for silver is 0.75 ppm.
- Sulphur content ranges from a minimum value of 0.06 % to a maximum of 1.31 %. The 25th percentile is 0.40 % and the median value is 1.21 % with the 75th percentile value of 1.29 %. The 10 times crustal abundance value for sulphur is 0.35 %.

- Zinc content ranges from a minimum value of 34.6 ppm to a maximum of 91.4 ppm. The 25th percentile is 52.9 ppm and the median value is 74.3 ppm with the 75th percentile value of 81.0 ppm. The 10 times crustal abundance value for zinc is 700 ppm.

Typically within a geochemical characterization study of this type, an elemental comparison between the mineralized and non-mineralized samples would be conducted. As all of the samples provided by AKHM were outside of the mineralized zones, no elemental geochemical comparisons between mineralized and non-mineralize samples could be made.

3.2.2 Discussion

Arsenic

The maximum arsenic content of 128.0 ppm was found within the quartzite (QTZ) unit. Arsenic values within the quartzite unit exceeded the 10 times crustal abundance values above the 95 percentile mark. Arsenic values within the graphitic schist (GSCH) unit exceeded the 10 times crustal abundance values above the 75 percentile mark. No arsenic values within the sericite schist (SSCH) or the thin-bedded quartzite (TQZT) exceeded the 10 times arsenic crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies. All arsenic median values within the 4 major lithologies were below the 10 times arsenic crustal abundance value.

Antimony

The maximum antimony content of 5.37 ppm was found within the quartzite (QTZ) unit. Antimony values within the quartzite unit exceeded the 10 times crustal abundance values above the 95 percentile mark. Antimony values within the graphitic schist (GSCH) and sericite schist (SSCH) units exceeded the 10 times crustal abundance values above the 75 percentile mark. No antimony values within the thin-bedded quartzite (TQZT) exceeded the 10 times antimony crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies. All antimony median values within the 4 major lithologies were below the 10 times antimony crustal abundance value.

Cadmium

The maximum cadmium content of 1.01 ppm was found within the thin-bedded quartzite (TQTZ) unit. No cadmium values within any of the four dominant lithologies exceeded the 10 times cadmium crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies.

Within the Lucky Queen deposit, it was found that cadmium values are increased in the mineralized zones, and this is likely due to the association of cadmium with sphalerite. As the samples analysed within this study are from the non-mineralized zone, this explains the relatively low cadmium content.

Calcium

The maximum calcium content of 8.56 % was found within the sericite schist (SSCH) unit. Calcium values within the thin-bedded quartzite unit exceeded the 10 times crustal abundance values above the 0 percentile mark. Calcium values within the graphitic schist (GSCH) unit exceeded the 10 times crustal abundance values above the 5 percentile mark. Calcium values within the quartzite (QZT) unit exceeded the 10 times crustal abundance values above the 25 percentile mark. Calcium values within the sericite schist (SSCH) unit exceeded the 10 times crustal abundance values above the 75 percentile mark. The thin-bedded quartzite unit had the highest median value, when compared with the 3 other dominant lithologies. Calcium median values within the thin-bedded quartzite, graphitic schist and quartzite units were above the 10 times calcium crustal abundance value (below in the sericite schist unit).

It has been reported for the Bellekeno and Onek deposits (Altura, 2008b, ACG, 2011a) that calcium is generally more abundant away from the veins and mineralized areas. Calcium values were reported to be similar for the mineralized and non-mineralized zones within the Lucky Queen deposit area.

Copper

The maximum copper content of 177.0 ppm was found within the sericite schist (SSCH) unit. No copper values within any of the four dominant lithologies exceeded the 10 times copper crustal abundance value. The sericite schist unit had the highest median value, when compared with the 3 other dominant lithologies.

Lead

The maximum lead content of 27.5 ppm was found within the graphitic schist (GSCH) unit. No lead values within any of the four dominant lithologies exceeded the 10 times lead crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies.

It was noted for the Lucky Queen deposit that mineralized samples, including vein materials, had significantly higher median and quartile lead values when compared to the non-mineralized samples. This was probably due to the presence of galena (PbS) within the mineralized and vein zones. As the samples analysed within this study are from the non-mineralized zone, this explains the relatively low lead content.

Nickel

The maximum nickel content of 61.3 ppm was found within the graphitic schist (GSCH) unit. No nickel values within any of the four dominant lithologies exceeded the 10 times nickel crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies.

Selenium

The maximum selenium content of 4.5 ppm was found within the graphitic schist (GSCH) unit. Selenium values within the graphitic schist unit exceeded the 10 times crustal abundance values above the 0 percentile mark. Selenium values within the thin-bedded quartzite (TQZT) unit exceeded the 10 times crustal abundance values above the 5 percentile mark. Selenium values within the quartzite (QZT) and sericite schist (SSCH) units exceeded the 10 times crustal abundance values above the 75 percentile mark. The graphitic schist and the thin-bedded quartzite units had the highest median values, when compared with the other dominant lithologies. The selenium median values within the graphitic schist and thin-bedded quartzite units were above the 10 times selenium crustal abundance value. The selenium median values within the quartzite and sericite schist units were below the 10 times selenium crustal abundance value.

Silver

The maximum silver content of 0.89 ppm was found within the quartzite (QTZ) unit. Silver values within the quartzite unit exceeded the 10 times crustal abundance values above the 95 percentile mark. Silver values within the thin-bedded quartzite (TQZT) unit exceeded the 10 times crustal abundance values above the 99 percentile mark. No silver values within the graphitic schist (GSCH) or sericite schist (SSCH) units exceeded the 10 times silver crustal abundance value. The thin-bedded quartzite unit had the highest median value, when compared with the 3 other dominant lithologies. All silver median values within the 4 major lithologies were below the 10 times silver crustal abundance value.

Within the KHSD, silver is typically associated with the mineralized and vein zones. As the samples analysed within this study are from the non-mineralized zone, this explains the relatively low silver content.

Sulphur

The maximum sulphur content of 2.38 % was found within the graphitic schist (GSCH) unit. Sulphur values within the graphitic schist unit exceeded the 10 times crustal abundance values above the 5 percentile mark. Sulphur values within the thin-bedded quartzite (TQZT) unit exceeded the 10 times crustal abundance values above the 25 percentile mark. Sulphur values within the quartzite (QZT) unit exceeded the 10 times crustal abundance values above the 75 percentile mark. Sulphur values within the sericite schist (SSCH) unit exceeded the 10 times crustal abundance values above the 90 percentile mark. The thin-bedded quartzite unit had the highest median value, when compared with the 3 other dominant lithologies. Sulphur median values within the thin-bedded quartzite and graphitic schist units were above the 10 times sulphur crustal abundance value (below in the quartzite and sericite schist units).

It has been noted within the Onek and Bellekeno deposits that the sulphur content from the mineralized and vein samples are always distinctly higher than those from the non-mineralized rock samples. This trend was found to not be the same within the Lucky Queen deposit area, as some mineralized and non-mineralized vein materials were found to have similar sulphur content.

Zinc

The maximum zinc content of 149.0 ppm was found within the graphitic schist (GSCH) unit. No zinc values within any of the four dominant lithologies exceeded the 10 times zinc crustal abundance value. The graphitic schist unit had the highest median value, when compared with the 3 other dominant lithologies and is elevated within the graphitic units above crustal abundance.

It was noted for the Lucky Queen deposit that mineralized samples, including vein materials, had significantly higher median and quartile zinc values when compared to the non-mineralized samples. This was probably due to the presence of sphalerite ((Zn,Fe)S) within the mineralized and vein zones. As the samples analysed within this study are from the non-mineralized zone, this explains the relatively low zinc content.

It should be noted that within the KHSD that arsenic, cadmium, lead, silver, and zinc are all strongly associated with the mineralized zones (as opposed to non-mineralized country rock). As the samples used within this geochemical characterization report are from the non-mineralized / country rock, and are at some distance from the major vein structures, it was not unexpected to find these elements in relatively low abundances.

3.3 ACID BASE ACCOUNTING

The principal purpose of ABA testing is to provide quantitative determination of the balance between acid producing and acid consuming minerals contained within geologic materials. ABA testing was conducted on all 50 samples representing 6 lithologies.

3.3.1 Results

Acid base accounting results are presented in Appendix B1 and summary statistics in Appendix B2.

Neutralizing Potential

A strong correlation between %Ca and $\%CO_2$ versus NP was noted in previous geoenvironmental characterizations within the district (Bellekeno - Altura, 2008b, Onek - ACG, 2011a, Lucky Queen – ACG, 2011b) especially when considering only unmineralized samples and excluding the vein lithology (not present within the Flame & Moth dataset) and GNST lithologies. In the case where significant dolomite or Mg bearing carbonates are known to exist, the correlation can be improved by comparing [Ca+Mg] with NP. Plots showing the relationships between bulk NP and a number of potential ICP data correlations (Ca, Mg, [Ca+Mg], and CO_2) for the Flame & Moth dataset are shown on Figure 8.

Very strong correlations were observed between NP and CO_2, Ca, and [Ca+Mg] (Figure 8). The strong correlation between NP and CO2 demonstrates that carbonate minerals are primarily responsible for producing the observed neutralizing potential in the samples. Because the siderite correction method in the analysis of these samples, the NP results have been isolated to include only the reactive calcium and magnesium carbonates.

Correlation coefficients with NP were similar between Ca and [Ca+Mg], but the presence of several samples with elevated [Ca+Mg] that did not have correspondingly elevated NP (circled in blue on Figure 7) suggest that that relationship between Ca and NP is more conservative. In addition, calcite ($CaCO_3$), rather than dolomite ($Ca,MgCO_3$), is normally the dominant carbonate phase within country rock away from vein faults within the district, and the correlation between Ca and NP has been the stronger relationship elsewhere in the district such as Lucky Queen and Onek. Finally, the slope of the NP:CO_2% and NP:Ca% trendlines correspond closely with the stoichiometric ratio of $CaCO_3$ to each of these constituents (22.7 and 25, respectively). These relationships indicate that calcium carbonate is likely the primary source of neutralizing potential, and that % Ca can be used to reliably and accurately estimate NP within all non-mineralized lithologies except for greenstone at Flame & Moth.

The relationship between Ca and NP allowed an estimation of neutralizing potential based on Ca [NP_{Ca}]. This relationship is used to support operational waste rock management that relies partly on fizz test results and measured %Ca for geochemical verification. The derived relationship between Ca and NP was:

$$NP_{Ca} = 25.448(\%\ Ca) + 3.6861$$

Elsewhere in the district, bulk NP in GNST is typically much lower than the linear correlation because significant non-neutralizing Ca exists within calcic silicates such as hornblende, actinolite and other amphiboles. In the only GNST sample within the Flame & Moth dataset (shown below in Figure 7), the GNST sample is below but near the best-fit line (not shown). Because GNST is represented within the dataset by a single sample (and thus does not have any significant effect to the correlation), it was not excluded, even though experience elsewhere in the district (Bellekeno, Onek) recommend that the Ca content and NP generally do not correlate in GNST samples.

Box plots showing bulk NP by lithology are shown in Figure 9.

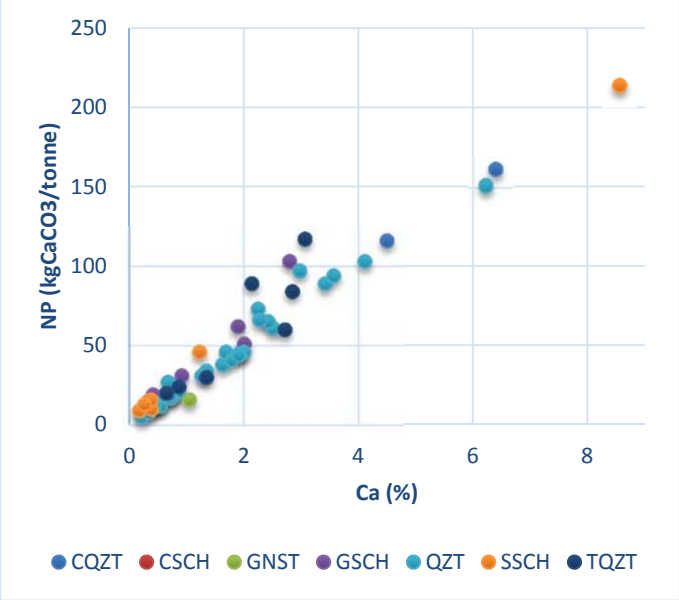


Figure 7. Relationship between NP and Ca, by Lithology

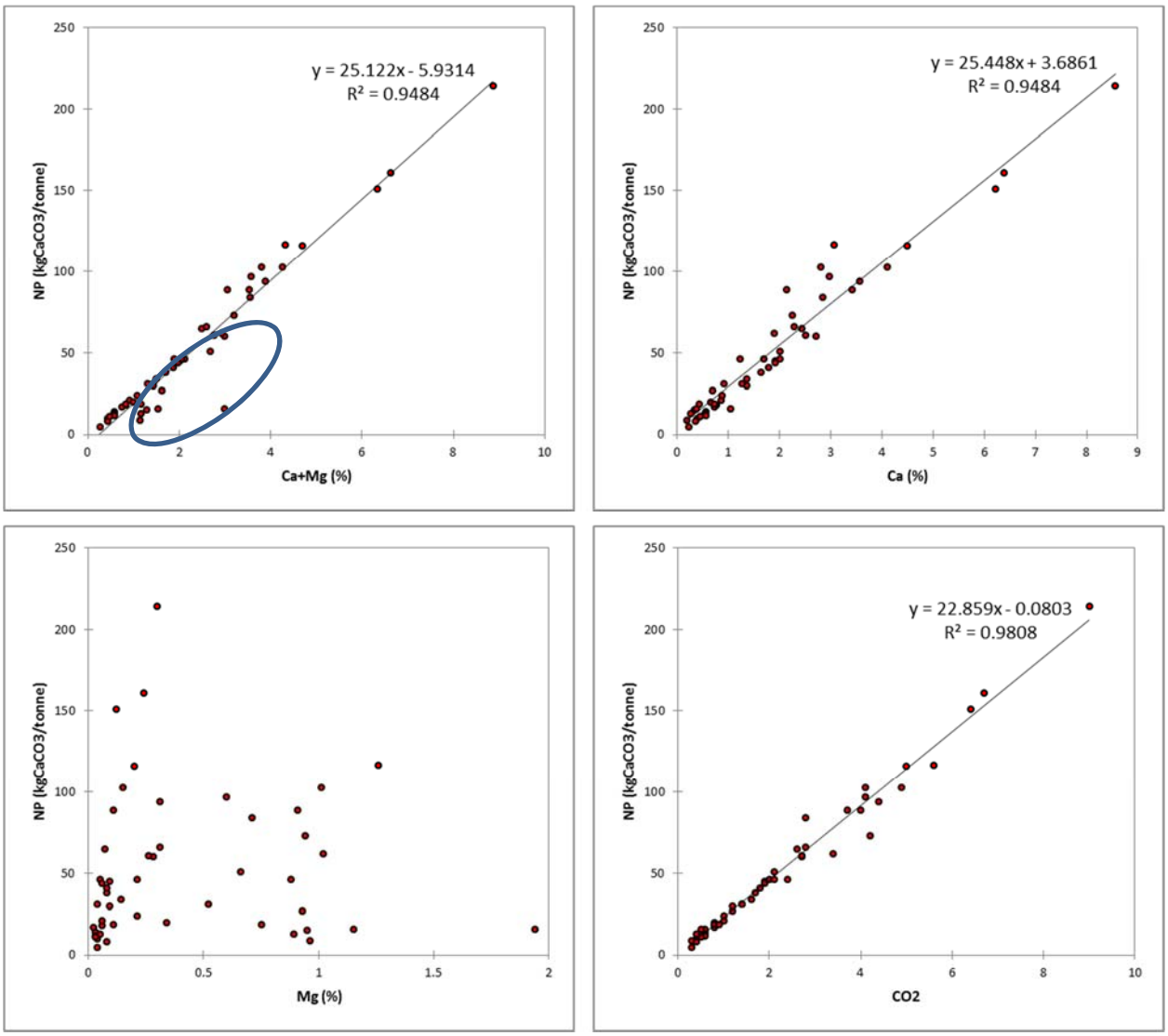


Figure 8. Relationship between Calcium, Magnesium and Carbonate with NP

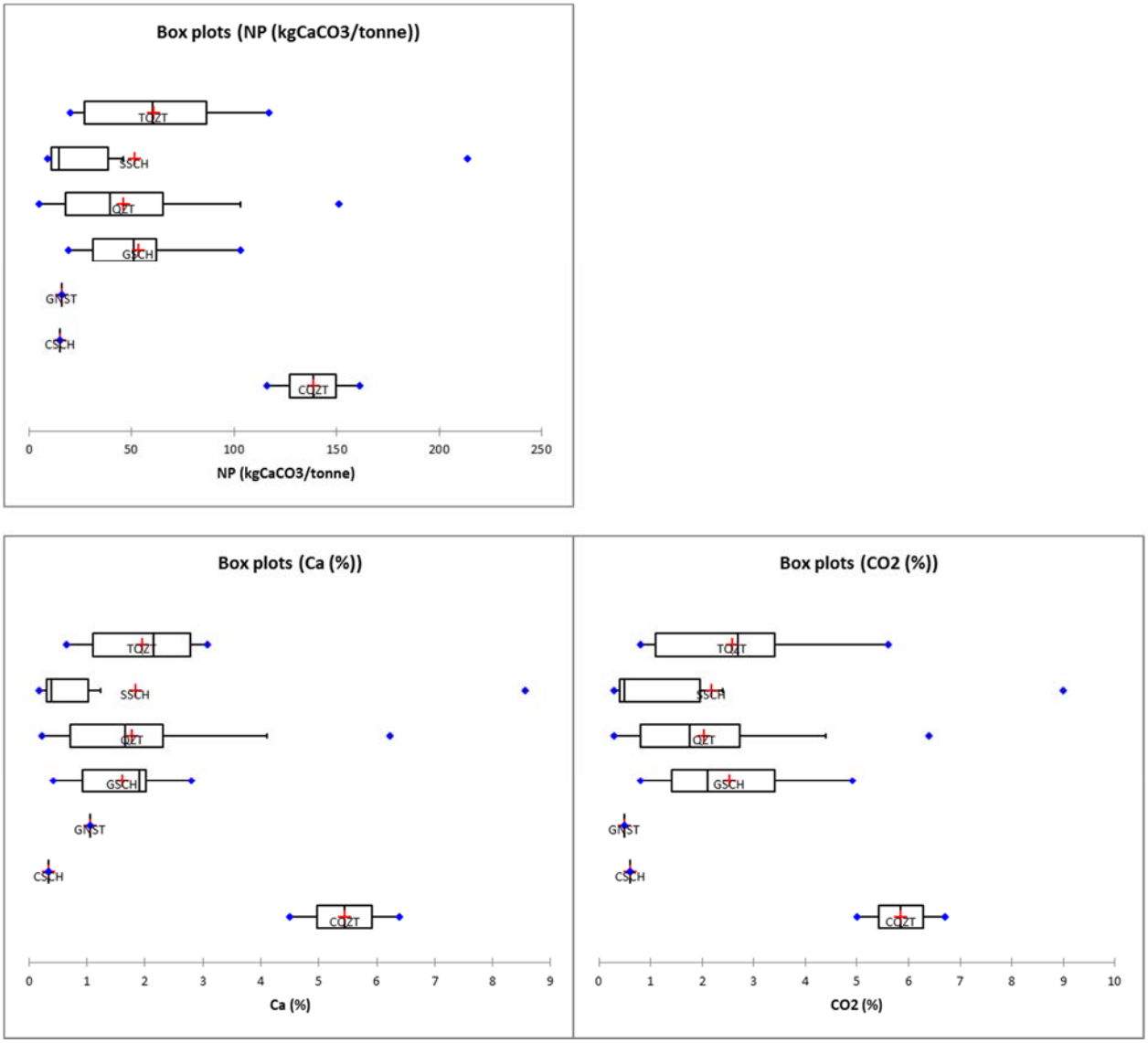


Figure 9. NP Box Plots

Among the 7 lithologies, CQZT had the highest median and upper and lower quartile NP with values of 138.5, 127.3 and 149.8 kgCaCO3/t, respectively. TQZT had the second highest median value of 61.0 kgCaCO3/t. Median NP of GSCH and QZT followed at 51.0 and 39.5 kgCaCO3/tonne. GNST, CSCH, and SSCH had similar, relatively low median NP values of 16.0, 15.0, and 14.5 kgCaCO3/tonne, respectively.

Sulphur Species and Maximum Potential Acidity (MPA)

Sulphur content and speciation is an important determining factor affecting the potential for generation of acidity. Sulphur occurs in various forms in rock including potentially acid generating sulphide, and sulphate which is generally not acid generating. Total sulphur was used in order to calculate the maximum acid potential. MPA (used interchangeably with AP, or acid potential) was calculated by multiplying the total % sulphur by 31.25. Box plots showing selected results for sulphur speciation are shown in Figure 11.

Total sulphur ranged between 0.02% and 2.56% in all rock lithologies. The highest median total sulphur value was observed in TQZT (1.1%), the lowest in GNST (0.02%) with GSCH (0.93%), QZT (0.275, SSCH (0.225), CQZT (0.195%), and CSCH (0.06%) in between. Sulphate sulphur via HCl leach (sulphate via sodium carbonate leach was not conducted on any of the Flame & Moth samples) varied from between below detection limit (0.01%) and 0.2% for rock lithologies. Median SO4 values for all lithologies with the exception of the single sample of CSCH was below detection limit. It was noted that at Onek (Access 2011b) and at Bellekeno (Altura 2008b), the sulphate via HCl leach is less sensitive than the carbonate leach, with significantly more samples below detection limit. It is also presumed that the HCl leach similarly underestimates the % sulphur as sulphate at Flame & Moth, which will in turn overestimate the % sulphur as sulphide, as sulphide sulphur is calculated as the total sulphur – sulphate sulphur. Because the Sobek method uses total sulphur to calculate AP, this has no material effect on the reported results but could result in potential over-estimation of MPA if significant non-acid generating sulphate phases such as barite or gypsum were present. Because of this, the reported AP values are considered conservative.

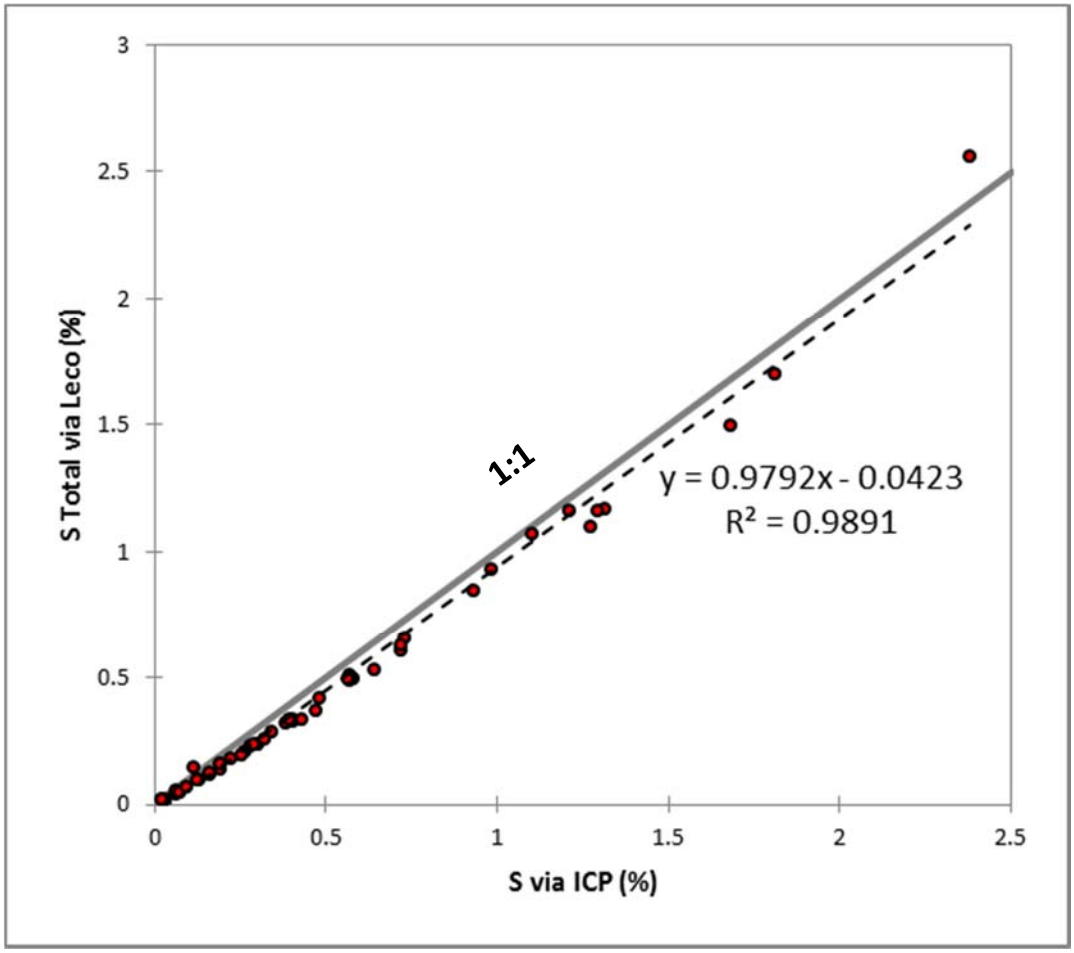


Figure 10. Relationship between Total S via Leco and S via ICP

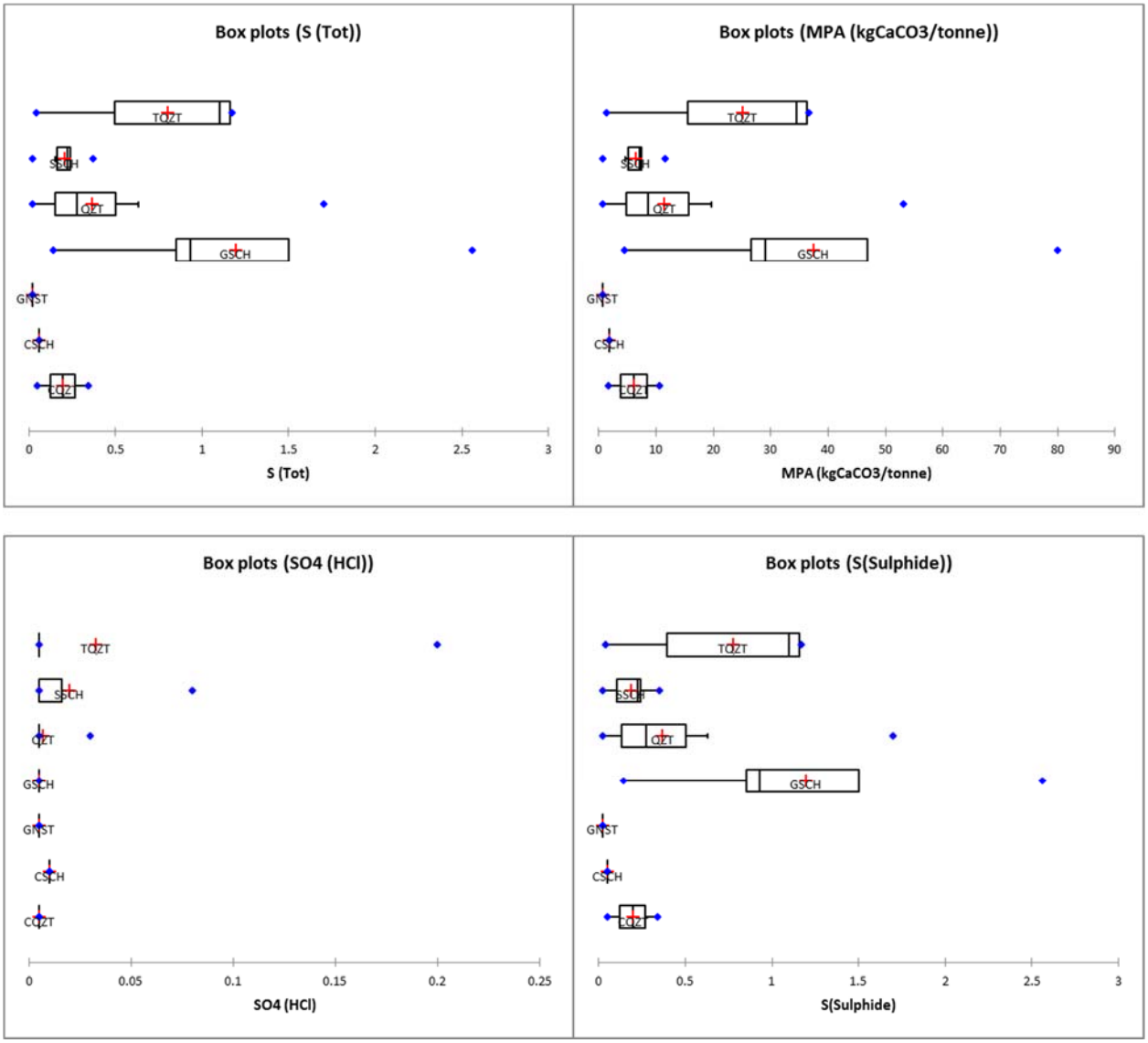


Figure 11. Selected Sulphur Species Box Plots

As a percentage of total sulphur, sulphate via HCl leach has a median of 25% in GNST, a median of 16.7% in CSCH, a median of 5.7% in CQTZ, a median of 3.9% in SSCH, a median of 2.0% in QZT, a median of 0.54% in GSCH, and a median of 0.45% in TQZT. The maximum [sulphate]:[total sulphur] ratio was 61% and was observed in TQZT. Although the data did not allow comparison between mineralized and unmineralized samples because all samples are non-mineralized, data from Bellekeno and Onek showed the total percentage of sulphate is much lower (<1% of total sulphur) in vein material and mineralized rock than in unmineralized rock.

The presence of insoluble barite ($BaSO_4$) and anglesite ($PbSO_4$) has the potential to result in overestimation of % sulphide where HCl leach is used to determine sulphate and sulphide sulphur is calculated as the difference between total sulphur and HCl leachable sulphate. Because total sulphur was used to calculate MPA (Sobek method) this would not have an effect on MPA or NPR. However the potential for the effect of these low solubility sulphates was considered. MEND (2009) outlines a procedure for estimating the potential for these minerals to interfere with the results. The concentration (ppm) of barium and lead needed to produce 0.01% barite and anglesite is 442.8 ppm Ba and 646.1 ppm Pb (MEND, 2009). The median concentrations for these elements within the ICP dataset are approximately 1 and 2 orders of magnitude lower than these numbers at 57.9 ppm for Ba 6.86 ppm for Pb, respectively, indicating that low solubility sulphates do not have any significant potential for affecting ABA results.

Similar to the relationships observed by Altura 2008b for Bellekeno and by Access 2011b at Onek, a very good correlation between total sulphur via Leco and sulphur via ICP was observed. A plot showing the relationship between sulphur measurements for Flame & Moth is shown in Figure 10 and agrees with the observations made for Bellekeno and Onek. The correlation coefficient in the relationship between S via ICP and Total S via Leco is 0.9891, and the slope is 0.9792, indicating that the ICP method appears to be slightly more sensitive than the Leco method of sulphur determination. As discussed above, MPA is determined in the Sobek method by multiplying the total sulphur by 31.25 in order to determine MPA in kg $CaCO_3$/tonne. The correlation shown in Figure 10 indicates that ICP sulphur can be used to accurately and reliably measure total sulphur, which can then be used to in order calculate MPA.

Neutralization Potential Ratio (NPR)

Box plots showing NPR (also referred to as NP/MPA) ratios (unitless) by lithology are shown on Figure 12. All lithologies showed median NPR ratios above 2 with ratios in order of decreasing value as follows: CQTZ – 44.7, GNST – 25.6, CSCH – 8, QZT – 4.59, SSCH – 2.95, TQZT – 2.59, GSCH 2.13.

MEND (2009) suggests that samples with NPR greater than 2 are non-potentially acid generating provided no significant errors have been made in the estimation of effective NP and AP. It is felt that the significant historical and operational geochemical experience with the KHSD have provided a good understanding of the variables and possible errors associated with the estimation of effective NP and AP. Because of this, the usage of a NPR ratio of >2:1 for geologic materials as being unlikely to produce net acidity is believed to be a conservative means of classification without further testwork at Flame & Moth.

Table 4 shows the distribution of samples according to NPR range from the ABA dataset. A total of 37 of the 50 or 74% of samples from the ABA dataset have NPRs of >2, indicating minimal potential for net acidity. Eight samples had a NPR of between 1 and 2, and the remaining five samples had NPRs of <1.

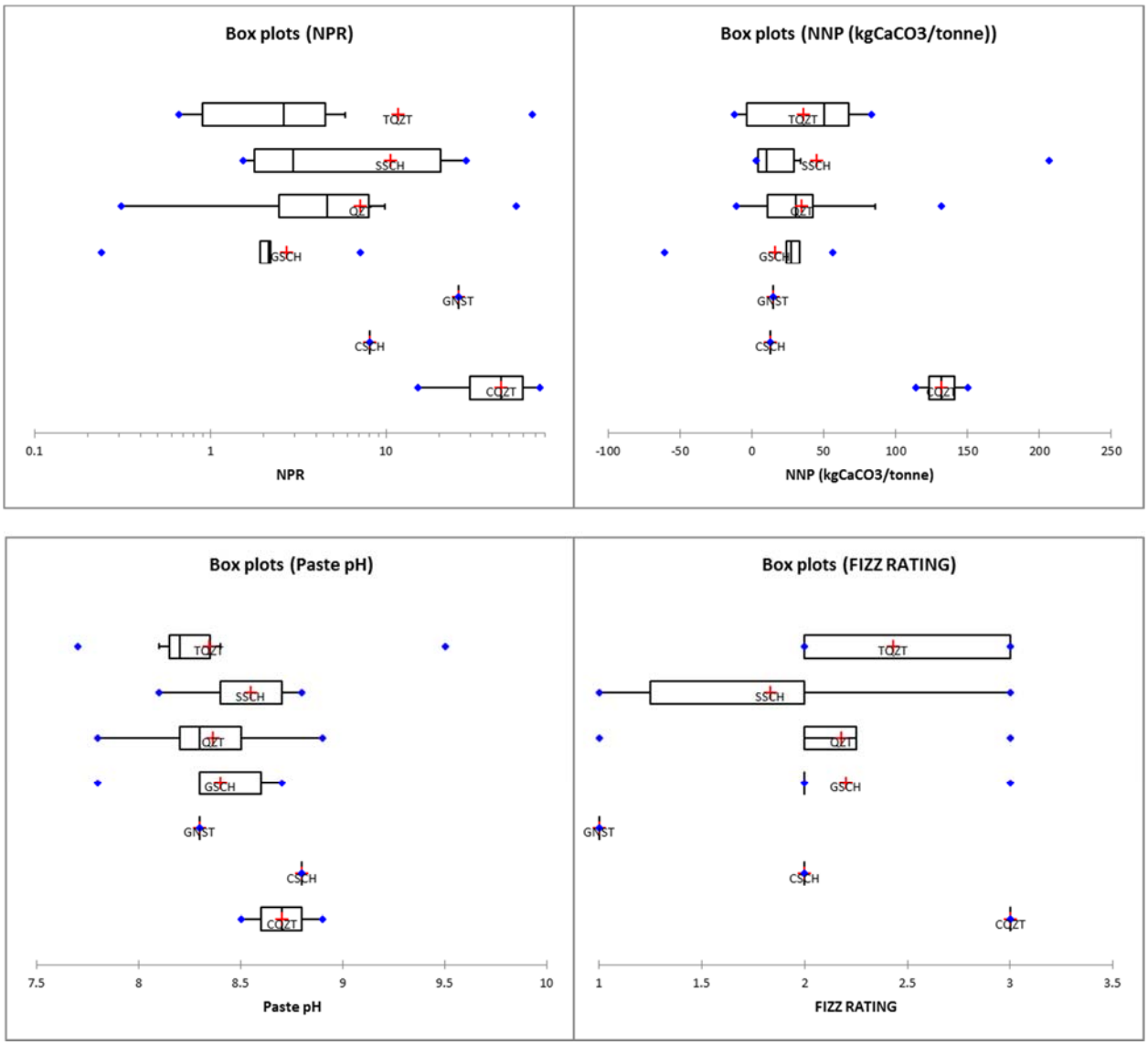


Figure 12. Selected ABA Box Plots

Table 4. Distribution of Neutralizing Potential Ratios

Lithology		NPR			
Description	**Code**	**< 1**	**1 to 2**	**>2**	**Total**
Graphitic Schist	GSCH	1	1	3	5
Quartzite	QZT	1	4	23	28
Thin-bedded Quartzite	TQZT	3	0	4	7
Sericite Schist	SSCH	0	3	3	6
Calcareous Quartzite	CQZT	0	0	2	2
Greenstone	GNST	0	0	1	1
Calcareous Schist	CSCH	0	0	1	1
	Total	5	8	37	50

Net Neutralization Potential (NNP)

The difference between the potentially acid producing materials and the neutralizing materials is termed the net neutralization potential (NNP), and is expressed in kg $CaCO_3$/t. The net neutralizing potential is significant because materials with sulphide minerals whose net neutralizing potential is negative may result in net acid generation unless sulphide content is very low and/or there are significant slow release, non-carbonate sources of alkalinity.

Although it is not the preferred method of characterizing the future potential for ARD, NNP provides an overall balance of acid producing and acid neutralizing materials, and can also provide another useful metric of ARD potential. Hutt and Morin (1999) showed that waste rock with a NNP of > 20 kg $CaCO_3$/tonne were very unlikely to generate net acidity. Samples with negative NNP are assumed to have potential for net acid generation due to excess MPA compared with the NP in the sample. Similar to samples with NPR 1<2, the potential for net acid generation in samples with between 0 and 20 kg $CaCO_3$/t is assumed to be uncertain without further testwork or study (e.g. kinetic testing).

Table 5 shows a summary of distribution of samples into three categories according to their NNP.

As Table 5 shows, 28 of 50 samples (56%) of samples showed a NNP of >20 kg $CaCO_3$/t, 17 of 50 (34%) samples contained NNP of 0<20 kg $CaCO_3$/tonne and 5 of 50 (10%) of samples showed negative NNPs. This indicates similar but more conservative results (with more samples in the uncertain category) compared with using NPR as an indicator of potential net acid generation.

Table 5. Distribution of NNP Ratios

Lithology		NNP			
Description	**Code**	# of Samples NNP < 0 kg $CaCO_3$/t	# of Samples NNP 0<20 kg $CaCO_3$/t	# of Samples NNP >20 kg $CaCO_3$/t	**Total**
Graphitic Schist	GSCH	1	0	4	5
Quartzite	QZT	1	10	17	28
Thin-bedded Quartzite	TQZT	3	0	4	7
Sericite Schist	SSCH	0	4	2	6
Calcareous Quartzite	CQZT	0	1	1	2
Greenstone	GNST	0	1	0	1
Calcareous Schist	CSCH	0	1	0	1
	Total	5	17	28	50

Paste pH

Paste pH values ranged between 7.8 and 8.9 with median values above 8 among all lithologies. This indicates that none of the rock lithologies were producing net acidity (assuming a cut off of pH 5.5) at the time of analysis.

Fizz Rating

The fizz rating used in ABA testing is a ranking system between 1 and 4 (1 being no effervescence, 4 being extremely fizzy) to rate the degree of effervescence observed when 25% HCl is added to a pulverized sample. This rating is used to determine the strength of acid to utilize for the neutralizing potential titration. The median value for all lithologies was 2 except for CQZT which had a median of 3, and the single GNST sample, which has a fizz rating of 1. Fizz rating was plotted against NP and showed that it is a useful tool for rough estimation of NP value, with a fizz rating of 3 corresponding to samples with approximately 60 kg $CaCO_3$/tonne and above, fizz rating of 2 corresponding to samples with between 10 and 80 kg $CaCO_3$/tonne, and a fizz rating of 1 corresponding to samples with less than 20 kg $CaCO_3$/tonne (Figure 13).

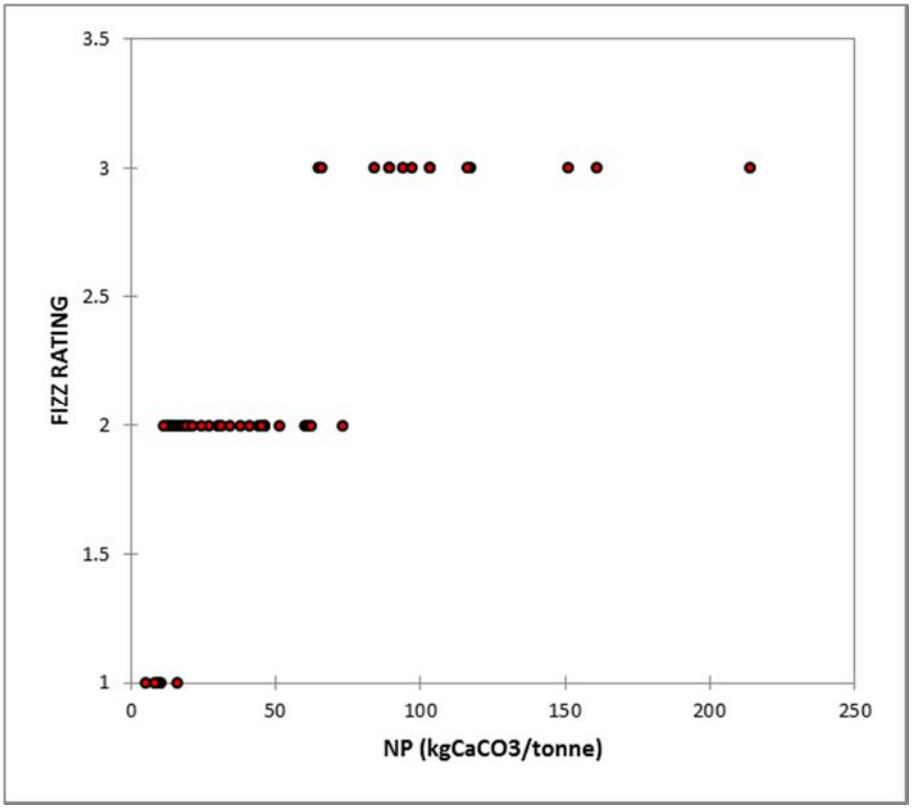


Figure 13. Fizz Rating and NP

3.4 SHAKE FLASK TESTING

The principal purpose of shake flask testing is to provide an indication of short-term metal leaching potential, and is the recommended solubility test procedure for determining the mass of soluble constituents (mg/kg) at higher water to solids ratios (MEND, 2009). SFE test results can be used as an indicator of the potential magnitude of effects that could result from the interactions of water that comes into contact with the waste rock, or provide inputs for geochemical modeling.

3.4.1 Results

Complete SFE results are presented in Appendix C1 and summary statistics in Appendix C2. Highlights of key statistical measurements of leachate concentrations from SFE testing for COPC elements identified in the district in previous studies (i.e. Altura, 2008) and regulated under licences currently held by Alexco (QZ09-092) are presented below and compared and contrasted between lithologies. Figure 14 and Figure 15 show box plots for each selected COPC element according to lithology.

Antimony

Median leachable Sb ranged between a minimum of 0.001 mg/L in CSCH to a maximum of 0.129 mg/L in SSCH. Similarly, median values were lowest in CSCH at 0.001 mg/L but highest in TQZT at 0.031 mg/L. Similar but slightly lower median values were expressed in GSCH (0.026 mg/L), SSCH (0.022 mg/L). CQZT and QZT had similar medians Sb of 0.014 mg/L and 0.012 mg/L, respectively and GSCH had a median SB of 0.008 mg/L. TQZT, which had a median value of 0.0015 mg/L.

Arsenic

Median leachable As for all lithologies was the analytical detection limit of 0.001 mg/L except for TQZT, which had a median value of 0.0015 mg/L. The maximum leachable As was observed in QZT at 0.012 mg/L.

Cadmium

Median leachable Cd for all lithologies was below analytical detection limit of 0.00005 mg/L (reported as half the detection limit, or 0.000025 mg/L). The maximum leachable Cd was observed in SSCH at 0.0006 mg/L.

Copper

Median leachable Cu for all lithologies was below analytical detection limit of 0.001 mg/L (reported as half the detection limit, or 0.0005 mg/L). The maximum leachable Cu was observed in QTZ at 0.0028 mg/L.

Lead

Median leachable Pb for CQZT, CSCH, GSCH, QZT, and TQZT was below the analytical detection limit of 0.0001 mg/L (reported as half the detection limit, or 0.00005 mg/L). Exceptions were GNST and SSCH, with median leachable Pb of 0.00015 mg/L and 0.00011 mg/L, respectively. The maximum leachable Pb was observed in SSCH at 0.00128 mg/L.

Nickel

Median leachable Ni for CQZT, GNST, CSCH, and QZT was below the analytical detection limit of 0.0005 mg/L (reported as half the detection limit, or 0.00025 mg/L). Exceptions were GSCH, SSCH, and TQZT with median leachable Ni of 0.00056 mg/L, 0.00055 mg/L and 0.00057 mg/L, respectively. The maximum leachable Ni was observed in SSCH at 0.00269 mg/L.

Selenium

Median leachable Se for was below the analytical detection limit of 0.0005 mg/L (reported as half the detection limit, or 0.00025 mg/L) in CSCH and GNST. GSCH, TQZT, CQZT, QZT and SSCH had median leachable Se of 0.0133 mg/L, 0.005 mg/L, 0.00196 mg/L, 0.00158 mg/L and 0.00081 mg/L, respectively. The maximum leachable Se was observed in GSCH at 0.030 mg/L.

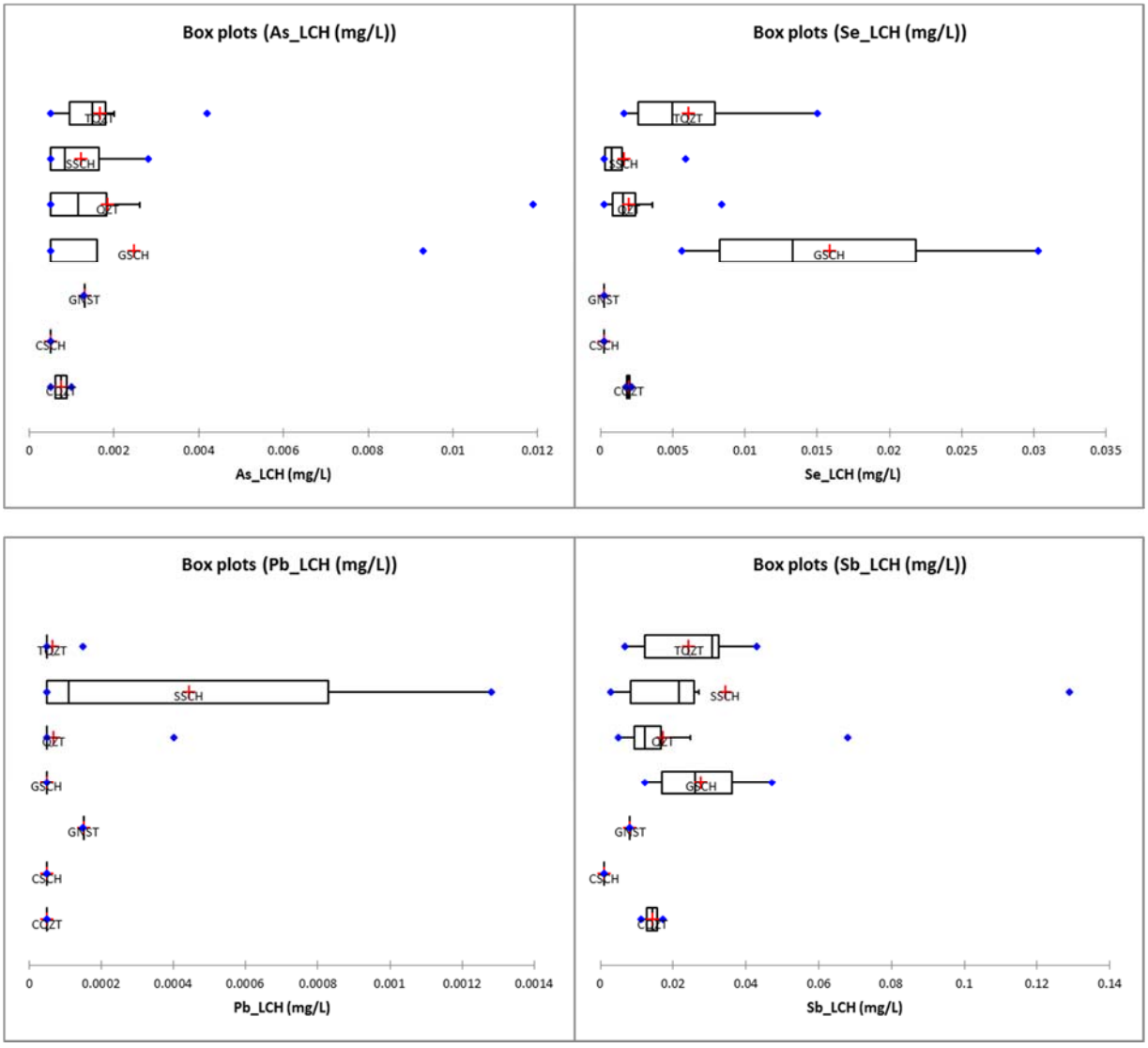


Figure 14. Selected COPC SFE Box Plots

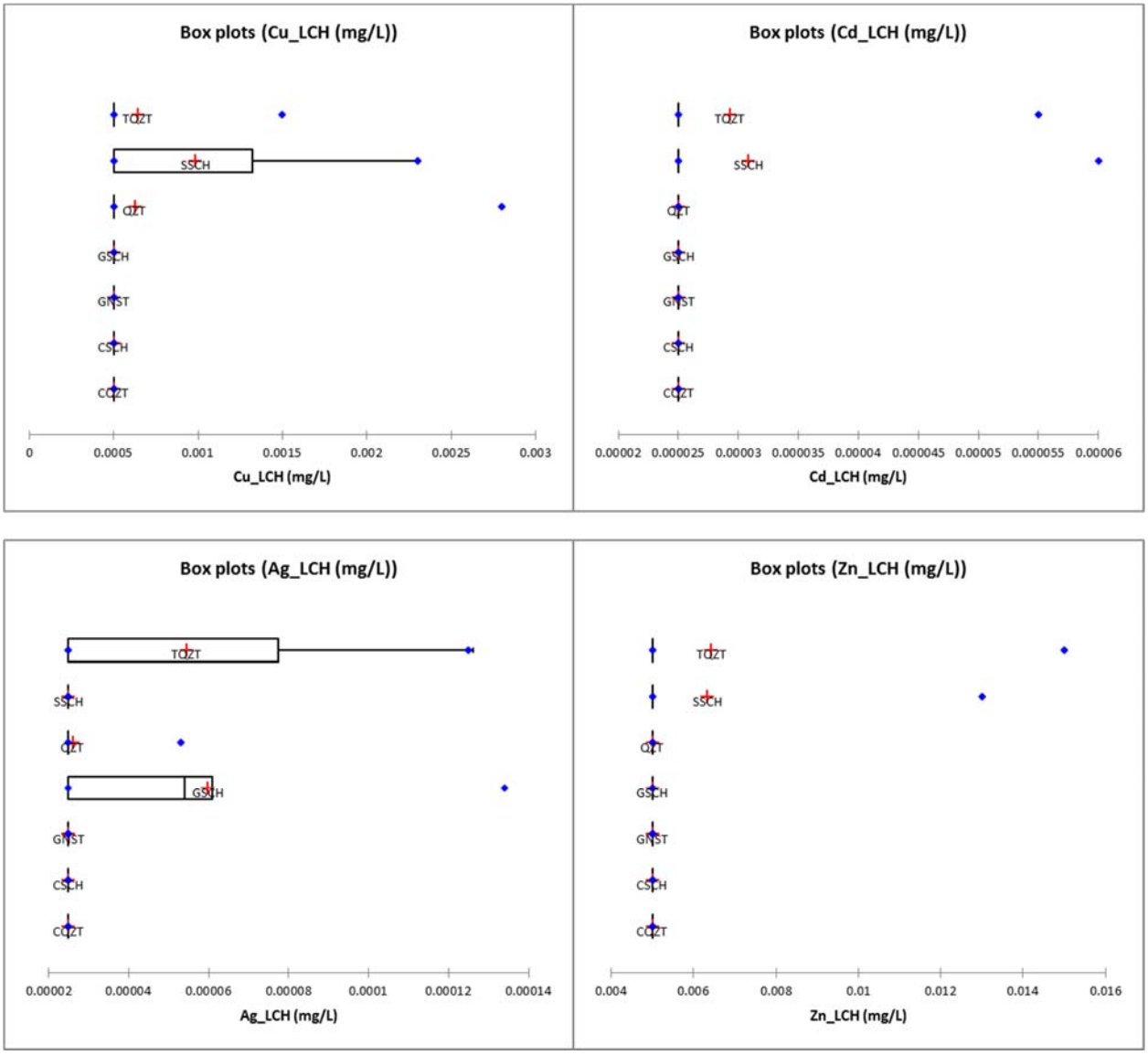


Figure 15. Selected COPC SFE Box Plots (Continued)

Silver

Median leachable Ag for all lithologies except GSCH was below the analytical detection limit of 0.00005 mg/L (reported as half the detection limit, or 0.000025 mg/L). Median leachable Ag in GSCH was 0.000054 mg/L. The maximum leachable Ag was observed in GSCH at 0.000134 mg/L.

Zinc

Median leachable Zn for all lithologies was below the analytical detection limit of 0.01 mg/L (reported as half the detection limit, or 0.005 mg/L). The maximum leachable Zn was observed in TQZT at 0.015 mg/L.

SFE results are compared with the Canadian Council of Ministers of the Environment guidelines for Freshwater Aquatic Life (CCME-FAL) and Alexco's Type A Water Licence QZ09-092 effluent quality standards below in Table 6. CCME-FAL are not an appropriate standard for comparison because of mitigations which will prevent direct discharge from waste rock to freshwater aquatic life bearing surface water, but are intended only to show the relative low concentration of leachable COPCs from the Flame & Moth sample set. Compared with water licence effluent quality standards, CCME-FAL guidelines are orders of magnitude lower for most COPC elements and are only used as a reference for comparison.

Table 6. Comparison of SFE Concentrations (all lithologies) with Water License Standards and CCME Guidelines

COPC	ML Min-Max Range (mg/L)	Median Value (mg/L)	QZ09-092 WL effluent quality standards (mg/L)	CCME Guideline (mg/L)
As	BDL-0.012	BDL	0.1	0.005
Cd	BDL-0.00006	BDL	0.01	0.000017 (equation based)
Pb	BDL-0.00005	BDL	0.2	0.001-0.007 (equation based)
Ag	BDL-0.000134	BDL	0.02	0.0001
Zn	BDL-0.015	BDL	0.5	0.03
Cu	BDL-0.0005	BDL	0.1	0.002 - 0.004 (equation based)
Ni	BDL-0.00269	BDL	0.5	0.025-0.15 (equation based)
Se	BDL-0.030	BDL-0.013*	-	0.001
Sb	0.001-0.129	0.001-0.031	-	-

i. BDL = below detection limit
ii. Equation based guidelines calculated based on the hardness range 10.26-1550.77 mg/L CaCO3 equivalent
iii. *Only GSCH median value exceeds CCME guideline

These results show that the short term metal leaching potential for all lithologies as indicated by SFE tests is very low, well below existing water licence effluent quality standards. With the exception of Se (which is not regulated under QZ09-092, and exceeds CCME-FAL for some lithologies, particularly

GSCH), only maximum values represented by a few samples exceeded CCME-FAL guidelines for several elements.

Using SFE tests to estimate potential leachate concentrations from waste rock is a conservative approach in that it assumes that all soluble loads leached in laboratory shake flask tests can be dissolved under field conditions. However, in practice, components of these total soluble loads are unavailable under field conditions because the laboratory samples are artificially crushed and agitated for leaching (SRK, 2003), and mineral solubility controls and sorption processes on other substrate surfaces are poorly reflected in SFE tests.

3.5 PRELIMINARY FLAME & MOTH KINETIC TESTING RESULTS

In order to further support waste rock characterization at Flame & Moth, Alexco commenced a kinetic testing program during the summer of 2013. A humidity cell consisting of a composite sample using 20 samples selected from splits of the static testing samples which are presented in this report was initiated on behalf of Alexco by ALS Chemex Labs and first sampled on July 3, 2013. Nineteen weeks of data are now available and are presented in this report. Five field cells were constructed using waste rock from Flame & Moth drill core during July, 2013, but data from these cells are not yet available. Humidity cells are typically conducted over at least 40 weeks, or until the rates of sulphate generation and metal leaching have stabilized at relatively constant rates for at least five weeks (MEND, 2009). Although these results should be considered preliminary, the data to date provide some useful observations which can be used to refine the Waste Rock Management Plan for rock to be excavated as part of this project.

3.5.1 Humidity Cell Composition

The 20 samples were selected to produce an equal volume composite humidity cell sample using representative numbers of each lithology. The samples were selected to include samples designated using the geochemical screening criteria as both N-AML and P-AML in their approximate relative proportions in the full (50 sample) dataset, i.e. 4 of 20, or 20% of the humidity cell samples were P-AML versus 22% of the entire dataset which was P-AML. The selected P-AML samples which were included in the humidity cell composite contain 0.25%<S>1.5% and Ca<0.75%. Select ICP metals data and ABA data for the humidity cell composite samples are shown in Table 7 and Table 8.

Table 7. Humidity Cell Composite Samples Selected ICP Metals Data

SAMPLE	Lithology	Waste Rock Designation	Ag (ppm)	As (ppm)	Ca (%)	Cd (ppm)	Cu (ppm)	Pb (ppm)	Ni (ppm)	Sb (ppm)	Se (ppm)	S (%)	Zn (ppm)
FM11	TQZT	N-AML	0.301	11.25	3.07	0.338	31.4	8.17	34	0.648	1.3	1.31	91.4
FM12	QZT	N-AML	0.215	2.58	0.55	0.21	7.25	3.7	3.2	0.549	0.2	0.13	20.4
FM13	CSCH	N-AML	0.09	0.5	0.34	0.127	82.9	3.89	38.5	0.042	0.3	0.06	101
FM14	GSCH	N-AML	0.502	19.15	0.92	0.628	30.2	10.35	38.4	1.845	0.9	0.19	106.5
FM15	QZT	N-AML	0.138	2.87	2.51	0.143	3.17	3.67	5.05	0.437	0.4	0.3	18.4
FM16	QZT	P-AML	0.214	0.87	0.68	0.061	76.4	4.83	40.4	0.175	0.2	0.4	88.2
FM17	SSCH	P-AML	0.21	2.9	0.39	0.101	6.69	3.06	3.44	0.908	0.3	0.26	10.3
FM2	SSCH	N-AML	0.197	2.95	8.56	0.422	5.03	5.34	7.75	0.537	0.6	0.3	47.1
FM20	SSCH	N-AML	0.132	0.06	0.18	0.05	177	2.34	38.6	0.088	0.2	0.11	89.5
FM21	TQZT	N-AML	0.471	11.85	2.14	0.282	40.8	8.71	37.4	1.055	2.1	1.27	81
FM22	QZT	P-AML	0.208	3.68	0.54	0.153	4.46	3.74	8.29	0.527	0.5	0.39	24.4
FM24	QZT	P-AML	0.139	2.69	0.73	0.117	2.49	2.75	3.88	0.495	0.2	0.25	12.2
FM25	QZT	N-AML	0.271	8.57	4.11	0.315	8.03	10.55	8.71	1.15	0.5	0.64	32.3
FM26	QZT	N-AML	0.781	3.45	6.22	0.382	6.73	26.4	8.82	0.901	0.9	0.72	29.7
FM27	QZT	N-AML	0.478	2.86	2	0.158	8.35	16.85	4.87	1.37	0.5	0.22	11.2
FM28	CQZT	N-AML	0.61	5.38	6.39	0.362	6.78	15.75	11.75	0.54	0.5	0.43	32.9
FM29	GNST	N-AML	0.553	2.58	1.05	0.171	202	7.5	30.4	0.912	0.4	0.02	65.5
FM3	TQZT	N-AML	0.16	1.32	2.85	0.181	21.3	2.54	30.8	0.649	0.4	0.06	34.6
FM30	QZT	N-AML	0.393	2.28	1.63	0.211	5.08	7.01	6.21	0.459	0.6	0.32	18.9
FM35	QZT	N-AML	0.379	2.63	3.42	0.213	6.15	6.04	6.97	0.573	0.7	0.34	23.8
Mean			0.322	4.52	2.41	0.231	36.61	7.66	18.37	0.69	0.6	0.39	47.0
Median			0.243	2.87	1.82	0.196	7.64	5.69	8.765	0.561	0.5	0.30	32.6
Avg. Crustal Abundance			0.750	1.80	1.50	0.56	600	140.0	840	841	0.5	0.35	700

Table 8. Humidity Cell Composite Samples ABA Data

SAMPLE	Lithology	Waste Rock Designation	FIZZ RATING	NP (kgCaCO3/tonne)	NPCa (kgCaCO3/tonne)	MPA (kgCaCO3/tonne)	MPA [SS] (kgCaCO3/tonne)	NNP (kgCaCO3/tonne)	NPR	Total S (%)	Paste pH	Sulphide (%)	C (%)	CO2 (%)
FM11	TQZT	N-AML	3	117	81.8	36.6	36.6	80	3.2	1.17	8.2	1.17	1.53	5.6
FM12	QZT	N-AML	2	14	17.7	3.1	3.1	11	4.48	0.1	8.2	0.1	0.15	0.6
FM13	CSCH	N-AML	2	15	12.3	1.9	1.6	13	8	0.06	8.8	0.05	0.16	0.6
FM14	GSCH	N-AML	2	31	27.1	4.4	4.4	27	7.09	0.14	8.7	0.14	0.39	1.4
FM15	QZT	N-AML	2	61	67.6	7.5	7.5	54	8.13	0.24	8.9	0.24	0.73	2.7
FM16	QZT	P-AML	2	27	21.0	10.6	10.6	16	2.54	0.34	8.9	0.34	0.33	1.2
FM17	SSCH	P-AML	1	10	13.6	6.6	6.6	3	1.52	0.21	8.3	0.21	0.11	0.4
FM2	SSCH	N-AML	3	214	221.5	7.5	7.5	207	28.53	0.24	8.1	0.24	2.45	9
FM20	SSCH	N-AML	1	9	8.3	4.7	2.2	4	1.92	0.15	8.7	0.07	0.08	0.3
FM21	TQZT	N-AML	3	89	58.1	34.4	34.4	55	2.59	1.1	8.4	1.1	1.09	4
FM22	QZT	P-AML	2	13	17.4	10.6	10.6	2	1.22	0.34	7.8	0.34	0.15	0.6
FM24	QZT	P-AML	2	17	22.3	6.3	6.3	11	2.72	0.2	7.9	0.2	0.21	0.8
FM25	QZT	N-AML	3	103	108.3	16.6	16.3	86	6.22	0.53	8.6	0.52	1.13	4.1
FM26	QZT	N-AML	3	151	162.0	19.1	19.1	132	7.92	0.61	8.4	0.61	1.75	6.4
FM27	QZT	N-AML	2	46	54.6	5.6	5.6	40	8.18	0.18	8.3	0.18	0.55	2
FM28	CQZT	N-AML	3	161	166.3	10.6	10.6	150	15.15	0.34	8.5	0.34	1.83	6.7
FM29	GNST	N-AML	1	16	30.4	0.6	0.6	15	25.6	0.02	8.3	0.02	0.12	0.5
FM3	TQZT	N-AML	3	84	76.2	1.3	1.3	83	67.2	0.04	9.5	0.04	0.77	2.8
FM30	QZT	N-AML	2	38	45.2	8.1	8.1	30	4.68	0.26	8.3	0.26	0.46	1.7
FM35	QZT	N-AML	3	89	90.7	9.1	9.1	80	9.82	0.29	8.5	0.29	1	3.7
		Mean	2.25	65	65.1	10.3	10.1	55	10.84	0.33	8.47	0.32	0.75	2.76
		Median	2	42	49.9	7.5	7.5	35	6.66	0.24	8.4	0.24	0.51	1.85

3.5.2 Humidity Cell Results

Complete preliminary humidity cell results through week 19 of the cycle are presented in Appendix D1. Selected plots showing the concentration of COPCs and other selected parameters over the initial 19 week period are shown below in Figure 16 - Figure 18. Maximum, minimum and mean SFE concentrations are plotted for comparison, and CCME-FAL guidelines are included where applicable.

Highlights of initial results are summarized below:

- Humidity cell leachable COPC metals concentrations over the initial 19 week period show no unexpected trends, are consistent with the results of SFE testing leachable metals and show that SFE tests give conservative predictions for metal leaching for all COPCs.

- The low initial concentrations of contained metals with the humidity cell composite sample result in low potential for metal leaching over time as the sample weathers.

- A number of key COPC elements have remained below analytical detection limit over the initial 19 week period including Ag, Zn and Pb. Cu was measured at week 4 at 0.00067 mg/L (vs. the detection limit of 0.0005 mg/L) but all other measurements were below the analytical detection limit. Similarly, Ni was below the detection limit of 0.0005 mg/L for all measurements except for the initial week 0 measurement, which was 0.00119 mg/L.

- Other key COPC elements including Cd and As have shown fairly stable concentrations well below CCME-FAL

- Selenium showed an initial concentration of 0.00282 mg/L and fell to 0.00086 mg/L by week 2 and then rose steadily to 0.00306 mg/L by week 8 before decreasing to below 0.001 mg/L by week 17 and was the only COPC element that showed any measurements above CCME-FAL.

- Sulphate concentration showed initial flush (week 0) concentrations of 180 mg/L and fell by week 2 to less than 110 mg/L and have dropped to 40 mg/L by week 19.

- Alkalinity started at 104 mg/L (week 0) and reached an initial peak of 127 mg/L at week 1 before declining steadily with a flattening trend to just over approximately 75 mg/L at week 18.

- pH over the initial 19 week period has maintained consistently alkaline conditions above pH 8. pH showed a generally steady decline from 8.4 between week 0 to week 7, then appears to have stabilized at approximately 8.1 through week 19.

- Acidity was measured from week 10 and onward, and showed an initial measurement of approximately 20 mg/L $CaCO_3$ equivalent and then rapidly stabilized near zero.

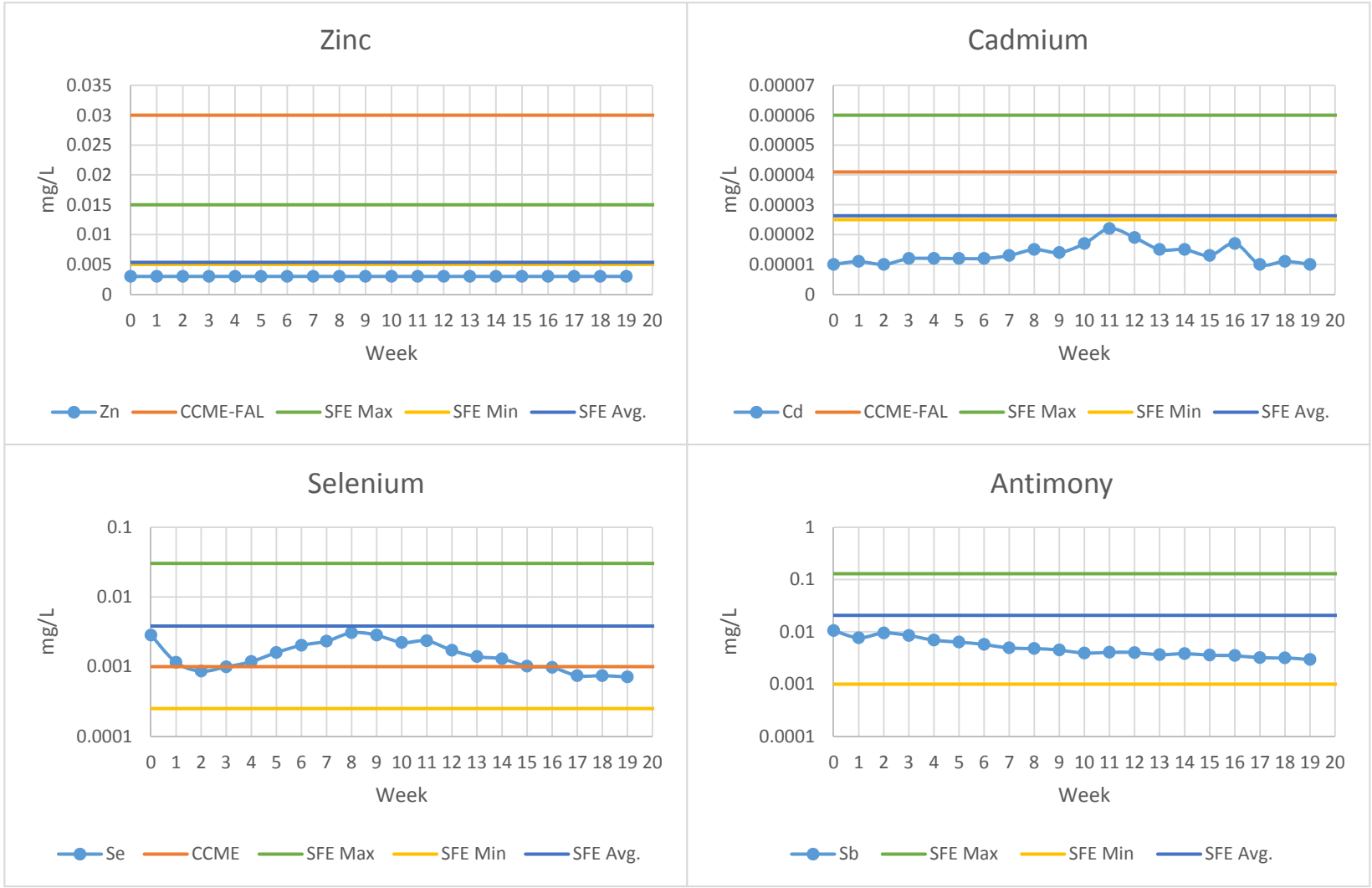


Figure 16. Humidity Cell COPCs (1 of 2), Week 0-19

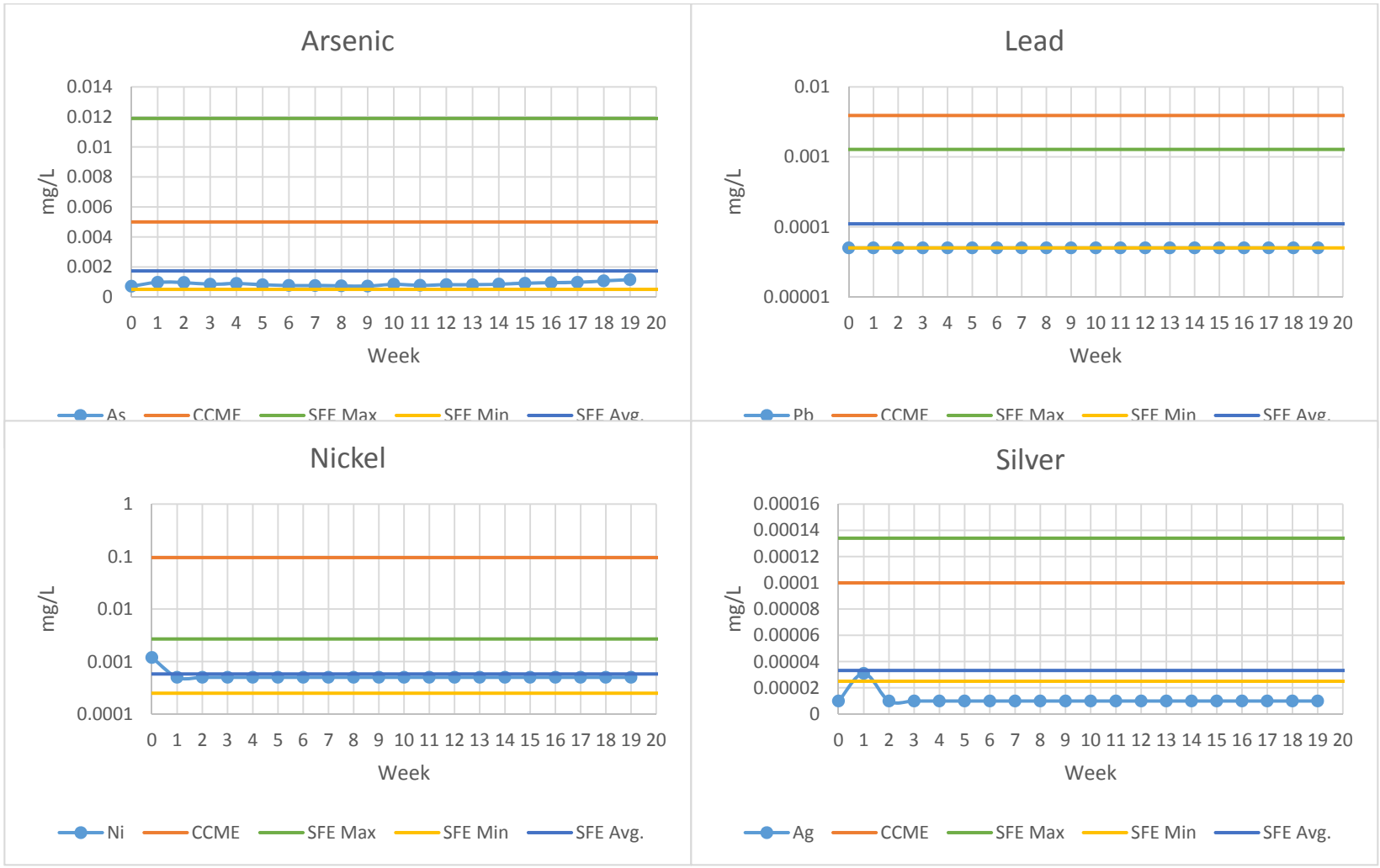
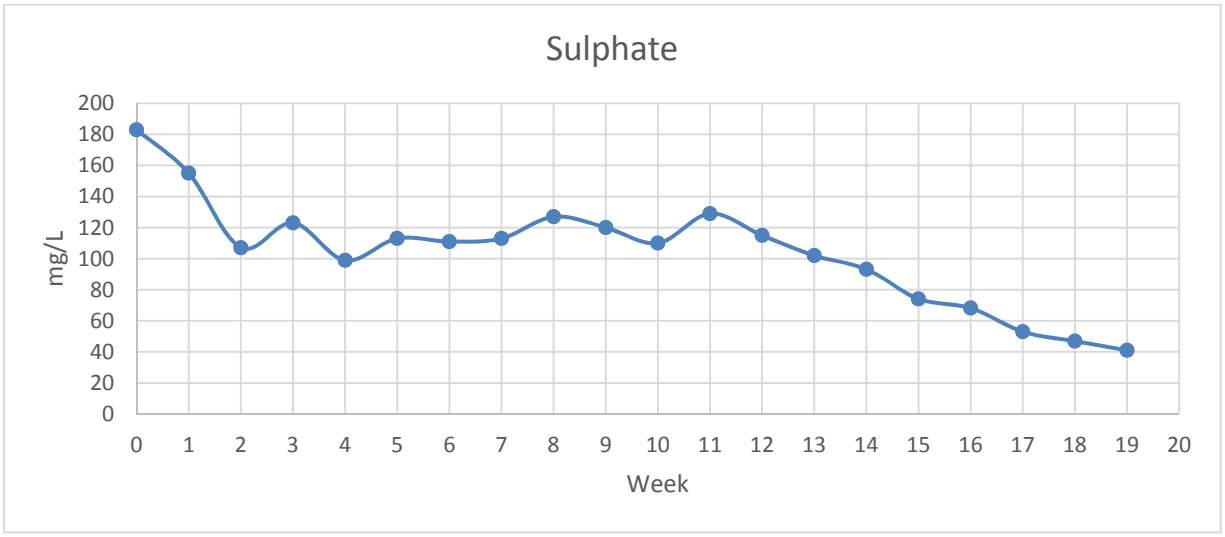


Figure 17. Humidity Cell COPCs (2 of 2), Week 0-19



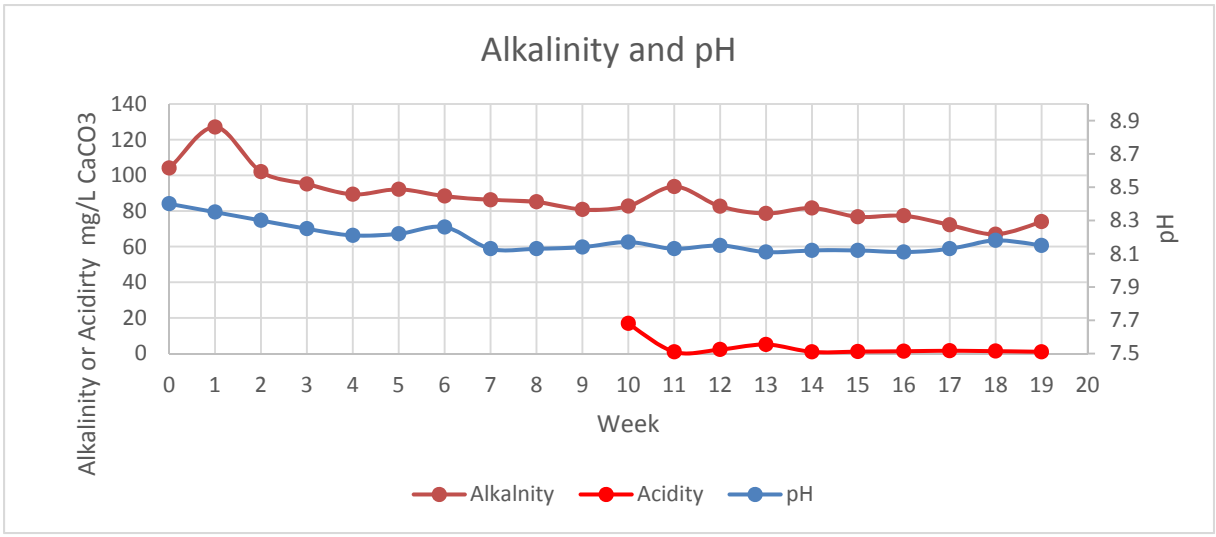
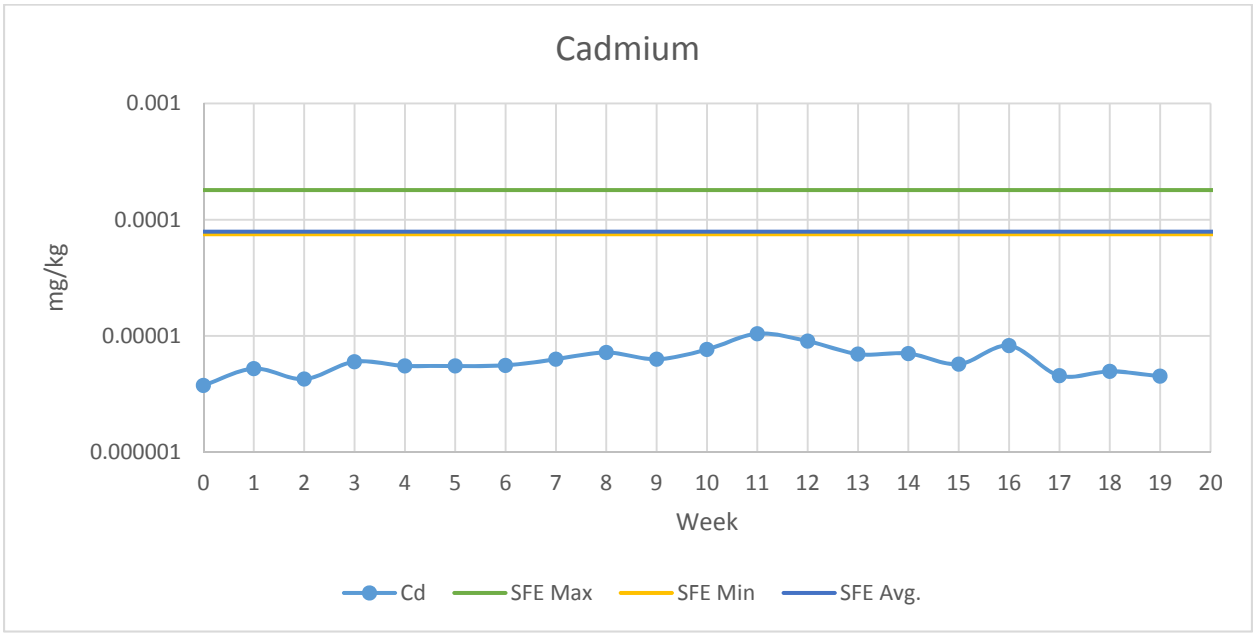


Figure 18. Humidity Cell Sulphate, Alkalinity and pH

Loadings Comparison – SFE vs. HC

Plots comparing HC COPC metal concentrations with SFE maximum, minimum, and average (mean) values show that SFE average concentrations are almost universally higher than concentrations seen in HC leachate. The only exception to this is the initial week 0 measurement for nickel, which slightly exceeded the SFE average value. In order to better compare the mass loading predicted by SFE tests and HCs (expressed in mg/kg), the results were scaled according to their respective liquid:solid ratio. In the case of SFEs, this remains a fixed 3:1 ratio for every sample, while for HCs, the "water out" reported by the lab was used as a ratio of the total mass of rock in the cell (1kg), and varied between

1:2 up to approximately 1:2.3. Converting these units effectively increases the difference between results by a factor of approximately 5 when compared with plots comparing concentration.



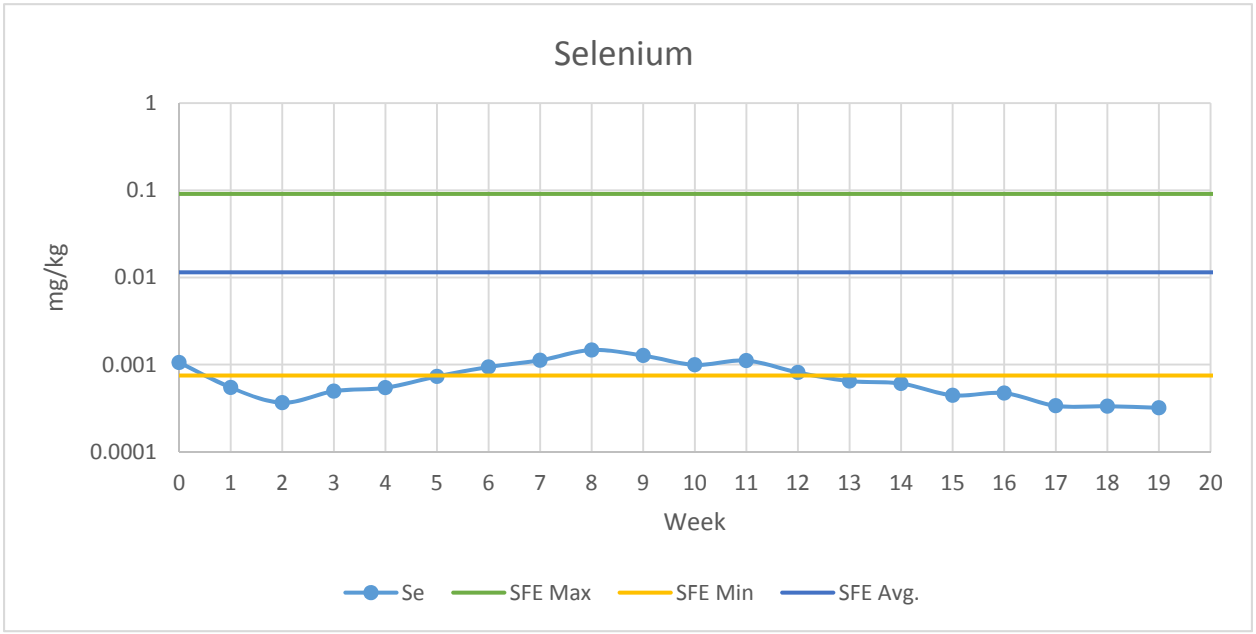


Figure 19. Selected COPC Mass Loading (week 0-19)

The contributing causes for the higher observed COPC concentrations and loadings observed in SFE tests compared with HC leachate are not well understood at this point but could be due to a variety of factors including:

1. Greater solubilisation in SFE results due to abrasion and agitation of the sample.
2. Preferential pathways forming within the humidity cells which may result in only partial flushing of the entire sample.
3. Mineral solubility constraints which may limit the concentration in HC leachate given the lower liquid:solid ratio compared with SFE tests, and the formation of sparingly soluble secondary mineral phases that are not dissolved upon flushing.

Humidity Cell Reaction Rates Calculations

The controlled environment of humidity cells enable the measurement of primary reaction rates and calculation of depletion times for acid generating, acid neutralizing, and metal leaching minerals. Because the 1 kg initial weight composite humidity cell sample consisted of equal 50 g splits of each of the 20 samples described above, average (mean) values were used in the calculations described in Table 7 and Table 8. Recommended equations for interpreting laboratory kinetic tests were used following methods described in MEND (2009). Figure 20 shows sulphur and NP depletion rates for the first 19 weeks of the humidity cell. Completion of the calculations through to conclusion of the humidity cell (minimum of 40 weeks) and will be undertaken at the end of the cycle once the cell is terminated.

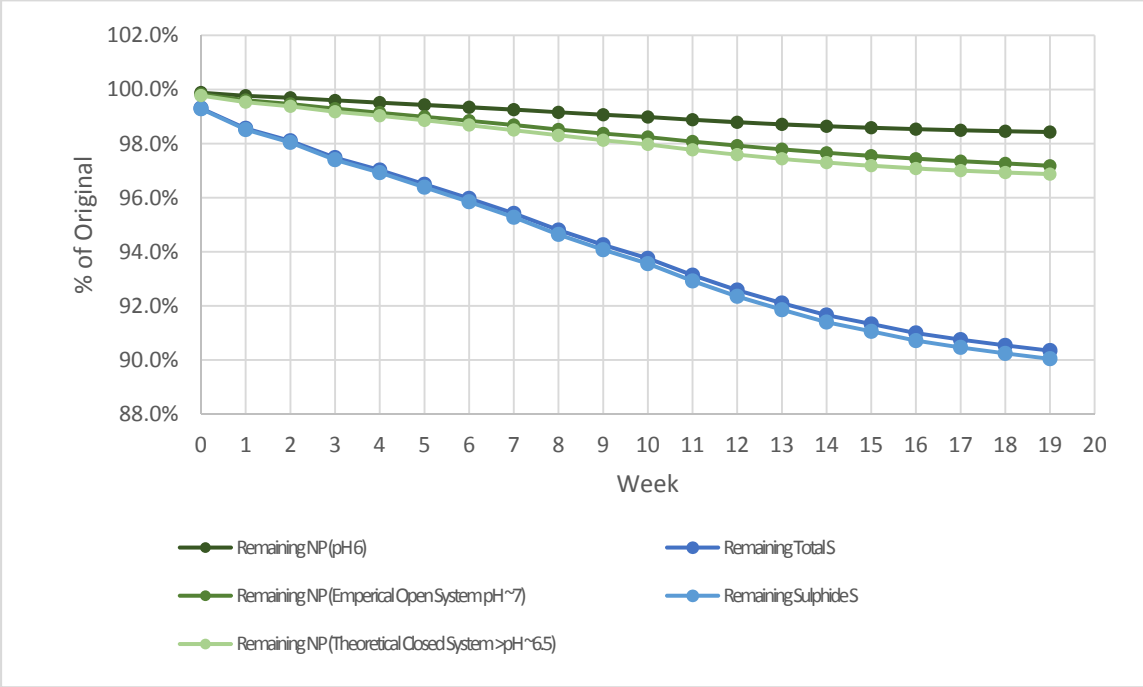


Figure 20. Preliminary Sulphur and NP Depletion Rates

Sulphur and NP reaction rate calculations and depletion trends (Figure 20) confirm the static ABA data which showed that the balance of neutralizing materials in the composite sample result in apparently faster depletion of sulphur and sulphide (AP) compared with NP. Projected forward, sulphur (and AP) are exhausted well before NP, meaning that the sample cannot produce net acid generation.

COPC metal leaching rates for each week were calculated based on the metal concentration and volume of leachate collected divided by the total sample charge. The cumulative leached metal was used with the original contained metal in order to calculate the remaining metal for each week. A plot showing the remaining metal for the COPC metals is shown in Figure 21, which indicates that only two elements, Se, and Sb show any appreciable depletion (>1%) over the initial 19 weeks. Both Se and Sb form oxyanions aqueous complexes, and are more mobile than cationic metal species at circumneutral pH (MEND, 2009).

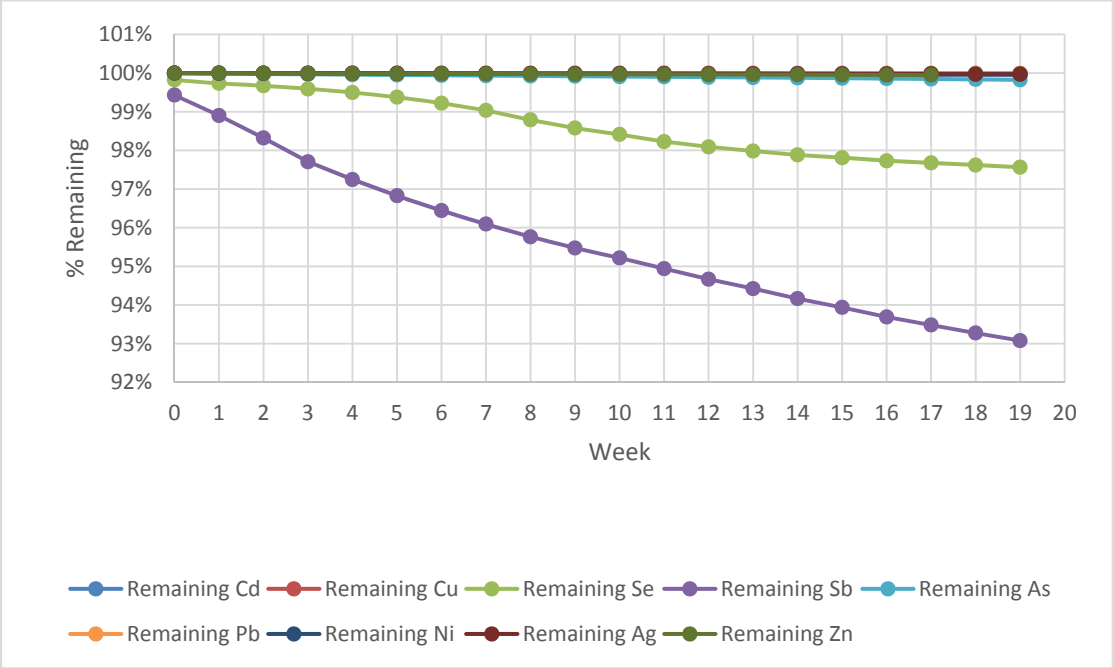


Figure 21. Humidity Cell Remaining Metal

4 Discussion

4.1 EXISTING GEOCHEMICAL SCREENING CRITERIA (BELLEKENO AND ONEK)

Altura (2008b) conducted geochemical testwork including shake flask extraction tests on 47 samples from waste rock dumps and pit wall dumps from over the KHSD. These samples were collected in 1995-1996 with an excavator but have been at the surface for up to 80 years. This study showed that net acidity and/or Pb and Zn metal leaching (AML) was associated with the following geochemical characteristics:

- Net Acidity: The two key aspects of samples demonstrating leachate pH ≤ 5.5 are either a calcium level in the rock of ≤ 0.51% or a CO_2 level of ≤ 0.6% coupled with an ICP sulphur level of ≥ 0.25%.

- Zinc Leaching: leaching of zinc to levels ≥ 10 mg/kg appears to occur under two differing conditions: i) solubilisation of zinc under net acidic conditions independent of zinc concentration in rock, and ii) solubilisation of zinc under overall neutral to alkaline conditions where Zn concentrations in rock exceed 5000 ppm.

- Lead Leaching: leaching of lead to levels ≥ 3 mg/kg occurs only under neutral pH conditions where Pb concentrations in rock exceed 5000 ppm.

Altura 2008b indicates that direct application of the factors of ≤0.51% Ca and ≥0.25% S via ICP results in a few samples with NP/MPA marginally above the 1 being classified into the category of having low potential for net acidity. The lower calcium threshold in the weathered site-wide dump samples was attributed to solubilisation and flushing of calcium under ambient site conditions. Altura used an adjustment factor for fresh rock samples of 1.5 to the calcium criteria increasing the Ca threshold to 0.75%. An upper threshold for sulphur of 1.5% was also recommended to ensure that high sulphur samples are classified as being P-AML regardless of calcium content.

The geochemical screening criteria to identify P-AML rock, based on review of the Bellekeno ABA dataset and the district wide AML study were presented in Altura 2008b:

a) Ca% ≤ 0.75% and S via ICP ≥ 0.25%
b) Or S via ICP ≥ 1.5%
c) Or Pb ≥ 5000 ppm
d) Or Zn ≥ 5000 ppm

ACG (2012) expanded the work of Altura 2008a by reanalyzing the AML controlling and correlating factors described by using additional static testing data (shake flask, ABA, and ICP trace metals) which had become available since 2008. ACG (2012) utilized both fresh, unweathered rock samples (N=29) and weathered samples (N=136) for a total of 165 samples from across the district and determined that the AML controlling and correlating factors described by Altura were reasonable and conservative with the expanded dataset, specifically:

- Leachate pH of <5.5 is appropriate and conservative for differentiating samples generating net acidity in that a significant proportion of samples with S >0.25% and <0.75% Ca do not demonstrate pH < 5.5

- Sample reactivity criteria for lead leaching of 3 mg/kg is indicated by the distribution of samples and corresponds well with a contained lead content of 5000 ppm, excluding samples with pH < 5.5

- Sample reactivity criteria for zinc leaching of 10 mg/kg is indicated by the distribution of samples and corresponds well with a contained zinc content of 5000 ppm, excluding samples with pH < 5.5

These geochemical screening criteria are the foundation for the predictive waste rock classification system and geochemical verification which in turn forms the basis of the Waste Rock Management Plan. Due to the generally similar stratigraphy, rock types and primary mineralogy present at Flame & Moth, the ARD/ML controlling and correlating factors derived therein should be applicable. The adjustment used by Altura (2008a) to increase the %Ca by a factor of 1.5 (from 0.5 to 0.75%) for application to fresh, unweathered rock were shown by ACG (2012) to be reasonable for application across the district.

4.2 PROPOSED ALTERNATE WASTE ROCK MANAGEMENT CRITERIA FOR FLAME AND MOTH EXCAVATION

A stepwise distribution of samples into each waste rock management category when filtered according to the geochemical screening criteria is shown in Figure 22.

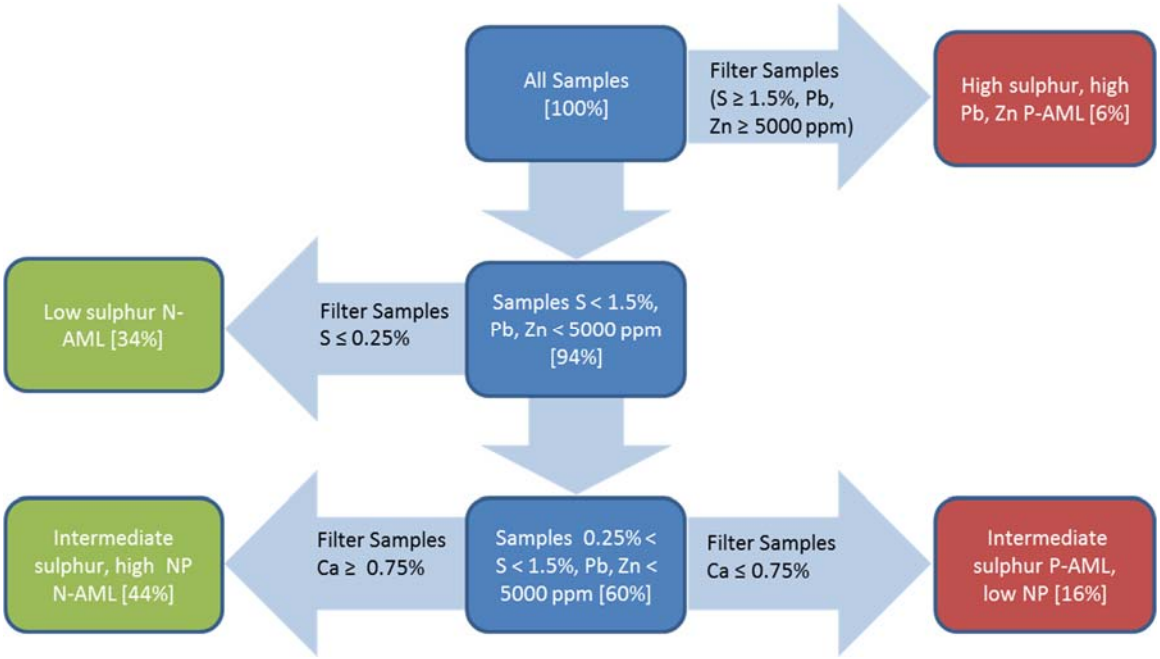


Figure 22. Sample Distribution according to Geochemical Screening Criteria

For the Flame & Moth project, Alexco proposes to simplify the geochemical waste rock screening criteria by eliminating criterion a) (Ca% ≤ 0.75% and S via ICP ≥ 0.25%). Effectively this would result in co-disposal of an estimated 16% of this intermediate sulphur P-AML material together with the combined 78% low sulphur N-AML and intermediate sulphur, high NP N-AML within surface waste rock dumps.

This modification to modify the field and geochemical screening criteria at Flame & Moth is deemed appropriate for the following reasons:

1. Based on Alexco's operational experience within the district, it is believed that the proposed waste rock management strategy of conducting permanent excavation only of rock distal to >5m (or the presence of vein associated stringers, whichever is further) from the mineralized vein fault will enable Alexco to reduce the proportion of excavated rock to surface with P-AML characteristics.
2. The use of conservative ABA methodology (e.g. calculation of AP using total sulphur) and a growing body of static and kinetic geochemical data and operational management experience within the district has increased confidence in Alexco's ability to effectively manage waste rock and has narrowed the areas of geochemical "uncertainty".
3. Average (mean and median) calculated NNP and NPR values using static testing data suggest that inclusion of samples screened as P-AML with intermediate (0.25<S>1.5) sulphur and Ca<0.75 (16%) would still result in excess bulk neutralizing potential and capacity. NPR and NNP were compared with established criteria (MEND, 2009, Hutt and Morin, 1999) and both metrics showed that only 5 of 50 (10%) of samples were considered to be potentially acid generating.
4. Preliminary kinetic testing (humidity cell) data using a composite sample which included a mixture of N-AML and intermediate sulphur, low NP samples in the approximate abundance found within the static testing dataset indicate that excess available NP prohibits net acid generation within the humidity cell.
5. Acid generation and neutralization occurs within all weathering rocks. This process takes place on various scales, from the microscopic (individual reaction) to the mesoscopic (mineral grain surface, hand sample) to the macroscopic (waste rock disposal area, mountain). Geochemical testing measures the average or bulk measurement of these processes at some scale. The geology and proposed mining methods at Flame & Moth creates limits to the potential scale at which acid generation can occur within surface waste rock disposal areas that result from the development of the project. As described in Section 3.1, lithologies which contain greater proportions of P-AML materials (e.g. GSCH) are frequently intercalated (on the centimeter to meter scale) with other lithologies that have more

favorable geochemical characteristics (e.g. QTZ, CQTZ, CSCH, GNST). The proposed method of mining and excavation (underground blasting and development of a 3.7 x 3.7 m decline) further results in mixing. Mixing of rock types will occur during the blasting, excavation, and disposal process and will result in the effective neutralization of weakly P-AML rock as it will be combined and intermingled with excess relative volumes of reactive neutralizing rock materials within the disposal areas.

It was found that eliminating criterion (a) of the P-AML geochemical screening criteria resulted in a slight increase in the proportion of samples with NPR <2, but based on the aforementioned reasons, it is unlikely to result in net acid generation in external waste rock disposal facilities at any significant scale. Based on this adjustment, the revised geochemical screening criteria proposed for Flame & Moth are as follows:

a) S via ICP ≥ 1.5%
b) Or Pb ≥ 5000 ppm
c) Or Zn ≥ 5000 ppm

Should Alexco decide to permanently excavate rock to surface from proximal to or within the mineralized vein envelope or encounter mineralized material >5 m away from the modeled vein structure, the standard (Bellekeno) geochemical screening criteria should apply.

4.3 FIELD SCREENING CRITERIA

Revised field screening criteria to identify P-AML rock to be excavated from the Flame and Moth development would be modified to reflect this change and would be as follows.

Any sample with one or more of the following:

a. Visual estimated sphalerite >0.75%
b. Visual estimated galena > 0.5%
c. Visual estimated pyrite >2%
d. Paste pH ≤ 6.0

Should Alexco decide to permanently excavate rock to surface from proximal to or within the mineralized vein envelope or encounter mineralized material >5 m away from the modeled vein structure, the standard (Bellekeno) field screening criteria should apply.

These changes to the field screening criteria specific to the Flame and Moth project will be submitted as an amendment to the Waste Rock Management Plan. Field screening criteria are subject to minor revision as necessary to maintain effectiveness at reliably identifying P-AML rock, and in response to routine geochemical (ICP and ABA) verification, which is a key component of the Waste Rock Management Plan.

4.4 ESTIMATED PROPORTIONS OF P-AML AND N-AML WASTE ROCK AND REVISED SCREENING CRITERIA FOR FLAME & MOTH

Estimated proportions of P-AML waste rock using the existing Waste Rock Management Plan (WRMP) geochemical screening criteria are presented in Table 9. All GNST, CSCH, and CQZT samples were indicated to be N-AML, and 11 of 50, or 22% of samples were designated as P-AML using the standard (Bellekeno) geochemical screening criteria. Among lithologies with P-AML samples identified, QZT shows the percentage of samples indicated as P-AML at 21%, while GSCH is 40% P-AML, SSCH is 33% P-AML, and TQZT is 14% P-AML.

The overall proportion of P-AML waste rock predicted at Flame & Moth by the general (Bellekeno) geochemical screening criteria (22%) is slightly lower than at Bellekeno, where 25% of P-AML rock was estimated, and significantly lower than Onek and Lucky Queen, where 35% P-AML waste rock was estimated. Relative proportions of P-AML at Flame & Moth rock within the main lithologies (QZT, GSCH) had the greatest similarity to Bellekeno where QZT was 22% P-AML and GSCH was much higher at 65% P-AML.

Table 9. Flame & Moth P-AML Samples Identified Using Bellekeno Geochemical Screening Criteria

Lithology		Number of Samples	# of P-AML Samples	% of P-AML Samples
Description	Code			
Graphitic Schist	GSCH	5	2	40%
Quartzite	QZT	28	6	21%
Thin Bedded Quartzite	TQZT	7	1	14%
Sericite Schist	SSCH	6	2	33%
Calcareous Quartzite	CQZT	2	0	0%
Greenstone	GNST	1	0	0%
Calcareous Schist	CSCH	1	0	0%
	Total	50	11	22%

The proportion of samples identified as P-AML according to the revised geochemical screening criteria specific to the planned Flame & Moth development is shown in Table 10. The revised geochemical screening criteria result in all the GNST, CSCH, SSCH, CQZT, and TQZT samples indicated to be N-AML, and 3 of 50, or 6% of total samples designated as P-AML. Among lithologies with P-AML samples identified, QZT shows the percentage of samples indicated as P-AML at 4%, while GSCH remains at 40% P-AML.

Table 10. Flame & Moth P-AML Samples Identified Using Modified Geochemical Screening Criteria

Lithology		Number of Samples	# of P-AML Samples	% of P-AML Samples
Description	Code			
Graphitic Schist	GSCH	5	2	40%
Quartzite	QZT	28	1	4%
Thin Bedded Quartzite	TQZT	7	0	0%
Sericite Schist	SSCH	6	0	0%
Calcareous Quartzite	CQZT	2	0	0%
Greenstone	GNST	1	0	0%
Calcareous Schist	CSCH	1	0	0%
	Total	50	3	6%

5 CONCLUSIONS

The geology and style of mineralization at Flame & Moth shares a number of key similarities with other district deposits. The deposits occur within the same major lithologic unit and share the same major rock lithologies, and while some differences exist, the style of mineralization is similar. As such, the geochemical and geoenvironmental characteristics of the rocks share a number of significant similarities. The WRMP, subject to the minor changes to geochemical and field screening criteria, is anticipated to be effective for waste rock characterization and management at Flame & Moth.

Samples and lithologies whose trace metal concentrations showed significant exceedance of crustal abundance (>10x) were identified as COPCs including As Sb, Cd, Cu, Pb, Ni, Se, Ag, and Zn. Further testing for leachability of these elements in the area of planned excavation (as measured using SFE tests) showed that only maximum values for Ag, As, Cd and Se exceed CCME guidelines, and only Se exceeds CCME at the average SFE concentration. Preliminary HC results (weeks 0-19) show that only Se exceeds the CCME guideline at any point during the testing and appears to be stabilizing below the CCME guideline (weeks 18-19).

The following key contrasts between Flame & Moth and other permitted district deposits are presented below:

- Planned exclusion of excavation of rock from within or near the mineralized zones results in more favorable geochemical characteristics (small proportion of P-AML rock) within the planned development and excavation area at Flame and Moth.

- With the exception of selenium, all other COPC elements including arsenic, antimony, cadmium, copper, lead, nickel, silver, and zinc values within the four major lithologies do not exceed their respective 10 time (10x) crustal abundances below the 95th percentile.

- A comparison of COPC metal concentrations observed from SFE tests with HC leachate showed that SFE tests appear to generate similar or greater metal solubility (average SFE concentration is > HC leachate concentration for all COPCs). This demonstrates that SFE tests likely provide a conservative estimate of leachable metals and loadings, given similar conditions (N-AML rock) when compared with kinetic tests.

- COPC element concentration in the Flame & Moth samples collected from the planned area of excavation are generally low compared with other district deposits (Bellekeno, Lucky Queen, Onek) which included samples from near and within the mineralized vein faults. This difference is likely explained by the selection of samples in the area of planned excavation, which is designed to be away from the mineralized vein structures at Flame & Moth.

- Although a number of elements were flagged as COPCs by their elevated concentration in comparison with crustal abundance, with the possible exception of Se and Sb, they do not appear to be leachable in rock from within the planned area of excavation for the Flame and Moth project.

- Lower NPRs and higher contained and leachable Se and Sb were associated with graphitic schist and lithologies containing graphitic schist (i.e. TQTZ).

- Similar to other district deposits (especially Bellekeno, Lucky Queen) the graphitic schist (GSCH) unit contained the highest concentrations of sulphur and other COPCs, while quartzite (QTZ) and other lithologies tended to have much lower concentrations of COPC elements.

All other aspects of WRMP are anticipated to be valid and utilized in order to effectively manage waste rock at Flame & Moth. Additional static testing data sampling will be conducted as part of the geochemical verification of the WRMP and will help confirm the efficacy of the WRMP. Field monitoring of waste rock including physical inspections for signs of oxidation and AML and licence requirements for downgradient surface and water quality monitoring will provide assurance that surface waste rock disposal area remains geochemically stable. The results of kinetic testing (both humidity cell and field bins) will be used to confirm and refine the predictions and the waste rock management proposal presented in this report.

The WRMP has demonstrated effectiveness at the Bellekeno mine for accurate identification, segregation, operational management and geochemical verification of waste rock. The site specific modifications to the screening criteria proposed herein are expected to ensure its efficacy at Flame & Moth. It is expected that aspects of the Waste Rock Management Plan may require minor modification in response to the feedback mechanisms featured within the WRMP. This operational responsiveness will assist with the efficacy of waste rock management at Flame & Moth and other mines within the district.

6 CLOSURE

We trust this report meets your current needs. If you have any questions or if we can be of further assistance, please contact the undersigned at (867) 668-6463.

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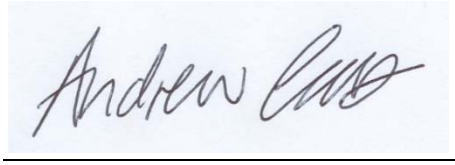

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8 ATTACHMENTS

Appendix A1 – A3

Appendix B1 – B2

Appendix C1 – C2

Appendix D1

APPENDIX A

Arsenic (As) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Arsenic (10x Crustal Abundance – 18 ppm)			Method Detection Limit = 0.1 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	20.7	128.0	5.6	12.5
99%	20.6	95.7	5.5	12.4
95%	20.2	77.9	5.3	12.2
90%	19.8	11.3	5.1	12.0
3rd Quartile 75%	19.9	5.9	5.0	11.9
Median 50%	17.1	3.1	2.9	11.3
1st Quartile 25%	6.9	2.2	0.2	5.9
10%	7.8	1.3	0.2	5.0
5%	5.2	1.0	0.1	3.2
1%	3.0	1.0	0.1	1.7
Minimum 0%	2.5	0.9	0.1	1.3
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Antimony (Sb) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Antomony (10x Crustal Abundance – 2 ppm)			Method Detection Limit = 0.05 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	4.48	5.37	2.63	1.91
99%	4.32	4.22	2.61	1.88
95%	3.69	3.58	2.52	1.76
90%	2.90	1.37	2.41	1.61
3rd Quartile 75%	3.16	0.88	2.40	1.54
Median 50%	1.24	0.59	0.74	1.06
1st Quartile 25%	0.95	0.47	0.42	0.65
10%	1.00	0.29	0.40	0.64
5%	0.85	0.23	0.25	0.63
1%	0.74	0.21	0.12	0.62
Minimum 0%	0.71	0.18	0.09	0.62
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Cadmium (Cd) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Cadmium (10x Crustal Abundance – 1.5 ppm)			Method Detection Limit = 0.01 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	0.83	0.63	0.42	1.01
99%	0.82	0.59	0.41	0.97
95%	0.80	0.57	0.34	0.80
90%	0.78	0.41	0.26	0.58
3rd Quartile 75%	0.79	0.22	0.25	0.47
Median 50%	0.63	0.16	0.11	0.37
1st Quartile 25%	0.42	0.07	0.07	0.28
10%	0.45	0.05	0.07	0.26
5%	0.36	0.04	0.06	0.22
1%	0.29	0.03	0.05	0.19
Minimum 0%	0.27	0.03	0.05	0.18
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Calcium (Ca) (%) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Calcium (10x Crustal Abundance – 0.563 %)			Method Detection Limit = 0.01 %	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	2.80	6.22	8.56	3.07
99%	2.75	5.61	8.05	3.05
95%	2.56	5.27	5.99	2.98
90%	2.33	3.62	3.43	2.89
3rd Quartile 75%	2.41	2.39	3.06	2.85
Median 50%	1.90	1.66	0.39	2.14
1st Quartile 25%	0.67	0.69	0.25	0.87
10%	0.72	0.43	0.24	0.83
5%	0.57	0.28	0.21	0.74
1%	0.45	0.26	0.19	0.67
Minimum 0%	0.42	0.22	0.18	0.65
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Copper (Cu) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Copper (10x Crustal Abundance – 600 ppm)			Method Detection Limit = 0.2 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	74.7	91.7	177.0	40.8
99%	72.0	87.3	171.7	40.0
95%	61.4	84.8	150.4	37.0
90%	48.1	52.3	123.8	33.3
3rd Quartile 75%	52.6	8.3	120.0	31.4
Median 50%	30.2	5.7	91.3	15.6
1st Quartile 25%	25.6	3.2	6.3	12.3
10%	25.8	2.3	6.2	11.9
5%	25.2	2.0	5.6	11.0
1%	24.8	2.0	5.1	10.3
Minimum 0%	24.7	2.0	5.0	10.2
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Lead (Pb) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Lead (10x Crustal Abundance – 140 ppm)			Method Detection Limit = 0.2 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	27.5	26.4	8.6	15.7
99%	26.7	23.6	8.4	15.2
95%	23.6	22.1	7.5	13.3
90%	19.7	15.8	6.3	11.0
3rd Quartile 75%	21.0	7.6	6.2	9.9
Median 50%	12.1	6.3	3.3	8.7
1st Quartile 25%	10.2	3.9	2.3	7.8
10%	10.2	2.7	2.2	6.7
5%	10.1	2.1	2.1	4.6
1%	10.0	1.9	2.1	3.0
Minimum 0%	10.0	1.6	2.0	2.5
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

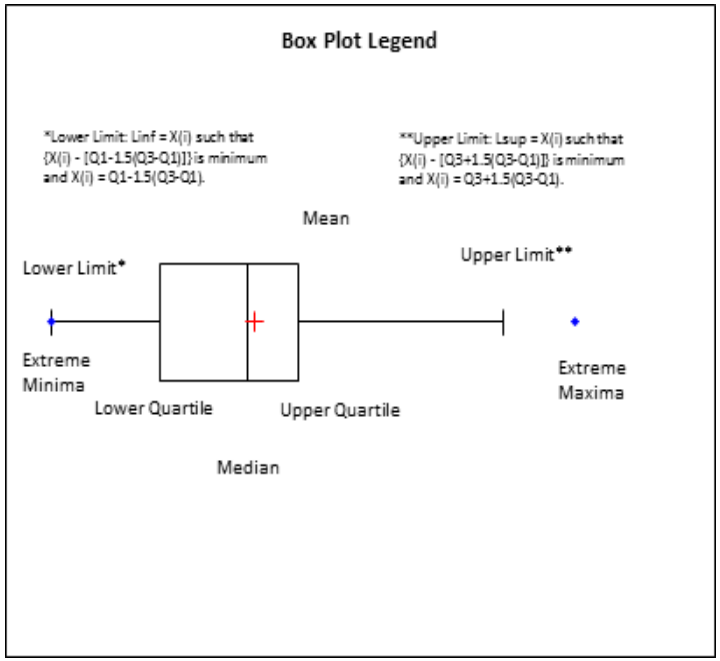
Nickel (Ni) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Nickel (10x Crustal Abundance – 840 ppm)			Method Detection Limit = 0.2 ppm	
	Graphitic Schist (GSCH)	Quartzite (QZT)	Sericite Schist (SSCH)	Thin-Bedded Quartzite (TQZT)
Maximum 100%	61.3	40.4	49.0	37.4
99%	60.3	38.8	48.4	37.1
95%	56.5	37.9	45.8	36.0
90%	51.6	16.8	42.6	34.7
3rd Quartile 75%	53.3	8.8	42.1	34.0
Median 50%	38.7	5.9	36.9	25.8
1st Quartile 25%	37.0	3.2	6.7	23.2
10%	37.2	2.5	6.5	22.0
5%	36.4	2.1	4.9	19.6
1%	35.7	2.1	3.7	17.6
Minimum 0%	35.5	2.1	3.4	17.2
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Selenium (Se) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Selenium (10x Crustal Abundance – 0.5 ppm)			Method Detection Limit = 0.2 ppm	
	Graphitic Schist (GSCH)	Quartzite (QZT)	Sericite Schist (SSCH)	Thin-Bedded Quartzite (TQZT)
Maximum 100%	4.5	1.8	0.7	2.1
99%	4.4	1.7	0.7	2.0
95%	4.1	1.6	0.7	1.8
90%	3.6	1.0	0.6	1.5
3rd Quartile 75%	3.8	0.7	0.6	1.3
Median 50%	1.2	0.4	0.4	1.2
1st Quartile 25%	0.9	0.2	0.3	0.8
10%	0.9	0.2	0.3	0.7
5%	0.8	0.1	0.2	0.6
1%	0.8	0.1	0.2	0.4
Minimum 0%	0.8	0.1	0.2	0.4
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Silver (Ag) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Silver (10x Crustal Abundance – 0.75 ppm)			Method Detection Limit = 0.01 ppm	
	Graphitic Schist (GSCH)	Quartzite (QZT)	Sericite Schist (SSCH)	Thin-Bedded Quartzite (TQZT)
Maximum 100%	0.59	0.89	0.30	0.82
99%	0.58	0.86	0.30	0.80
95%	0.56	0.84	0.27	0.72
90%	0.54	0.51	0.24	0.62
3rd Quartile 75%	0.55	0.38	0.23	0.57
Median 50%	0.46	0.23	0.17	0.47
1st Quartile 25%	0.36	0.16	0.13	0.30
10%	0.38	0.13	0.13	0.27
5%	0.33	0.09	0.13	0.22
1%	0.30	0.08	0.13	0.17
Minimum 0%	0.29	0.06	0.13	0.16
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Sulphur (S) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Sulphur (10x Crustal Abundance – 0.35 %)			Method Detection Limit = 0.01 %	
	Graphitic Schist (GSCH)	Quartzite (QZT)	Sericite Schist (SSCH)	Thin-Bedded Quartzite (TQZT)
Maximum 100%	2.38	1.81	0.47	1.31
99%	2.34	1.60	0.46	1.31
95%	2.17	1.49	0.41	1.30
90%	1.96	0.76	0.35	1.29
3rd Quartile 75%	2.03	0.57	0.34	1.29
Median 50%	0.98	0.33	0.28	1.21
1st Quartile 25%	0.56	0.17	0.09	0.40
10%	0.63	0.09	0.08	0.33
5%	0.41	0.05	0.05	0.20
1%	0.23	0.04	0.03	0.09
Minimum 0%	0.19	0.03	0.02	0.06
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			

Zinc (Zn) (ppm) Within Dominant Lithologies - Flame & Moth ICP (Trace Metals) Results				
Zinc (10x Crustal Abundance – 700 ppm)			Method Detection Limit = 2 ppm	
	Graphitic Schist (GSCH)	**Quartzite (QZT)**	**Sericite Schist (SSCH)**	**Thin-Bedded Quartzite (TQZT)**
Maximum 100%	149.0	88.2	144.0	91.4
99%	147.9	85.4	140.3	90.6
95%	143.5	83.9	125.7	87.2
90%	137.9	59.9	107.5	83.1
3rd Quartile 75%	139.8	34.8	104.9	81.0
Median 50%	116.5	20.1	83.9	74.3
1st Quartile 25%	107.0	10.6	37.9	52.9
10%	107.1	6.4	36.1	49.2
5%	106.8	5.9	23.2	41.9
1%	106.6	5.9	12.9	36.1
Minimum 0%	106.5	5.8	10.3	34.6
Number of Samples	5	28	6	7
	Highlighted Results Exceed 10X Crustal Value			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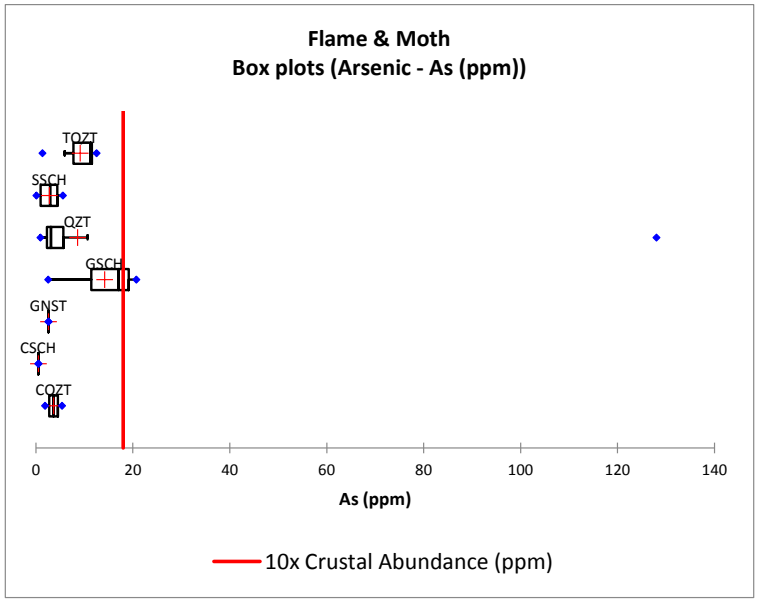
**Upper Limit: Lsup = X(i) such that {X(i) - [Q3+1.5(Q3-Q1)]} is minimum and X(i) = Q3+1.5(Q3-Q1).
Mean
Lower Limit*
Upper Limit**
Extreme Minima
Extreme Maxima
Lower Quartile
Upper Quartile
Median


Flame & Moth
Box plots (Arsenic - As (ppm))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
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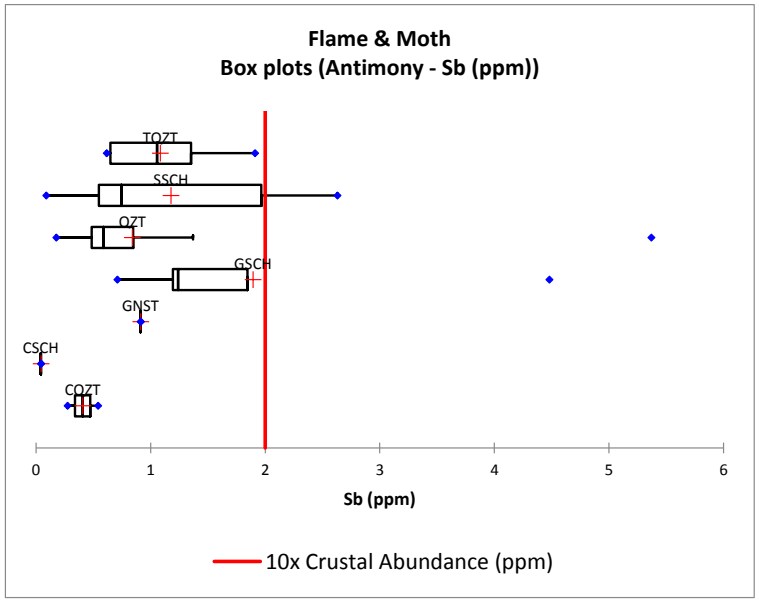
20
40
60
80
100
120
140
As (ppm)
10x Crustal Abundance (ppm)


Flame & Moth
Box plots (Antimony - Sb (ppm))
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SSCH
OZT
GSCH
GNST
CSCH
COZT
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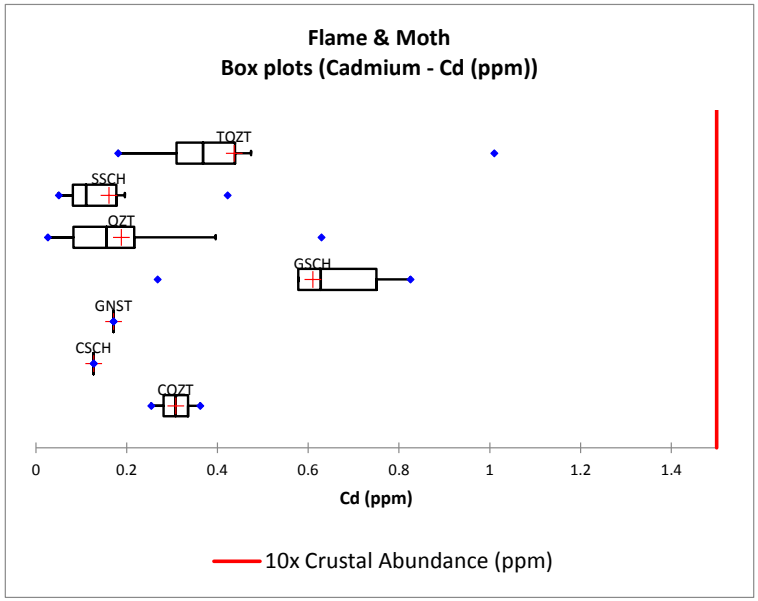
1
2
3
4
5
6
Sb (ppm)
10x Crustal Abundance (ppm)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Box plots (Cadmium - Cd (ppm))
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SSCH
OZT
GSCH
GNST
CSCH
COZT
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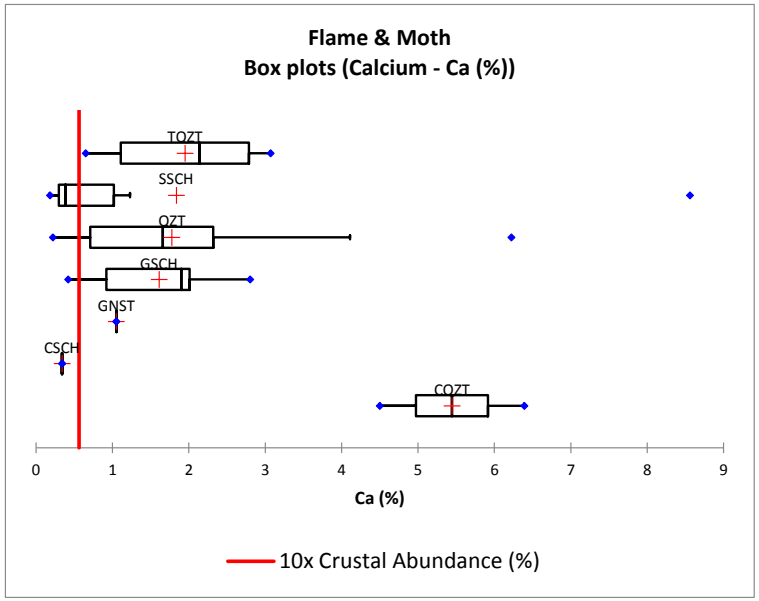
0.6
0.8
1
1.2
1.4
Cd (ppm)
10x Crustal Abundance (ppm)


Flame & Moth
Box plots (Calcium - Ca (%))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
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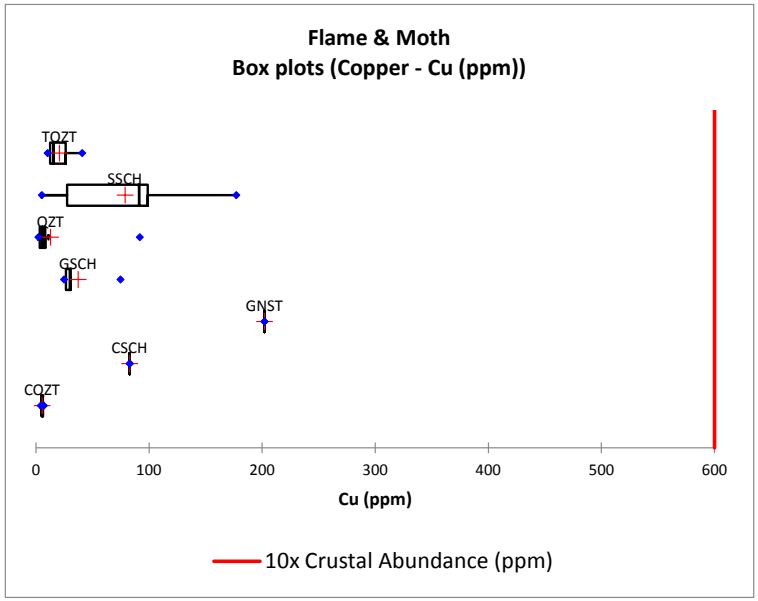
2
3
4
5
6
7
8
9
Ca (%)
10x Crustal Abundance (%)


Flame & Moth
Box plots (Copper - Cu (ppm))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
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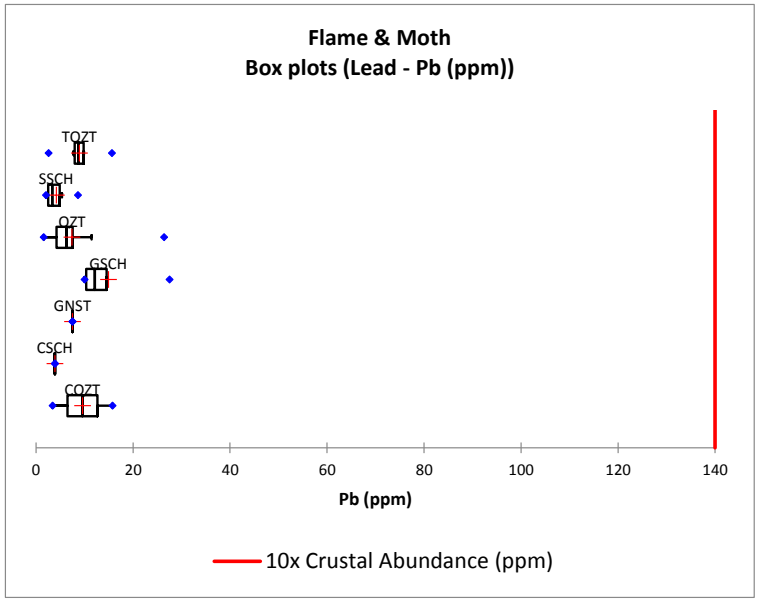
100
200
300
400
500
600
Cu (ppm)
10x Crustal Abundance (ppm)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SSCH
OZT
GSCH
GNST
CSCH
COZT
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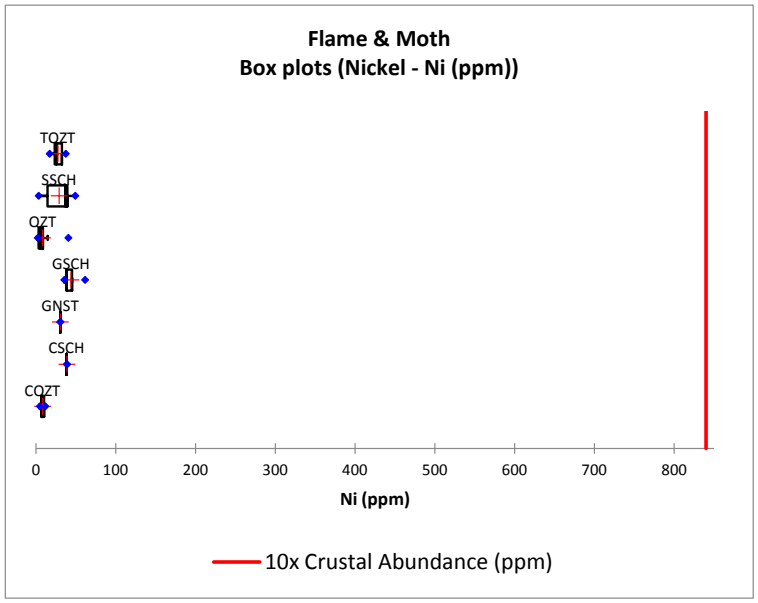
60
80
100
120
140
Pb (ppm)
10x Crustal Abundance (ppm)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Box plots (Nickel - Ni (ppm))
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SSCH
OZT
GSCH
GNST
CSCH
COZT
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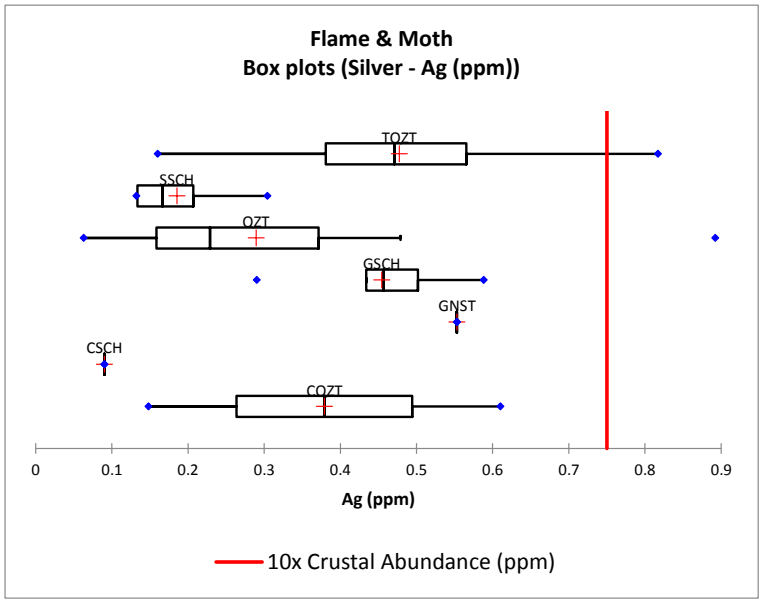
200
300
400
500
600
700
800
Ni (ppm)
10x Crustal Abundance (ppm)


Flame & Moth
Box plots (Silver - Ag (ppm))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
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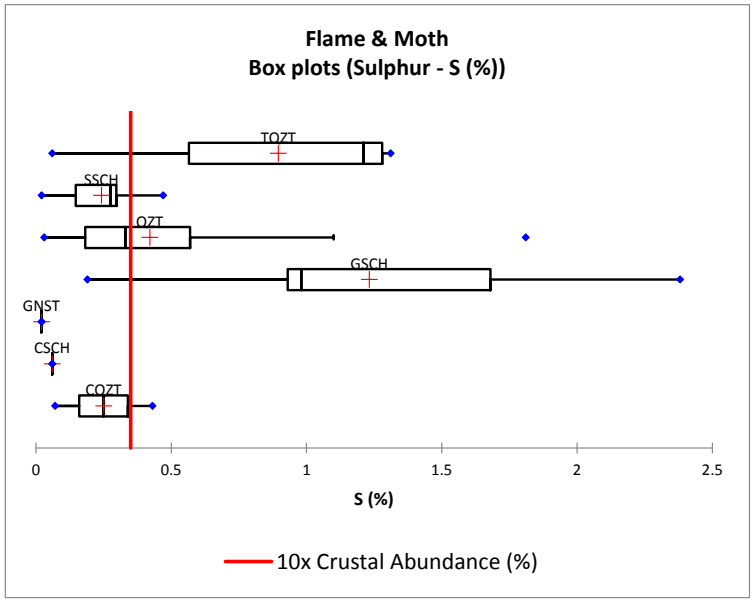
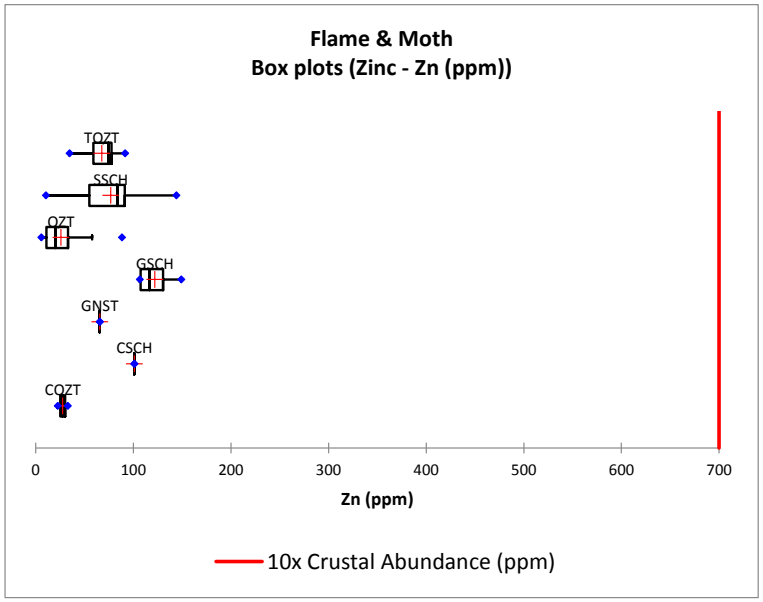
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Ag (ppm)
10x Crustal Abundance (ppm)


Flame & Moth
Box plots (Sulphur - S (%))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
0
0.5
1
1.5
2
2.5
S (%)
10x Crustal Abundance (%)


Flame & Moth
Box plots (Zinc - Zn (ppm))
TOZT
SSCH
OZT
GSCH
GNST
CSCH
COZT
0
100
200
300
400
500
600
700
Zn (ppm)
10x Crustal Abundance (ppm)

SAMPLE	MAJ_LITH	Hole	From_m	To_m	Au (ppm)	Ag (ppm)	Al (%)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Ge (ppm)	Hf (ppm)
FM1	TQZT	K-10-298	47	52	0.0002	0.558	0.7	12.5	5	85.6	0.32	0.096	2.72	0.474	24.7	4.8	23.7	1.05	12.3	2.27	1.78	0.07	0.1
FM10	SSCH	K-10-320	109.3	110.7	0.0007	0.136	1.34	4.85	5	698	0.2	0.107	1.23	0.12	14	10.7	21.2	1.01	101	2.84	4.12	0.046	0.039
FM11	TQZT	K-10-320	118.35	122.7	0.0007	0.301	0.9	11.25	5	137.5	0.33	0.142	3.07	0.338	13.1	8.51	19.65	1.42	31.4	2.95	2.43	0.051	0.183
FM12	QZT	K-11-346	76.46	79	0.0003	0.215	0.08	2.58	5	22.6	0.02	0.161	0.55	0.21	5.42	0.585	23.5	0.263	7.25	0.59	0.324	0.015	0.049
FM13	CSCH	K-11-346	109.6	112.78	0.0023	0.09	1.78	0.5	5	2780	0.28	0.156	0.34	0.127	28.2	14.7	18.65	1.625	82.9	2.6	5.08	0.053	0.069
FM14	GSCH	K-11-346	119	120.75	0.0001	0.502	1.84	19.15	5	143	0.57	0.2	0.92	0.628	26.7	15.3	28	2.07	30.2	2.53	4.48	0.082	0.141
FM15	QZT	K-11-346	127	128.2	0.0002	0.138	0.29	2.87	5	46.9	0.09	0.031	2.51	0.143	8.62	1.655	16.2	0.218	3.17	0.89	0.777	0.028	0.063
FM16	QZT	K-12-405	110.49	110.7	0.0055	0.214	1.7	0.87	5	817	0.23	0.062	0.68	0.061	14.7	11.95	24.8	1.525	76.4	2.78	5	0.043	0.036
FM17	SSCH	K-12-405	98.86	100.21	0.0003	0.21	0.1	2.9	5	19.5	0.03	0.097	0.39	0.101	4.73	0.748	20.8	0.362	6.69	0.78	0.353	0.017	0.07
FM18	SSCH	K-12-405	135.52	137.2	0.0014	0.133	2.09	0.29	5	538	0.29	0.177	0.38	0.196	49.3	19.9	22.6	1.635	92.8	3.31	6.42	0.071	0.053
FM19	TQZT	K-11-345	80.32	82.35	0.0001	0.461	0.48	5.93	5	85.7	0.33	0.087	1.35	0.368	12.8	3.68	16.95	0.807	10.15	1.65	1.31	0.036	0.153
FM2	SSCH	K-10-298	60.48	63.99	0.0001	0.197	0.49	2.95	5	84.2	0.14	0.052	8.56	0.422	15.25	2.3	14.25	0.367	5.03	1.04	1.265	0.038	0.153
FM20	SSCH	K-11-345	100.61	103.3	0.0027	0.132	1.76	0.06	5	4100	0.17	0.356	0.18	0.05	14.45	10.95	21.1	1.17	177	2.55	5.23	0.042	0.021
FM21	TQZT	K-11-345	106.68	108.22	0.0002	0.471	0.89	11.85	5	203	0.38	0.216	2.14	0.282	12.7	9.28	15.95	1.555	40.8	2.43	2.49	0.06	0.338
FM22	QZT	K-11-345	119.6	121.92	0.0001	0.208	0.23	3.68	5	63.6	0.14	0.055	0.54	0.153	13.55	2.37	17.75	0.555	4.46	0.81	0.707	0.042	0.06
FM23	GSCH	K-12-402	11.18	12.02	0.0001	0.29	1.73	2.49	5	187	0.46	0.144	2.01	0.578	58.6	12	27.4	1.33	26.5	3.23	4.58	0.106	0.204
FM24	QZT	K-12-402	21.01	22.95	0.0015	0.139	0.08	2.69	5	25.1	0.05	0.019	0.73	0.117	7.95	0.958	21.9	0.118	2.49	0.64	0.295	0.023	0.044
FM25	QZT	K-12-402	66.17	69.5	0.0008	0.271	0.38	8.57	5	78.7	0.1	0.191	4.11	0.315	9.4	1.945	16.1	0.725	8.03	1.17	0.967	0.028	0.06
FM26	QZT	K-12-469	81.11	82.08	0.0003	0.781	0.24	3.45	5	40.7	0.19	0.054	6.22	0.382	6.23	1.255	14.7	0.209	6.73	0.99	0.633	0.024	0.099
FM27	QZT	K-12-469	97	97.68	0.0003	0.478	0.13	2.86	5	22	0.08	0.216	2	0.158	6.4	1.015	14.7	0.256	8.35	0.68	0.407	0.024	0.073
FM28	CQZT	K-12-469	153.54	155.22	0.0001	0.61	0.48	5.38	5	64.4	0.12	0.078	6.39	0.362	19.1	3.27	16.1	0.323	6.78	1.19	1.275	0.041	0.061
FM29	GNST	K-12-469	176.79	179	0.0015	0.553	2.75	2.58	5	240	0.18	0.018	1.05	0.171	4.38	25.2	16.6	2.65	202	4.12	4.19	0.074	0.042
FM3	TQZT	K-10-298	27.73	30.1	0.0004	0.16	1.79	1.32	5	216	0.34	0.015	2.85	0.181	29.2	4.86	41.3	0.669	21.3	1.89	4.54	0.055	0.121
FM30	QZT	K-12-421	90.43	91.56	0.0005	0.393	0.17	2.28	5	23.8	0.13	0.033	1.63	0.211	5.13	0.974	13.8	0.18	5.08	0.69	0.43	0.02	0.069
FM31	QZT	K-12-421	113.57	114.6	0.0002	0.378	0.34	6.49	5	58.2	0.18	0.061	2.98	0.252	14.15	3.31	13.35	0.715	10.1	1.3	0.928	0.046	0.149
FM32	TQZT	K-10-285	94.07	95.8	0.0001	0.817	0.57	9.48	5	97.9	0.26	0.132	0.87	0.403	41	5.41	18.55	0.906	12.6	1.84	1.635	0.084	0.099
FM33	TQZT	K-10-285	112.12	113.05	0.0001	0.573	0.8	11.25	5	126.5	0.25	0.119	0.65	1.01	39.6	7.15	20	0.761	15.6	1.71	2	0.06	0.2
FM34	QZT	K-10-285	131.78	140.5	0.0005	0.479	0.13	3.28	5	41.8	0.06	0.041	0.22	0.069	9.31	1.88	10.9	0.221	3.48	0.81	0.403	0.026	0.058
FM35	QZT	K-12-467	85.96	87.45	0.0001	0.379	0.18	2.63	5	22.2	0.15	0.031	3.42	0.213	4.13	0.961	14.05	0.176	6.15	0.73	0.491	0.022	0.069
FM36	QZT	K-12-467	108.52	109.51	0.0002	0.321	0.24	4.37	5	35.7	0.12	0.052	1.69	0.145	8.52	2.66	15.85	0.334	7.27	1.17	0.68	0.045	0.064
FM37	QZT	K-12-467	183.11	184.04	0.0003	0.157	0.16	3.52	5	39.7	0.03	0.028	0.35	0.055	7.36	1.36	11.95	0.138	2.62	0.67	0.452	0.022	0.044
FM38	QZT	K-11-357	106.55	107.97	0.0001	0.272	0.05	1.66	5	10.8	0.04	0.097	2.43	0.212	3.58	0.374	15.5	0.094	7.15	0.53	0.191	0.018	0.028
FM39	SSCH	K-11-357	145.36	146.41	0.0011	0.304	1.67	5.56	5	701	0.18	0.058	0.27	0.075	12.3	11	22.5	0.881	89.8	2.75	4.89	0.043	0.041
FM4	QZT	K-10-298	71.93	74.23	0.0359	0.159	0.16	128	5	16.1	0.03	0.04	0.76	0.18	8.23	1.075	22.7	0.076	4.2	1.11	0.565	0.025	0.065
FM40	GSCH	K-11-357	141.11	142.5	0.0007	0.588	1.31	20.7	5	57.6	0.25	0.299	0.42	0.268	10.45	14.7	25.1	1.615	74.7	3.72	3.14	0.053	0.306
FM41	QZT	K-11-357	153.15	154.63	0.0004	0.233	0.53	7.19	5	88.2	0.26	0.252	2.25	0.106	11.65	10.6	9.97	1.29	49.6	2.1	1.46	0.047	0.117
FM42	QZT	K-11-357	166.21	167	0.0004	0.156	0.15	2.11	5	17.6	0.04	0.021	1.79	0.087	5.4	1.045	15.2	0.155	2.42	0.65	0.454	0.026	0.034
FM43	QZT	K-12-398	53.82	56.07	0.0006	0.369	0.24	5.98	5	57.6	0.12	0.035	1.92	0.161	11.7	1.725	23	0.36	4.31	1.05	0.679	0.027	0.077
FM44	QZT	K-12-398	83.7	84.48	0.0001	0.892	0.4	10.65	5	47.4	0.23	3.51	3.57	0.505	5.07	1.94	18.95	0.57	91.7	3.01	1.64	0.037	0.157
FM45	QZT	K-12-398	82.58	83.7	0.0001	0.225	0.31	5.53	5	39.2	0.12	0.06	2.28	0.226	10.75	2.81	14.8	0.586	11.05	1.37	0.892	0.039	0.078
FM46	QZT	K-11-349	23.53	25.48	0.0007	0.304	0.09	16.7	5	11.1	0.06	0.206	0.55	0.092	5.86	0.997	16.2	0.092	9.98	0.57	0.313	0.02	0.029
FM47	QZT	K-11-349	70.35	71.73	0.0001	0.173	0.14	1.66	5	40.6	0.02	0.265	0.72	0.026	5.73	0.688	18.7	0.097	6.01	0.78	0.438	0.02	0.036
FM48	QZT	K-12-451	66.21	67.64	0.0016	0.19	0.05	2.77	5	8.8	0.04	0.02	0.44	0.048	5.01	0.651	17.3	0.079	2.31	0.54	0.174	0.015	0.023
FM49	GSCH	K-12-451	83.15	84.41	0.0001	0.457	1.37	11.4	5	101.5	0.4	0.152	1.9	0.825	10.5	10.9	19.2	1.85	24.7	3.35	3.37	0.052	0.168
FM5	QZT	K-12-479	92	95	0.0007	0.269	0.22	3.29	5	33.2	0.07	0.046	1.92	0.629	7.14	1.24	21.4	0.258	5.39	0.91	0.633	0.027	0.055
FM50	QZT	K-12-451	101.27	103.1	0.0001	0.112	0.06	1.3	5	9.7	0.03	0.018	1.27	0.049	5.17	0.508	19.75	0.093	2.07	0.53	0.203	0.015	0.017
FM6	QZT	K-12-479	119.91	120.92	0.0003	0.132	0.09	1.27	5	20.4	0.03	0.026	0.86	0.396	6.64	0.638	19.55	0.118	4.41	0.6	0.319	0.02	0.035
FM7	CQZT	K-12-479	110	111.1	0.0001	0.148	0.23	1.87	5	64.2	0.07	0.032	4.5	0.254	10.75	1.66	18.3	0.154	4.07	0.65	0.725	0.038	0.073
FM8	QZT	K-12-479	65.16	66.96	0.0003	0.063	0.16	1.18	5	51.5	0.04	0.018	1.35	0.066	9.2	0.991	18.8	0.105	1.95	0.59	0.496	0.028	0.04
FM9	GSCH	K-10-320	105.7	109	0.0004	0.434	0.83	17.05	5	192.5	0.26	0.196	2.8	0.75	40.7	9.51	18	1.435	30.4	3.45	2.35	0.086	0.267

SAMPLE	MAJ_LITH	Hole	From_m	To_m	Hg (ppm)	In (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)	Mn (ppm)	Mo (ppm)	Na (%)	Nb (ppm)	Ni (ppm)	P (%)	Pb (ppm)	Pd (ppm)	Pt (ppm)	Rb (ppm)	Re (ppm)	S (%)	Sb (ppm)
FM1	TQZT	K-10-298	47	52	0.028	0.031	0.11	13.95	9.5	0.28	202	0.89	0.026	0.012	23.8	0.12	9.86	0.001	0.001	4.87	0.001	0.4	1.54
FM10	SSCH	K-10-320	109.3	110.7	0.045	0.029	0.17	6.35	25.4	0.88	3210	0.18	0.016	0.006	35.1	0.032	2.03	0.006	0.001	8.9	0.0005	0.47	0.581
FM11	TQZT	K-10-320	118.35	122.7	0.043	0.033	0.17	6.79	14.6	1.26	417	3.11	0.033	0.01	34	0.047	8.17	0.003	0.001	9.67	0.005	1.31	0.648
FM12	QZT	K-11-346	76.46	79	0.008	0.021	0.02	2.85	1.2	0.03	76.7	0.54	0.003	0.008	3.2	0.016	3.7	0.001	0.001	2.13	0.0005	0.13	0.549
FM13	CSCH	K-11-346	109.6	112.78	0.02	0.014	0.25	10.9	57.3	0.95	761	0.11	0.057	0.008	38.5	0.039	3.89	0.003	0.001	12.7	0.0005	0.06	0.042
FM14	GSCH	K-11-346	119	120.75	0.035	0.041	0.15	14.2	17	0.52	387	1.51	0.037	0.011	38.4	0.102	10.35	0.001	0.001	7.63	0.002	0.19	1.845
FM15	QZT	K-11-346	127	128.2	0.017	0.013	0.04	4.83	8.6	0.26	172.5	0.41	0.009	0.009	5.05	0.045	3.67	0.0005	0.001	2.12	0.0005	0.3	0.437
FM16	QZT	K-12-405	110.49	110.7	0.008	0.014	0.28	6.81	32.2	0.93	1585	0.11	0.019	0.005	40.4	0.04	4.83	0.007	0.001	14.65	0.0005	0.4	0.175
FM17	SSCH	K-12-405	98.86	100.21	0.009	0.01	0.02	2.47	1.6	0.04	84.7	0.43	0.003	0.01	3.44	0.016	3.06	0.0005	0.001	1.835	0.0005	0.26	0.908
FM18	SSCH	K-12-405	135.52	137.2	0.01	0.02	0.23	17.6	64.5	1.15	1810	0.1	0.016	0.005	49	0.049	3.55	0.005	0.001	13.15	0.0005	0.02	2.32
FM19	TQZT	K-11-345	80.32	82.35	0.061	0.023	0.1	7.54	8.8	0.09	152.5	4.75	0.036	0.013	17.15	0.05	7.76	0.001	0.001	4.71	0.007	1.29	0.615
FM2	SSCH	K-10-298	60.48	63.99	0.006	0.037	0.09	9.21	7.4	0.3	151.5	0.4	0.015	0.007	7.75	0.059	5.34	0.003	0.001	3.75	0.0005	0.3	0.537
FM20	SSCH	K-11-345	100.61	103.3	0.007	0.012	0.21	6.94	39.1	0.96	517	0.12	0.048	0.008	38.6	0.026	2.34	0.005	0.001	10.85	0.0005	0.11	0.088
FM21	TQZT	K-11-345	106.68	108.22	0.099	0.034	0.19	6.62	4.4	0.91	209	13	0.043	0.009	37.4	0.039	8.71	0.002	0.001	9.53	0.011	1.27	1.055
FM22	QZT	K-11-345	119.6	121.92	0.018	0.009	0.06	7.33	3.2	0.05	57.7	0.51	0.011	0.011	8.29	0.032	3.74	0.002	0.001	3.1	0.002	0.39	0.527
FM23	GSCH	K-12-402	11.18	12.02	0.051	0.027	0.25	30.6	30.9	0.66	926	1.28	0.054	0.008	45.2	0.078	9.97	0.004	0.001	10.95	0.005	0.93	4.48
FM24	QZT	K-12-402	21.01	22.95	0.019	0.006	0.03	4.3	1	0.02	60.8	0.52	0.006	0.011	3.88	0.018	2.75	0.0005	0.001	1.505	0.001	0.25	0.495
FM25	QZT	K-12-402	66.17	69.5	0.009	0.02	0.11	5.61	5.1	0.15	215	0.46	0.01	0.01	8.71	0.038	10.55	0.001	0.001	6.1	0.001	0.64	1.15
FM26	QZT	K-12-469	81.11	82.08	0.065	0.027	0.02	4.23	6.4	0.12	103.5	1.26	0.014	0.012	8.82	0.041	26.4	0.001	0.001	1.28	0.001	0.72	0.901
FM27	QZT	K-12-469	97	97.68	0.011	0.028	0.03	3.57	2.3	0.05	147.5	0.61	0.005	0.012	4.87	0.023	16.85	0.001	0.001	3.02	0.001	0.22	1.37
FM28	CQZT	K-12-469	153.54	155.22	0.006	0.035	0.07	10.7	8.3	0.24	170	0.39	0.01	0.008	11.75	0.039	15.75	0.005	0.001	3.3	0.001	0.43	0.54
FM29	GNST	K-12-469	176.79	179	0.004	0.044	0.005	1.765	20.8	1.94	706	0.34	0.015	0.049	30.4	0.059	7.5	0.018	0.003	0.734	0.0005	0.02	0.912
FM3	TQZT	K-10-298	27.73	30.1	0.005	0.024	0.2	17.05	33.2	0.71	174	2.77	0.091	0.008	30.8	0.069	2.54	0.004	0.001	8.86	0.005	0.06	0.649
FM30	QZT	K-12-421	90.43	91.56	0.022	0.011	0.02	3.09	3.2	0.08	62.5	2.1	0.007	0.011	6.21	0.023	7.01	0.0005	0.001	1.705	0.004	0.32	0.459
FM31	QZT	K-12-421	113.57	114.6	0.018	0.014	0.07	7.75	5.3	0.6	141	5.02	0.013	0.013	14.75	0.052	6.89	0.002	0.001	5.37	0.007	0.58	0.829
FM32	TQZT	K-10-285	94.07	95.8	0.018	0.024	0.11	23	6.9	0.21	90	0.92	0.019	0.012	25.8	0.095	15.65	0.001	0.001	5.27	0.002	1.21	1.91
FM33	TQZT	K-10-285	112.12	113.05	0.013	0.021	0.14	21.7	9.5	0.34	185	0.82	0.016	0.007	23.2	0.061	9.72	0.001	0.001	6.04	0.002	0.73	1.165
FM34	QZT	K-10-285	131.78	140.5	0.004	0.017	0.04	4.95	1.3	0.04	69.8	0.29	0.005	0.011	6.53	0.03	7.48	0.001	0.001	1.94	0.001	0.57	0.634
FM35	QZT	K-12-467	85.96	87.45	0.019	0.019	0.02	2.59	4.4	0.11	80.7	0.62	0.007	0.012	6.97	0.024	6.04	0.0005	0.001	1.465	0.001	0.34	0.573
FM36	QZT	K-12-467	108.52	109.51	0.042	0.013	0.04	4.37	3.8	0.21	123.5	1.19	0.012	0.007	10.2	0.039	6.82	0.001	0.001	1.99	0.002	0.57	0.583
FM37	QZT	K-12-467	183.11	184.04	0.004	0.009	0.03	3.96	3.2	0.08	121	0.24	0.003	0.006	5.61	0.028	7.49	0.0005	0.001	2.26	0.0005	0.28	0.675
FM38	QZT	K-11-357	106.55	107.97	0.007	0.015	0.01	1.945	0.5	0.07	117	0.36	0.002	0.012	2.18	0.019	10.3	0.001	0.001	1.22	0.0005	0.12	0.454
FM39	SSCH	K-11-357	145.36	146.41	0.011	0.024	0.17	5.81	38.5	0.89	577	0.07	0.012	0.006	39.8	0.032	8.6	0.004	0.001	8.99	0.0005	0.29	2.63
FM4	QZT	K-10-298	71.93	74.23	0.006	0.022	0.02	4.24	3.8	0.06	88.6	0.35	0.003	0.014	3.33	0.009	5.55	0.0005	0.001	1.145	0.0005	0.48	0.525
FM40	GSCH	K-11-357	141.11	142.5	0.05	0.032	0.17	5.45	33.4	0.75	335	8.9	0.02	0.006	61.3	0.042	27.5	0.005	0.002	9.07	0.012	2.38	1.195
FM41	QZT	K-11-357	153.15	154.63	0.074	0.027	0.11	5.76	5	0.94	162.5	0.62	0.015	0.004	34.9	0.043	11.45	0.004	0.002	6.09	0.0005	1.1	1.275
FM42	QZT	K-11-357	166.21	167	0.007	0.018	0.02	3.03	4.7	0.08	82.1	0.24	0.004	0.011	3.99	0.038	4.4	0.001	0.001	1.14	0.0005	0.19	0.338
FM43	QZT	K-12-398	53.82	56.07	0.017	0.01	0.07	6.22	3.1	0.06	92.8	1.76	0.014	0.011	8.07	0.033	4.99	0.0005	0.001	3.1	0.003	0.56	0.732
FM44	QZT	K-12-398	83.7	84.48	0.016	0.015	0.07	3.1	5.3	0.31	279	2.58	0.006	0.01	14.75	0.051	15.7	0.002	0.001	6	0.004	1.81	5.37
FM45	QZT	K-12-398	82.58	83.7	0.022	0.013	0.06	5.62	4.4	0.31	159.5	1.2	0.008	0.008	12.25	0.047	6.6	0.002	0.001	5.77	0.004	0.72	1.02
FM46	QZT	K-11-349	23.53	25.48	0.002	0.011	0.01	3.12	2.6	0.03	85.3	0.44	0.004	0.012	3.61	0.018	7.68	0.0005	0.001	1.045	0.0005	0.07	1.4
FM47	QZT	K-11-349	70.35	71.73	0.002	0.006	0.02	2.89	3	0.11	116	0.32	0.003	0.013	2.89	0.021	6.3	0.0005	0.001	0.966	0.0005	0.09	0.685
FM48	QZT	K-12-451	66.21	67.64	0.006	0.0025	0.01	2.59	1.2	0.03	53.1	0.32	0.005	0.013	3.02	0.01	3.42	0.001	0.001	0.603	0.0005	0.19	0.681
FM49	GSCH	K-12-451	83.15	84.41	0.021	0.029	0.1	5.47	19	1.02	667	1.26	0.027	0.008	35.5	0.112	12.1	0.004	0.001	5.42	0.002	0.98	1.24
FM5	QZT	K-12-479	92	95	0.016	0.047	0.03	4.19	5.4	0.09	105.5	0.92	0.02	0.009	6.55	0.028	6.22	0.001	0.001	1.78	0.001	0.38	0.504
FM50	QZT	K-12-451	101.27	103.1	0.005	0.0025	0.01	2.89	1.2	0.04	75.4	0.52	0.003	0.013	2.56	0.018	2.67	0.001	0.001	0.74	0.0005	0.16	0.29
FM6	QZT	K-12-479	119.91	120.92	0.005	0.031	0.02	3.35	1.7	0.06	76.2	0.32	0.005	0.01	2.58	0.014	5.59	0.0005	0.001	1.335	0.0005	0.16	0.288
FM7	CQZT	K-12-479	110	111.1	0.002	0.011	0.06	6.07	1.8	0.2	1450	0.32	0.009	0.01	4.65	0.054	3.38	0.001	0.001	2.92	0.0005	0.07	0.274
FM8	QZT	K-12-479	65.16	66.96	0.002	0.008	0.04	4.78	3.2	0.14	71.2	0.32	0.005	0.009	2.09	0.022	1.575	0.0005	0.001	1.63	0.0005	0.03	0.594
FM9	GSCH	K-10-320	105.7	109	0.078	0.049	0.22	20.7	7.3	1.01	586	13.6	0.045	0.008	38.7	0.08	14.55	0.004	0.001	11.2	0.017	1.68	0.709

SAMPLE	MAJ_LITH	Hole	From_m	To_m	Sc (ppm)	Se (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Th (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
FM1	TQZT	K-10-298	47	52	1.435	0.8	0.19	128	0.0025	0.005	4.17	0.001	0.05	0.927	10.1	0.083	5.18	74.3	4.51
FM10	SSCH	K-10-320	109.3	110.7	2.24	0.7	0.14	122.5	0.0025	0.06	2.33	0.003	0.059	0.41	14	0.066	3.06	78.2	2.11
FM11	TQZT	K-10-320	118.35	122.7	3.24	1.3	0.17	97.2	0.0025	0.04	4.14	0.001	0.081	0.534	17.3	0.023	5.42	91.4	6.95
FM12	QZT	K-11-346	76.46	79	0.237	0.2	5.18	6.52	0.0025	0.01	1.085	0.001	0.052	0.134	1.4	0.049	0.962	20.4	1.89
FM13	CSCH	K-11-346	109.6	112.78	1.82	0.3	0.22	67.2	0.0025	0.05	4.18	0.005	0.073	0.376	23.5	0.202	2.47	101	3.03
FM14	GSCH	K-11-346	119	120.75	3.64	0.9	0.32	54.3	0.0025	0.04	5.15	0.002	0.056	0.997	29.1	0.054	4.44	106.5	6.27
FM15	QZT	K-11-346	127	128.2	0.829	0.4	0.09	41.8	0.0025	0.01	1.485	0.001	0.038	0.379	5.5	0.031	2.77	18.4	2.51
FM16	QZT	K-12-405	110.49	110.7	2.48	0.2	0.2	134.5	0.0025	0.11	2.05	0.005	0.093	0.152	22.1	0.029	2.46	88.2	1.58
FM17	SSCH	K-12-405	98.86	100.21	0.2	0.3	0.83	4.23	0.0025	0.005	0.837	0.001	0.075	0.127	1.6	0.026	0.802	10.3	2.2
FM18	SSCH	K-12-405	135.52	137.2	2.04	0.3	0.2	22.3	0.0025	0.06	5.33	0.007	0.092	0.245	25.5	0.443	3.29	144	2.64
FM19	TQZT	K-11-345	80.32	82.35	0.81	1.2	0.14	28.9	0.0025	0.01	3.1	0.001	0.066	0.635	7.6	0.125	2.66	52.9	6.05
FM2	SSCH	K-10-298	60.48	63.99	1.4	0.6	0.23	274	0.0025	0.01	2.11	0.001	0.034	0.379	8.3	0.028	5.08	47.1	5.58
FM20	SSCH	K-11-345	100.61	103.3	1.865	0.2	0.13	73.5	0.0025	0.11	2.06	0.006	0.06	0.125	22.4	0.182	1.585	89.5	0.92
FM21	TQZT	K-11-345	106.68	108.22	2.5	2.1	0.17	72.8	0.0025	0.07	3.9	0.001	0.095	1.955	17.7	0.233	4.78	81	14.75
FM22	QZT	K-11-345	119.6	121.92	0.498	0.5	0.08	12.2	0.0025	0.01	2.66	0.001	0.035	0.256	3.7	0.212	1.555	24.4	2.47
FM23	GSCH	K-12-402	11.18	12.02	2.49	1.2	0.28	62.6	0.0025	0.03	9.37	0.003	0.11	0.743	25.9	0.065	7.83	116.5	9.76
FM24	QZT	K-12-402	21.01	22.95	0.297	0.2	0.07	12.35	0.0025	0.005	1.095	0.001	0.036	0.188	1.8	0.032	1.135	12.2	1.63
FM25	QZT	K-12-402	66.17	69.5	0.812	0.5	0.59	71.9	0.0025	0.01	2.22	0.001	0.123	0.28	5.7	0.087	3.14	32.3	3.04
FM26	QZT	K-12-469	81.11	82.08	0.864	0.9	0.12	93.7	0.0025	0.01	1.81	0.001	0.044	0.385	3.8	0.028	2.49	29.7	3.19
FM27	QZT	K-12-469	97	97.68	0.309	0.5	0.46	21.3	0.0025	0.01	1.355	0.001	0.051	0.228	2	0.039	1.7	11.2	2.33
FM28	CQZT	K-12-469	153.54	155.22	1.065	0.5	0.15	247	0.0025	0.005	2.62	0.001	0.02	0.322	6.5	0.038	4.21	32.9	2.36
FM29	GNST	K-12-469	176.79	179	3.45	0.4	0.13	59.9	0.0025	0.01	0.123	0.165	0.001	0.019	58.3	0.091	4.7	65.5	0.67
FM3	TQZT	K-10-298	27.73	30.1	2.28	0.4	0.2	66.1	0.0025	0.01	5.69	0.003	0.073	0.707	30.4	0.027	5.44	34.6	5.52
FM30	QZT	K-12-421	90.43	91.56	0.39	0.6	0.08	20	0.0025	0.005	1.125	0.001	0.038	0.253	2.4	0.05	1.335	18.9	2.28
FM31	QZT	K-12-421	113.57	114.6	1.12	1.4	0.08	35.1	0.0025	0.01	3.22	0.003	0.09	1.365	6.9	0.063	3.67	35.6	4.84
FM32	TQZT	K-10-285	94.07	95.8	0.939	1.2	0.14	44.7	0.0025	0.04	6.48	0.001	0.072	0.556	9.3	0.036	4.18	65.4	4.13
FM33	TQZT	K-10-285	112.12	113.05	1.39	1	0.15	16.6	0.0025	0.03	6.87	0.001	0.058	0.683	10.9	0.041	4.59	74.6	6.44
FM34	QZT	K-10-285	131.78	140.5	0.316	0.3	0.06	4.57	0.0025	0.005	1.985	0.001	0.029	0.192	2.2	0.023	1.3	8.7	2.22
FM35	QZT	K-12-467	85.96	87.45	0.468	0.7	0.07	51.2	0.0025	0.01	1.185	0.001	0.033	0.229	2.7	0.018	1.71	23.8	1.95
FM36	QZT	K-12-467	108.52	109.51	0.738	0.4	0.06	32	0.0025	0.01	2.18	0.001	0.034	0.289	4.9	0.027	1.815	24.4	1.97
FM37	QZT	K-12-467	183.11	184.04	0.396	0.2	0.07	5.07	0.0025	0.01	1.22	0.001	0.026	0.09	2.4	0.019	1.66	7.6	1.48
FM38	QZT	K-11-357	106.55	107.97	0.264	0.2	1.05	25.6	0.0025	0.01	0.704	0.0005	0.019	0.129	0.9	0.241	1.25	15.8	1.09
FM39	SSCH	K-11-357	145.36	146.41	2.17	0.5	0.12	35.6	0.0025	0.08	1.71	0.003	0.053	0.136	39.5	0.021	1.73	91.8	1.54
FM4	QZT	K-10-298	71.93	74.23	0.304	0.5	0.11	13.75	0.0025	0.01	1.625	0.001	0.015	0.107	1.9	0.049	1.03	21	2.29
FM40	GSCH	K-11-357	141.11	142.5	1.725	4.5	0.16	38.7	0.0025	0.16	3.92	0.002	0.099	1.595	22.9	0.04	3.2	149	12.5
FM41	QZT	K-11-357	153.15	154.63	1.78	1	0.12	56.8	0.0025	0.07	5.37	0.001	0.056	0.576	10.2	0.037	4.02	78.6	5.44
FM42	QZT	K-11-357	166.21	167	0.437	0.3	0.07	28.8	0.0025	0.005	1.39	0.001	0.014	0.144	2.2	0.049	1.57	11	1.1
FM43	QZT	K-12-398	53.82	56.07	0.49	0.7	0.07	39.2	0.0025	0.03	2.54	0.001	0.044	0.485	3.9	0.513	2.26	19.8	2.83
FM44	QZT	K-12-398	83.7	84.48	1.035	1.8	2.99	59.5	0.0025	0.005	2.66	0.001	0.136	1.91	7.9	0.091	3.17	51.5	6.13
FM45	QZT	K-12-398	82.58	83.7	1.01	0.8	0.28	46.6	0.0025	0.01	2.65	0.001	0.089	1.005	6.8	0.014	2.48	37.9	2.92
FM46	QZT	K-11-349	23.53	25.48	0.239	0.2	1.72	6.56	0.0025	0.005	1.06	0.0005	0.017	0.116	1.8	0.077	0.848	9.3	1.26
FM47	QZT	K-11-349	70.35	71.73	0.316	0.2	0.83	16	0.0025	0.005	1.06	0.001	0.01	0.106	1.9	0.035	0.905	5.8	1.34
FM48	QZT	K-12-451	66.21	67.64	0.173	0.4	0.05	6.84	0.0025	0.005	1.03	0.0005	0.013	0.097	0.7	0.026	0.691	6.1	0.95
FM49	GSCH	K-12-451	83.15	84.41	3.16	0.8	0.15	86.4	0.0025	0.04	3.05	0.002	0.106	0.995	23.2	0.043	5.27	107.5	7.07
FM5	QZT	K-12-479	92	95	0.484	0.6	0.2	43.4	0.0025	0.005	1.355	0.001	0.027	0.167	3.9	0.044	1.655	57.8	1.79
FM50	QZT	K-12-451	101.27	103.1	0.226	0.3	0.06	23.8	0.0025	0.005	0.929	0.0005	0.011	0.07	0.8	0.039	0.873	6.4	0.83
FM6	QZT	K-12-479	119.91	120.92	0.195	0.05	0.16	14.2	0.0025	0.005	1.05	0.001	0.018	0.077	1	0.047	0.798	36.1	1.13
FM7	CQZT	K-12-479	110	111.1	0.741	0.4	0.08	51.1	0.0025	0.01	1.74	0.001	0.022	0.219	5.3	0.025	3.55	22.4	2.51
FM8	QZT	K-12-479	65.16	66.96	0.406	0.1	0.05	27	0.0025	0.01	1.13	0.001	0.007	0.118	2.6	0.023	1.295	10.5	1.34
FM9	GSCH	K-10-320	105.7	109	2.86	3	0.23	182.5	0.0025	0.08	6.66	0.002	0.111	1.425	16.4	0.045	7.87	130.5	10.95

APPENDIX B

SAMPLE	MAJ_LITH	Hole	From_m	To_m	FIZZ RATING	NP (kgCaCO3/tonne)	NPCa (kgCaCO3/tonne)	MPA (kgCaCO3/tonne)	MPA [SS] (kgCaCO3/tonne)	NNP (kgCaCO3/tonne)	NPR	S (Tot)	Paste pH	S(Sulphide)	SO4 (HCl)	C (%)	CO2 (%)	%SO4	Ca+Mg (%)
FM1	TQZT	K-10-298	47	52	2	60	72.90466	10.3	4.06	50	5.82	0.33	8.1	0.13	0.2	0.73	2.7	0.606	3
FM10	SSCH	K-10-320	109.3	110.7	2	46	34.98714	11.6	10.94	34	3.98	0.37	8.7	0.35	0.02	0.65	2.4	0.054	2.11
FM11	TQZT	K-10-320	118.35	122.7	3	117	81.81146	36.6	36.56	80	3.2	1.17	8.2	1.17	0.005	1.53	5.6	0.004	4.33
FM12	QZT	K-11-346	76.46	79	2	14	17.6825	3.1	3.13	11	4.48	0.1	8.2	0.1	0.005	0.15	0.6	0.050	0.58
FM13	CSCH	K-11-346	109.6	112.78	2	15	12.33842	1.9	1.56	13	8	0.06	8.8	0.05	0.01	0.16	0.6	0.167	1.29
FM14	GSCH	K-11-346	119	120.75	2	31	27.09826	4.4	4.38	27	7.09	0.14	8.7	0.14	0.005	0.39	1.4	0.036	1.44
FM15	QZT	K-11-346	127	128.2	2	61	67.56058	7.5	7.50	54	8.13	0.24	8.9	0.24	0.005	0.73	2.7	0.021	2.77
FM16	QZT	K-12-405	110.49	110.7	2	27	20.99074	10.6	10.63	16	2.54	0.34	8.9	0.34	0.005	0.33	1.2	0.015	1.61
FM17	SSCH	K-12-405	98.86	100.21	1	10	13.61082	6.6	6.56	3	1.52	0.21	8.3	0.21	0.005	0.11	0.4	0.024	0.43
FM18	SSCH	K-12-405	135.52	137.2	2	16	13.35634	0.6	0.63	15	25.6	0.02	8.8	0.02	0.005	0.16	0.6	0.250	1.53
FM19	TQZT	K-11-345	80.32	82.35	2	30	38.0409	36.3	36.25	-6	0.83	1.16	8.2	1.16	0.005	0.33	1.2	0.004	1.44
FM2	SSCH	K-10-298	60.48	63.99	3	214	221.52098	7.5	7.50	207	28.53	0.24	8.1	0.24	0.005	2.45	9	0.021	8.86
FM20	SSCH	K-11-345	100.61	103.3	1	9	8.26674	4.7	2.19	4	1.92	0.15	8.7	0.07	0.08	0.08	0.3	0.533	1.14
FM21	TQZT	K-11-345	106.68	108.22	3	89	58.14482	34.4	34.38	55	2.59	1.1	8.4	1.1	0.005	1.09	4	0.005	3.05
FM22	QZT	K-11-345	119.6	121.92	2	13	17.42802	10.6	10.63	2	1.22	0.34	7.8	0.34	0.005	0.15	0.6	0.015	0.59
FM23	GSCH	K-12-402	11.18	12.02	2	51	54.83658	26.6	26.56	24	1.92	0.85	8.3	0.85	0.005	0.56	2.1	0.006	2.67
FM24	QZT	K-12-402	21.01	22.95	2	17	22.26314	6.3	6.25	11	2.72	0.2	7.9	0.2	0.005	0.21	0.8	0.025	0.75
FM25	QZT	K-12-402	66.17	69.5	3	103	108.27738	16.6	16.25	86	6.22	0.53	8.6	0.52	0.01	1.13	4.1	0.019	4.26
FM26	QZT	K-12-469	81.11	82.08	3	151	161.97266	19.1	19.06	132	7.92	0.61	8.4	0.61	0.005	1.75	6.4	0.008	6.34
FM27	QZT	K-12-469	97	97.68	2	46	54.5821	5.6	5.63	40	8.18	0.18	8.3	0.18	0.005	0.55	2	0.028	2.05
FM28	CQZT	K-12-469	153.54	155.22	3	161	166.29882	10.6	10.63	150	15.15	0.34	8.5	0.34	0.005	1.83	6.7	0.015	6.63
FM29	GNST	K-12-469	176.79	179	1	16	30.4065	0.6	0.63	15	25.6	0.02	8.3	0.02	0.005	0.12	0.5	0.250	2.99
FM3	TQZT	K-10-298	27.73	30.1	3	84	76.2129	1.3	1.25	83	67.2	0.04	9.5	0.04	0.005	0.77	2.8	0.125	3.56
FM30	QZT	K-12-421	90.43	91.56	2	38	45.16634	8.1	8.13	30	4.68	0.26	8.3	0.26	0.005	0.46	1.7	0.019	1.71
FM31	QZT	K-12-421	113.57	114.6	3	97	79.52114	15.6	15.63	81	6.21	0.5	8.5	0.5	0.005	1.12	4.1	0.010	3.58
FM32	TQZT	K-10-285	94.07	95.8	2	24	25.82586	36.3	36.25	-12	0.66	1.16	7.7	1.16	0.005	0.28	1	0.004	1.08
FM33	TQZT	K-10-285	112.12	113.05	2	20	20.2273	20.6	20.63	-1	0.97	0.66	8.3	0.66	0.005	0.22	0.8	0.008	0.99
FM34	QZT	K-10-285	131.78	140.5	1	5	9.28466	15.9	15.94	-11	0.31	0.51	7.9	0.51	0.005	0.07	0.3	0.010	0.26
FM35	QZT	K-12-467	85.96	87.45	3	89	90.71826	9.1	9.06	80	9.82	0.29	8.5	0.29	0.005	1	3.7	0.017	3.53
FM36	QZT	K-12-467	108.52	109.51	2	46	46.69322	15.3	15.31	31	3	0.49	8.4	0.49	0.005	0.58	2.1	0.010	1.9
FM37	QZT	K-12-467	183.11	184.04	1	8	12.5929	7.2	7.19	1	1.11	0.23	8	0.23	0.005	0.1	0.4	0.022	0.43
FM38	QZT	K-11-357	106.55	107.97	3	65	65.52474	3.1	3.13	62	20.8	0.1	8.4	0.1	0.005	0.7	2.6	0.050	2.5
FM39	SSCH	K-11-357	145.36	146.41	2	13	10.55706	7.5	7.50	6	1.73	0.24	8.7	0.24	0.005	0.12	0.4	0.021	1.16
FM4	QZT	K-10-298	71.93	74.23	2	18	23.02658	13.1	13.13	5	1.37	0.42	8.6	0.42	0.005	0.21	0.8	0.012	0.82
FM40	GSCH	K-11-357	141.11	142.5	2	19	14.37426	80	80.00	-61	0.24	2.56	7.8	2.56	0.005	0.21	0.8	0.002	1.17
FM41	QZT	K-11-357	153.15	154.63	2	73	60.9441	33.4	33.44	40	2.18	1.07	8.3	1.07	0.005	1.15	4.2	0.005	3.19
FM42	QZT	K-11-357	166.21	167	2	41	49.23802	5	5.00	36	8.2	0.16	8.3	0.16	0.005	0.49	1.8	0.031	1.87
FM43	QZT	K-12-398	53.82	56.07	2	44	52.54626	15.6	15.63	28	2.82	0.5	8.3	0.5	0.005	0.51	1.9	0.010	1.98
FM44	QZT	K-12-398	83.7	84.48	3	94	94.53546	53.1	53.13	41	1.77	1.7	8.2	1.7	0.005	1.19	4.4	0.003	3.88
FM45	QZT	K-12-398	82.58	83.7	3	66	61.70754	19.7	19.69	46	3.35	0.63	8.3	0.63	0.005	0.75	2.8	0.008	2.59
FM46	QZT	K-11-349	23.53	25.48	2	12	17.6825	1.6	1.56	10	7.68	0.05	8.4	0.05	0.005	0.16	0.6	0.100	0.58
FM47	QZT	K-11-349	70.35	71.73	2	19	22.00866	2.2	2.19	17	8.69	0.07	8.3	0.07	0.005	0.24	0.9	0.071	0.83
FM48	QZT	K-12-451	66.21	67.64	2	11	14.88322	5	4.06	6	2.2	0.16	8	0.13	0.03	0.14	0.5	0.188	0.47
FM49	GSCH	K-12-451	83.15	84.41	2	62	52.0373	29.1	29.06	33	2.13	0.93	8.6	0.93	0.005	0.94	3.4	0.005	2.92
FM5	QZT	K-12-479	92	95	2	45	52.54626	10	9.38	35	4.5	0.32	8.9	0.3	0.02	0.52	1.9	0.063	2.01
FM50	QZT	K-12-451	101.27	103.1	2	31	36.00506	4.1	4.06	27	7.63	0.13	8.2	0.13	0.005	0.38	1.4	0.038	1.31
FM6	QZT	K-12-479	119.91	120.92	2	21	25.57138	3.8	3.44	17	5.6	0.12	8.5	0.11	0.01	0.26	1	0.083	0.92
FM7	CQZT	K-12-479	110	111.1	3	116	118.2021	1.6	1.56	114	74.24	0.05	8.9	0.05	0.005	1.36	5	0.100	4.7
FM8	QZT	K-12-479	65.16	66.96	2	34	38.0409	0.6	0.63	33	54.4	0.02	8.9	0.02	0.005	0.43	1.6	0.250	1.49
FM9	GSCH	K-10-320	105.7	109	3	103	74.9405	46.9	46.88	56	2.2	1.5	8.6	1.5	0.005	1.35	4.9	0.003	3.81

Statistic	FIZZ RATING | CQZT	FIZZ RATING | CSCH	FIZZ RATING | GNST	FIZZ RATING | GSCH	FIZZ RATING | QZT	FIZZ RATING | SSCH	FIZZ RATING | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	3.000	2.000	1.000	2.000	1.000	1.000	2.000
Maximum	3.000	2.000	1.000	3.000	3.000	3.000	3.000
1st Quartile	3.000	2.000	1.000	2.000	2.000	1.250	2.000
Median	3.000	2.000	1.000	2.000	2.000	2.000	2.000
3rd Quartile	3.000	2.000	1.000	2.000	2.250	2.000	3.000
Mean	3.000	2.000	1.000	2.200	2.179	1.833	2.429
Variance (n-1)	0.000			0.200	0.300	0.567	0.286
Standard deviation (n-1)	0.000			0.447	0.548	0.753	0.535
Skewness (Pearson)				1.500	0.114	0.228	0.289
Geometric mean	3.000	2.000	1.000	2.169	2.106	1.698	2.380

Statistic	NP (kgCaCO3/tonne) | CQZT	NP (kgCaCO3/tonne) | CSCH	NP (kgCaCO3/tonne) | GNST	NP (kgCaCO3/tonne) | GSCH	NP (kgCaCO3/tonne) | QZT	NP (kgCaCO3/tonne) | SSCH	NP (kgCaCO3/tonne) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	116.000	15.000	16.000	19.000	5.000	9.000	20.000
Maximum	161.000	15.000	16.000	103.000	151.000	214.000	117.000
1st Quartile	127.250	15.000	16.000	31.000	17.750	10.750	27.000
Median	138.500	15.000	16.000	51.000	39.500	14.500	60.000
3rd Quartile	149.750	15.000	16.000	62.000	65.250	38.500	86.500
Mean	138.500	15.000	16.000	53.200	46.036	51.333	60.571
Variance (n-1)	1012.500			1056.200	1265.369	6541.467	1409.952
Standard deviation (n-1)	31.820			32.499	35.572	80.879	37.549
Skewness (Pearson)	0.000	0.000	0.000	0.596	1.115	1.680	0.242
Geometric mean	136.660	15.000	16.000	45.351	33.553	23.855	49.763

Statistic	MPA (kgCaCO3/tonne) | CQZT	MPA (kgCaCO3/tonne) | CSCH	MPA (kgCaCO3/tonne) | GNST	MPA (kgCaCO3/tonne) | GSCH	MPA (kgCaCO3/tonne) | QZT	MPA (kgCaCO3/tonne) | SSCH	MPA (kgCaCO3/tonne) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	1.600	1.900	0.600	4.400	0.600	0.600	1.300
Maximum	10.600	1.900	0.600	80.000	53.100	11.600	36.600
1st Quartile	3.850	1.900	0.600	26.600	4.775	5.175	15.450
Median	6.100	1.900	0.600	29.100	8.600	7.050	34.400
3rd Quartile	8.350	1.900	0.600	46.900	15.600	7.500	36.300
Mean	6.100	1.900	0.600	37.400	11.461	6.417	25.114
Variance (n-1)	40.500			794.885	118.208	13.206	212.558
Standard deviation (n-1)	6.364			28.194	10.872	3.634	14.579
Skewness (Pearson)	0.000	0.000	0.000	0.504	2.291	-0.274	-0.682
Geometric mean	4.118	1.900	0.600	26.381	7.833	4.794	17.267

Statistic	NNP (kgCaCO3/tonne) | CQZT	NNP (kgCaCO3/tonne) | CSCH	NNP (kgCaCO3/tonne) | GNST	NNP (kgCaCO3/tonne) | GSCH	NNP (kgCaCO3/tonne) | QZT	NNP (kgCaCO3/tonne) | SSCH	NNP (kgCaCO3/tonne) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	114.000	13.000	15.000	-61.000	-11.000	3.000	-12.000
Maximum	150.000	13.000	15.000	56.000	132.000	207.000	83.000
1st Quartile	123.000	13.000	15.000	24.000	11.000	4.500	-3.500
Median	132.000	13.000	15.000	27.000	30.500	10.500	50.000
3rd Quartile	141.000	13.000	15.000	33.000	42.250	29.250	67.500
Mean	132.000	13.000	15.000	15.800	34.536	44.833	35.571
Variance (n-1)	648.000			2000.700	981.073	6446.167	1689.619
Standard deviation (n-1)	25.456			44.729	31.322	80.288	41.105
Skewness (Pearson)	0.000	0.000	0.000	-1.190	1.242	1.709	-0.061
Geometric mean	130.767	13.000	15.000			14.022	

Statistic	NPR | CQZT	NPR | CSCH	NPR | GNST	NPR | GSCH	NPR | QZT	NPR | SSCH	NPR | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	15.150	8.000	25.600	0.240	0.310	1.520	0.660
Maximum	74.240	8.000	25.600	7.090	54.400	28.530	67.200
1st Quartile	29.923	8.000	25.600	1.920	2.455	1.778	0.900
Median	44.695	8.000	25.600	2.130	4.590	2.950	2.590
3rd Quartile	59.468	8.000	25.600	2.200	7.973	20.195	4.510
Mean	44.695	8.000	25.600	2.716	7.062	10.547	11.610
Variance (n-1)	1745.814			6.626	102.892	165.352	604.197
Standard deviation (n-1)	41.783			2.574	10.144	12.859	24.580
Skewness (Pearson)	0.000	0.000	0.000	1.109	3.867	0.709	2.018
Geometric mean	33.537	8.000	25.600	1.726	4.279	4.948	2.899

Statistic	S (Tot) | CQZT	S (Tot) | CSCH	S (Tot) | GNST	S (Tot) | GSCH	S (Tot) | QZT	S (Tot) | SSCH	S (Tot) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	0.050	0.060	0.020	0.140	0.020	0.020	0.040
Maximum	0.340	0.060	0.020	2.560	1.700	0.370	1.170
1st Quartile	0.123	0.060	0.020	0.850	0.153	0.165	0.495
Median	0.195	0.060	0.020	0.930	0.275	0.225	1.100
3rd Quartile	0.268	0.060	0.020	1.500	0.500	0.240	1.160
Mean	0.195	0.060	0.020	1.196	0.367	0.205	0.803
Variance (n-1)	0.042			0.815	0.121	0.013	0.217
Standard deviation (n-1)	0.205			0.903	0.348	0.116	0.466
Skewness (Pearson)	0.000	0.000	0.000	0.505	2.290	-0.271	-0.685
Geometric mean	0.130	0.060	0.020	0.843	0.251	0.154	0.549

Statistic	Paste pH | CQZT	Paste pH | CSCH	Paste pH | GNST	Paste pH | GSCH	Paste pH | QZT	Paste pH | SSCH	Paste pH | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	8.500	8.800	8.300	7.800	7.800	8.100	7.700
Maximum	8.900	8.800	8.300	8.700	8.900	8.800	9.500
1st Quartile	8.600	8.800	8.300	8.300	8.200	8.400	8.150
Median	8.700	8.800	8.300	8.600	8.300	8.700	8.200
3rd Quartile	8.800	8.800	8.300	8.600	8.500	8.700	8.350
Mean	8.700	8.800	8.300	8.400	8.364	8.550	8.343
Variance (n-1)	0.080			0.135	0.091	0.079	0.310
Standard deviation (n-1)	0.283			0.367	0.301	0.281	0.556
Skewness (Pearson)	0.000	0.000	0.000	-0.980	0.218	-0.799	1.321
Geometric mean	8.698	8.800	8.300	8.393	8.359	8.546	8.328

Statistic	S(Sulphide) | CQZT	S(Sulphide) | CSCH	S(Sulphide) | GNST	S(Sulphide) | GSCH	S(Sulphide) | QZT	S(Sulphide) | SSCH	S(Sulphide) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	0.050	0.050	0.020	0.140	0.020	0.020	0.040
Maximum	0.340	0.050	0.020	2.560	1.700	0.350	1.170
1st Quartile	0.123	0.050	0.020	0.850	0.130	0.105	0.395
Median	0.195	0.050	0.020	0.930	0.275	0.225	1.100
3rd Quartile	0.268	0.050	0.020	1.500	0.500	0.240	1.160
Mean	0.195	0.050	0.020	1.196	0.364	0.188	0.774
Variance (n-1)	0.042			0.815	0.122	0.015	0.255
Standard deviation (n-1)	0.205			0.903	0.349	0.122	0.505
Skewness (Pearson)	0.000	0.000	0.000	0.505	2.288	-0.232	-0.636
Geometric mean	0.130	0.050	0.020	0.843	0.247	0.135	0.481

Statistic	SO4 (HCl) | CQZT	SO4 (HCl) | CSCH	SO4 (HCl) | GNST	SO4 (HCl) | GSCH	SO4 (HCl) | QZT	SO4 (HCl) | SSCH	SO4 (HCl) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	0.005	0.010	0.005	0.005	0.005	0.005	0.005
Maximum	0.005	0.010	0.005	0.005	0.030	0.080	0.200
1st Quartile	0.005	0.010	0.005	0.005	0.005	0.005	0.005
Median	0.005	0.010	0.005	0.005	0.005	0.005	0.005
3rd Quartile	0.005	0.010	0.005	0.005	0.005	0.016	0.005
Mean	0.005	0.010	0.005	0.005	0.007	0.020	0.033
Variance (n-1)	0.000			0.000	0.000	0.001	0.005
Standard deviation (n-1)	0.000			0.000	0.005	0.030	0.074
Skewness (Pearson)					3.381	1.643	2.041
Geometric mean	0.005	0.010	0.005	0.005	0.006	0.010	0.008

Statistic	C (%) | CQZT	C (%) | CSCH	C (%) | GNST	C (%) | GSCH	C (%) | QZT	C (%) | SSCH	C (%) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	1.360	0.160	0.120	0.210	0.070	0.080	0.220
Maximum	1.830	0.160	0.120	1.350	1.750	2.450	1.530
1st Quartile	1.478	0.160	0.120	0.390	0.210	0.113	0.305
Median	1.595	0.160	0.120	0.560	0.475	0.140	0.730
3rd Quartile	1.713	0.160	0.120	0.940	0.735	0.528	0.930
Mean	1.595	0.160	0.120	0.690	0.552	0.595	0.707
Variance (n-1)	0.110			0.209	0.176	0.872	0.232
Standard deviation (n-1)	0.332			0.457	0.420	0.934	0.481
Skewness (Pearson)	0.000	0.000	0.000	0.478	1.047	1.599	0.591
Geometric mean	1.578	0.160	0.120	0.566	0.407	0.254	0.568

Statistic	CO2 (%) | CQZT	CO2 (%) | CSCH	CO2 (%) | GNST	CO2 (%) | GSCH	CO2 (%) | QZT	CO2 (%) | SSCH	CO2 (%) | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	5.000	0.600	0.500	0.800	0.300	0.300	0.800
Maximum	6.700	0.600	0.500	4.900	6.400	9.000	5.600
1st Quartile	5.425	0.600	0.500	1.400	0.800	0.400	1.100
Median	5.850	0.600	0.500	2.100	1.750	0.500	2.700
3rd Quartile	6.275	0.600	0.500	3.400	2.725	1.950	3.400
Mean	5.850	0.600	0.500	2.520	2.039	2.183	2.586
Variance (n-1)	1.445			2.707	2.337	11.786	3.128
Standard deviation (n-1)	1.202			1.645	1.529	3.433	1.769
Skewness (Pearson)	0.000	0.000	0.000	0.477	1.050	1.596	0.582
Geometric mean	5.788	0.600	0.500	2.083	1.525	0.924	2.069

Statistic	%SO4 | CQZT	%SO4 | CSCH	%SO4 | GNST	%SO4 | GSCH	%SO4 | QZT	%SO4 | SSCH	%SO4 | TQZT
No. of observations	2	1	1	5	28	6	7
Minimum	0.015	0.167	0.250	0.002	0.003	0.021	0.004
Maximum	0.100	0.167	0.250	0.036	0.250	0.533	0.606
1st Quartile	0.036	0.167	0.250	0.003	0.010	0.022	0.004
Median	0.057	0.167	0.250	0.005	0.020	0.039	0.005
3rd Quartile	0.079	0.167	0.250	0.006	0.050	0.201	0.066
Mean	0.057	0.167	0.250	0.010	0.042	0.150	0.108
Variance (n-1)	0.004	0.000	0.000	0.000	0.003	0.043	0.050
Standard deviation (n-1)	0.060	0.000	0.000	0.014	0.056	0.208	0.224
Skewness (Pearson)	0.000	0.000	0.000	1.453	2.504	1.220	1.888
Geometric mean	0.038	0.167	0.250	0.006	0.023	0.065	0.015

APPENDIX C

SAMPLE	MAJ_LITH	Hole	From_m	To_m	Alk(t) (as CaCO3)	Bromide (Br)	Chloride (Cl)	Cond.	Fluoride (F)	Nitrate (as N)	Nitrite (as N)	pH	Sulfate (SO4)	Hardness	Anion Sum	Cation Sum	Cation - Anion Balance	Al_LCH (mg/L)	Sb_LCH (mg/L)	As_LCH (mg/L)	Ba_LCH (mg/L)
FM1	TQZT	K-10-298	47	52	41.2	0.5	5	2510	4.49	0.05	0.01	7.87	1710	1550.77	36.6	33.6	-4.2	0.066	0.00678	0.0015	0.228
FM10	SSCH	K-10-320	109.3	110.7	148	0.025	3.15	371	1.48	0.0244	0.0168	8.68	24.1	75.80	3.63	3.57	-0.7	0.910	0.0221	0.0012	0.228
FM11	TQZT	K-10-320	118.35	122.7	201	0.025	1.94	592	0.826	0.0240	0.0085	8.51	92.1	164.19	6.04	5.92	-1.0	0.565	0.0140	0.0005	0.0332
FM12	QZT	K-11-346	76.46	79	61.5	0.025	0.62	154	0.325	0.0149	0.0034	8.69	17.8	52.42	1.64	1.34	-9.8	0.0361	0.0116	0.0011	0.0089
FM13	CSCH	K-11-346	109.6	112.78	104	0.025	0.25	276	2.21	0.0143	0.0093	8.97	26.5	35.36	2.74	2.50	-4.6	1.41	0.00099	0.0005	0.264
FM14	GSCH	K-11-346	119	120.75	131	0.025	0.52	322	0.879	0.0095	0.0040	8.64	23.9	51.82	3.18	3.14	-0.6	0.645	0.0472	0.0093	0.0142
FM15	QZT	K-11-346	127	128.2	87.3	0.025	0.67	256	0.501	0.0177	0.0079	8.76	35.7	84.51	2.54	2.44	-1.9	0.739	0.0123	0.0013	0.0224
FM16	QZT	K-12-405	110.49	110.7	143	0.025	0.25	357	1.65	0.0350	0.0615	8.87	20.3	53.42	3.37	3.37	0.0	1.14	0.00655	0.0005	0.425
FM17	SSCH	K-12-405	98.86	100.21	61.7	0.025	0.51	169	0.527	0.0374	0.0076	8.95	25.2	58.43	1.80	1.44	-11.1	0.109	0.0270	0.0028	0.0078
FM18	SSCH	K-12-405	135.52	137.2	112	0.025	0.25	229	1.81	0.0281	0.0269	8.98	5.60	24.13	2.45	2.91	8.6	6.17	0.0213	0.0005	0.421
FM19	TQZT	K-11-345	80.32	82.35	87.5	0.025	2.29	460	1.09	0.0308	0.0044	8.41	130	101.45	4.58	4.11	-5.4	0.489	0.0104	0.0014	0.0192
FM2	SSCH	K-10-298	60.48	63.99	102	0.25	2.5	743	0.1	0.025	0.040	7.98	291	280.29	8.11	7.30	-5.2	0.302	0.00275	0.0005	0.0501
FM20	SSCH	K-11-345	100.61	103.3	98.5	0.025	0.25	236	1.63	0.0320	0.0756	9.08	19.4	21.03	2.46	2.40	-1.3	2.72	0.00401	0.0005	0.471
FM21	TQZT	K-11-345	106.68	108.22	186	0.125	1.25	665	1.19	0.056	0.0072	8.44	138	177.73	6.67	6.64	-0.2	0.586	0.0335	0.0016	0.0490
FM22	QZT	K-11-345	119.6	121.92	81.8	0.025	2.90	289	0.881	0.0169	0.0022	8.40	56.0	84.38	2.93	2.57	-6.5	0.245	0.0107	0.0005	0.0385
FM23	GSCH	K-12-402	11.18	12.02	109	0.025	0.25	514	0.729	0.0364	0.0064	8.41	128	75.13	4.89	4.74	-1.6	0.482	0.0261	0.0005	0.0215
FM24	QZT	K-12-402	21.01	22.95	49.1	0.025	0.25	184	0.457	0.0185	0.0049	8.48	37.5	60.00	1.79	1.65	-4.0	0.0385	0.0127	0.0018	0.0110
FM25	QZT	K-12-402	66.17	69.5	82.2	0.025	0.25	270	0.449	0.0455	0.0354	8.88	41.6	40.94	2.54	2.26	-5.7	1.65	0.0359	0.0020	0.0112
FM26	QZT	K-12-469	81.11	82.08	66.3	0.025	0.81	238	0.068	0.0111	0.0018	8.33	48.5	85.84	2.36	2.26	-2.2	0.473	0.0133	0.0005	0.0151
FM27	QZT	K-12-469	97	97.68	49.1	0.025	1.62	149	0.219	0.0144	0.0021	8.69	18.7	46.61	1.43	1.34	-3.1	0.112	0.0196	0.0012	0.0065
FM28	CQZT	K-12-469	153.54	155.22	52.5	0.025	2.05	220	0.087	0.0256	0.0071	8.48	17.7	51.13	1.48	2.03	15.7	0.660	0.0113	0.0010	0.0102
FM29	GNST	K-12-469	176.79	179	46.7	0.025	0.25	94.7	0.145	0.0065	0.0011	8.90	2.62	33.83	1.00	1.01	0.8	0.146	0.00814	0.0013	0.0065
FM3	TQZT	K-10-298	27.73	30.1	167	0.025	0.71	309	1.13	0.0359	0.0505	9.22	12.8	10.26	3.69	3.70	0.2	5.11	0.0430	0.0042	0.0066
FM30	QZT	K-12-421	90.43	91.56	59.4	0.025	0.25	180	0.273	0.0131	0.0016	8.60	29.5	68.03	1.81	1.73	-2.5	0.244	0.0106	0.0011	0.0095
FM31	QZT	K-12-421	113.57	114.6	130	0.025	0.25	344	0.489	0.0210	0.0047	8.52	42.5	115.41	3.51	3.30	-3.2	0.395	0.0281	0.0011	0.0142
FM32	TQZT	K-10-285	94.07	95.8	70.0	0.025	2.01	489	0.960	0.0128	0.0005	8.11	157	133.45	4.77	4.31	-5.0	0.0577	0.0317	0.0005	0.0505
FM33	TQZT	K-10-285	112.12	113.05	98.9	0.025	5.52	334	1.00	0.0247	0.0102	8.50	46.5	63.24	3.16	2.88	-4.5	0.486	0.0308	0.0020	0.0190
FM34	QZT	K-10-285	131.78	140.5	58.4	0.025	6.28	213	0.724	0.0215	0.0016	8.33	30.0	62.02	2.01	1.82	-5.0	0.130	0.0119	0.0011	0.0142
FM35	QZT	K-12-467	85.96	87.45	61.7	0.025	0.25	164	0.138	0.0099	0.0013	8.65	19.0	57.20	1.64	1.55	-2.8	0.452	0.0130	0.0005	0.0072
FM36	QZT	K-12-467	108.52	109.51	103	0.025	0.70	287	0.385	0.0122	0.0011	8.46	40.6	98.39	2.94	2.76	-3.3	0.278	0.00850	0.0005	0.0126
FM37	QZT	K-12-467	183.11	184.04	47.7	0.025	0.83	167	0.563	0.0229	0.0035	8.65	25.7	51.33	1.54	1.43	-3.6	0.0653	0.0158	0.0014	0.0145
FM38	QZT	K-11-357	106.55	107.97	55.0	0.025	0.25	125	0.101	0.0082	0.0011	8.71	8.70	48.26	1.29	1.17	-4.6	0.0260	0.00941	0.0005	0.0055
FM39	SSCH	K-11-357	145.36	146.41	108	0.025	0.25	230	1.33	0.0224	0.0384	8.97	7.05	27.63	2.38	2.47	1.7	3.84	0.129	0.0018	0.460
FM4	QZT	K-10-298	71.93	74.23	68.0	0.025	1.10	174	0.175	0.0163	0.0034	8.52	23.2	59.51	1.88	1.58	-8.8	0.0576	0.00833	0.0065	0.0081
FM40	GSCH	K-11-357	141.11	142.5	97.7	0.025	0.25	477	0.774	0.0148	0.0033	8.24	119	106.53	4.47	4.36	-1.3	0.210	0.0169	0.0005	0.142
FM41	QZT	K-11-357	153.15	154.63	127	0.025	0.25	486	0.792	0.0086	0.0025	8.30	110	159.69	4.89	4.74	-1.5	0.267	0.0438	0.0005	0.0248
FM42	QZT	K-11-357	166.21	167	48.5	0.025	0.25	488	0.256	0.0079	0.0013	8.67	32.7	57.82	1.66	1.51	-4.8	0.102	0.00488	0.0005	0.0069
FM43	QZT	K-12-398	53.82	56.07	76.0	0.025	0.25	172	0.602	0.0299	0.0052	8.54	44.5	56.71	2.48	2.24	-5.1	0.349	0.0130	0.0019	0.0106
FM44	QZT	K-12-398	83.7	84.48	57.6	0.025	0.50	255	0.593	0.0183	0.0005	8.65	65.3	66.36	2.56	2.36	-3.9	0.115	0.0341	0.0005	0.0147
FM45	QZT	K-12-398	82.58	83.7	92.9	0.025	0.25	313	0.440	0.0182	0.0033	8.44	57.5	101.69	3.08	2.89	-3.2	0.265	0.00946	0.0005	0.0114
FM46	QZT	K-11-349	23.53	25.48	47.5	0.025	1.02	121	0.297	0.0329	0.0005	8.73	7.45	42.81	1.15	1.17	0.9	0.0624	0.00654	0.0119	0.0191
FM47	QZT	K-11-349	70.35	71.73	78.9	0.025	7.82	169	0.330	0.0311	0.0034	8.69	5.50	65.27	1.93	1.57	-10.3	0.0167	0.0117	0.0048	0.0271
FM48	QZT	K-12-451	66.21	67.64	48.5	0.025	1.00	161	0.205	0.0083	0.0005	8.54	26.8	62.52	1.57	1.48	-2.8	0.0223	0.0155	0.0015	0.0053
FM49	GSCH	K-12-451	83.15	84.41	131	0.025	0.97	313	0.557	0.0071	0.0030	8.54	31.5	78.96	3.34	3.08	-4.0	0.421	0.0361	0.0016	0.0149
FM5	QZT	K-12-479	92	95	76.2	0.025	0.56	216	0.413	0.0200	0.0085	8.70	29.7	49.27	2.18	2.09	-2.1	1.04	0.0247	0.0023	0.0062
FM50	QZT	K-12-451	101.27	103.1	45.7	0.025	0.25	116	0.170	0.0116	0.0019	8.82	10.5	42.16	1.14	1.07	-3.4	0.0179	0.00919	0.0017	0.0040
FM6	QZT	K-12-479	119.91	120.92	65.7	0.025	4.54	167	0.314	0.0194	0.0073	8.60	14.9	56.54	1.77	1.45	-9.8	0.0450	0.00794	0.0014	0.0080
FM7	CQZT	K-12-479	110	111.1	130	0.025	8.52	290	0.199	0.0187	0.0256	8.53	3.62	76.45	2.93	2.83	-1.8	0.898	0.0171	0.0005	0.0214
FM8	QZT	K-12-479	65.16	66.96	86.5	0.025	0.25	163	0.340	0.0245	0.0215	8.80	2.86	50.65	1.81	1.55	-7.6	0.178	0.0680	0.0026	0.0155
FM9	GSCH	K-10-320	105.7	109	199	0.25	2.5	692	0.97	0.025	0.005	8.41	145	187.78	7.04	6.93	-0.8	0.489	0.0122	0.0005	0.113

SAMPLE	MAJ_LITH	Hole	From_m	To_m	Be_LCH (mg/L)	Bi_LCH (mg/L)	B_LCH (mg/L)	Cd_LCH (mg/L)	Ca_LCH (mg/L)	Cr_LCH (mg/L)	Co_LCH (mg/L)	Cu_LCH (mg/L)	Fe_LCH (mg/L)	Pb_LCH (mg/L)	Li_LCH (mg/L)	Mg_LCH (mg/L)	Mn_LCH (mg/L)	Hg_LCH (mg/L)	Mo_LCH (mg/L)	Ni_LCH (mg/L)	P_LCH (mg/L)
FM1	TQZT	K-10-298	47	52	0.00055	0.00055	0.036	0.000055	588	0.00055	0.00015	0.0015	0.070	0.00015	0.188	19.7	0.330	0.000025	0.0210	0.00055	0.15
FM10	SSCH	K-10-320	109.3	110.7	0.00025	0.00025	0.053	0.000025	16.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0138	8.61	0.0777	0.000025	0.00142	0.00025	0.15
FM11	TQZT	K-10-320	118.35	122.7	0.00025	0.00025	0.052	0.000025	23.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0362	25.9	0.0139	0.000025	0.0136	0.00025	0.15
FM12	QZT	K-11-346	76.46	79	0.00025	0.00025	0.078	0.000025	16.9	0.00025	0.00005	0.0005	0.015	0.00005	0.0903	2.48	0.0190	0.000025	0.00263	0.00025	0.15
FM13	CSCH	K-11-346	109.6	112.78	0.00025	0.00025	0.027	0.000025	7.52	0.00067	0.00005	0.0005	0.177	0.00005	0.0400	4.04	0.0131	0.000025	0.00042	0.00025	0.15
FM14	GSCH	K-11-346	119	120.75	0.00025	0.00025	0.046	0.000025	12.3	0.00025	0.00005	0.0005	0.015	0.00005	0.0117	5.14	0.00727	0.000025	0.0236	0.00025	0.15
FM15	QZT	K-11-346	127	128.2	0.00025	0.00025	0.033	0.000025	15.6	0.00025	0.00005	0.0005	0.015	0.00005	0.320	11.1	0.00429	0.000025	0.00298	0.00025	0.15
FM16	QZT	K-12-405	110.49	110.7	0.00025	0.00025	0.046	0.000025	10.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0169	6.81	0.0323	0.000025	0.00046	0.00025	0.15
FM17	SSCH	K-12-405	98.86	100.21	0.00025	0.00025	0.079	0.000025	16.6	0.00025	0.00005	0.0005	0.015	0.00005	0.147	4.13	0.0118	0.000025	0.00259	0.00025	0.15
FM18	SSCH	K-12-405	135.52	137.2	0.00025	0.00025	0.040	0.000060	3.93	0.00738	0.00093	0.0023	2.33	0.00105	0.0160	3.49	0.0854	0.000025	0.00054	0.00269	0.15
FM19	TQZT	K-11-345	80.32	82.35	0.00025	0.00025	0.043	0.000025	33.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0757	4.50	0.0193	0.000025	0.0143	0.00073	0.15
FM2	SSCH	K-10-298	60.48	63.99	0.00025	0.00025	0.028	0.000025	76.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0469	21.9	0.00647	0.000025	0.0102	0.00025	0.15
FM20	SSCH	K-11-345	100.61	103.3	0.00025	0.00025	0.035	0.000025	3.08	0.00193	0.00021	0.0016	0.622	0.00017	0.0085	3.25	0.0131	0.000025	0.00049	0.00085	0.15
FM21	TQZT	K-11-345	106.68	108.22	0.00025	0.00025	0.059	0.000025	33.7	0.00025	0.00005	0.0005	0.015	0.00005	0.0186	22.8	0.0153	0.000025	0.0590	0.00055	0.15
FM22	QZT	K-11-345	119.6	121.92	0.00025	0.00025	0.029	0.000025	26.7	0.00025	0.00005	0.0005	0.015	0.00005	0.0456	4.30	0.0189	0.000025	0.00335	0.00025	0.15
FM23	GSCH	K-12-402	11.18	12.02	0.00025	0.00025	0.073	0.000025	22.9	0.00025	0.00012	0.0005	0.015	0.00005	0.0212	4.36	0.0235	0.000025	0.00982	0.00060	0.15
FM24	QZT	K-12-402	21.01	22.95	0.00025	0.00025	0.026	0.000025	21.9	0.00025	0.00005	0.0005	0.015	0.00005	0.0214	1.28	0.0101	0.000025	0.00310	0.00083	0.15
FM25	QZT	K-12-402	66.17	69.5	0.00025	0.00025	0.115	0.000025	11.8	0.00025	0.00005	0.0005	0.015	0.00005	0.0410	2.79	0.00210	0.000025	0.00463	0.00025	0.15
FM26	QZT	K-12-469	81.11	82.08	0.00025	0.00025	0.017	0.000025	26.3	0.00025	0.00005	0.0005	0.015	0.00005	0.0800	4.90	0.00308	0.000025	0.00659	0.00025	0.15
FM27	QZT	K-12-469	97	97.68	0.00025	0.00025	0.071	0.000025	15.2	0.00025	0.00005	0.0005	0.015	0.00005	0.0414	2.10	0.00536	0.000025	0.00333	0.00025	0.15
FM28	CQZT	K-12-469	153.54	155.22	0.00025	0.00025	0.042	0.000025	15.5	0.00025	0.00005	0.0005	0.015	0.00005	0.0172	3.02	0.00144	0.000025	0.00250	0.00025	0.15
FM29	GNST	K-12-469	176.79	179	0.00025	0.00025	0.019	0.000025	8.71	0.00025	0.00005	0.0005	0.075	0.00015	0.0025	2.94	0.00195	0.000025	0.00046	0.00025	0.15
FM3	TQZT	K-10-298	27.73	30.1	0.00025	0.00025	0.080	0.000025	3.02	0.0172	0.00005	0.0005	0.063	0.00005	0.0165	0.662	0.00057	0.000025	0.0114	0.00057	0.15
FM30	QZT	K-12-421	90.43	91.56	0.00025	0.00025	0.030	0.000025	19.7	0.00025	0.00005	0.0005	0.015	0.00005	0.0511	4.58	0.00431	0.000025	0.00732	0.00111	0.15
FM31	QZT	K-12-421	113.57	114.6	0.00025	0.00025	0.040	0.000025	17.3	0.00025	0.00005	0.0005	0.015	0.00005	0.0388	17.6	0.00665	0.000025	0.0198	0.00065	0.15
FM32	TQZT	K-10-285	94.07	95.8	0.00025	0.00025	0.030	0.000025	37.7	0.00025	0.00005	0.0005	0.015	0.00005	0.0262	9.56	0.0341	0.000025	0.00426	0.00069	0.15
FM33	TQZT	K-10-285	112.12	113.05	0.00025	0.00025	0.029	0.000025	16.9	0.00025	0.00005	0.0005	0.015	0.00005	0.0129	5.12	0.0153	0.000025	0.00407	0.00200	0.15
FM34	QZT	K-10-285	131.78	140.5	0.00025	0.00025	0.027	0.000025	21.1	0.00025	0.00005	0.0005	0.015	0.00012	0.0119	2.26	0.0483	0.000025	0.00166	0.00072	0.15
FM35	QZT	K-12-467	85.96	87.45	0.00025	0.00025	0.020	0.000025	16.4	0.00025	0.00005	0.0005	0.015	0.00005	0.0652	3.95	0.00295	0.000025	0.00329	0.00025	0.15
FM36	QZT	K-12-467	108.52	109.51	0.00025	0.00025	0.019	0.000025	22.3	0.00025	0.00005	0.0005	0.015	0.00005	0.0468	10.4	0.0128	0.000025	0.00370	0.00080	0.15
FM37	QZT	K-12-467	183.11	184.04	0.00025	0.00025	0.034	0.000025	16.4	0.00025	0.00005	0.0005	0.015	0.00005	0.0143	2.52	0.0220	0.000025	0.00201	0.00072	0.15
FM38	QZT	K-11-357	106.55	107.97	0.00025	0.00025	0.037	0.000025	13.4	0.00025	0.00005	0.0005	0.015	0.00005	0.0211	3.60	0.00405	0.000025	0.00149	0.00025	0.15
FM39	SSCH	K-11-357	145.36	146.41	0.00025	0.00025	0.037	0.000025	4.82	0.00398	0.00023	0.0005	0.975	0.00128	0.0104	3.80	0.0215	0.000025	0.00057	0.00162	0.15
FM4	QZT	K-10-298	71.93	74.23	0.00025	0.00025	0.043	0.000025	19.0	0.00025	0.00005	0.0005	0.015	0.00005	0.0331	2.93	0.00917	0.000025	0.00384	0.00025	0.15
FM40	GSCH	K-11-357	141.11	142.5	0.00025	0.00025	0.081	0.000025	20.8	0.00025	0.00005	0.0005	0.015	0.00005	0.0209	13.3	0.0528	0.000025	0.0145	0.00124	0.15
FM41	QZT	K-11-357	153.15	154.63	0.00025	0.00025	0.021	0.000025	33.7	0.00025	0.00013	0.0005	0.015	0.00005	0.0097	18.4	0.0162	0.000025	0.00211	0.00025	0.15
FM42	QZT	K-11-357	166.21	167	0.00025	0.00025	0.022	0.000025	18.8	0.00025	0.00005	0.0005	0.015	0.00005	0.0528	2.64	0.00501	0.000025	0.00191	0.00071	0.15
FM43	QZT	K-12-398	53.82	56.07	0.00025	0.00025	0.038	0.000025	19.7	0.00025	0.00005	0.0005	0.015	0.00005	0.0420	1.82	0.00525	0.000025	0.00749	0.00025	0.15
FM44	QZT	K-12-398	83.7	84.48	0.00025	0.00025	0.073	0.000025	15.9	0.00025	0.00005	0.0005	0.015	0.00005	0.0123	6.49	0.00777	0.000025	0.0147	0.00025	0.15
FM45	QZT	K-12-398	82.58	83.7	0.00025	0.00025	0.049	0.000025	22.8	0.00025	0.00005	0.0005	0.015	0.00005	0.0319	10.9	0.00939	0.000025	0.00500	0.00025	0.15
FM46	QZT	K-11-349	23.53	25.48	0.00025	0.00025	0.042	0.000025	15.4	0.00025	0.00005	0.0017	0.120	0.00040	0.0349	1.05	0.0101	0.000025	0.00761	0.00089	0.15
FM47	QZT	K-11-349	70.35	71.73	0.00025	0.00025	0.033	0.000025	17.4	0.00025	0.00005	0.0005	0.015	0.00005	0.0220	5.31	0.0114	0.000025	0.00239	0.00182	0.15
FM48	QZT	K-12-451	66.21	67.64	0.00025	0.00025	0.015	0.000025	20.4	0.00025	0.00005	0.0005	0.015	0.00005	0.0502	2.81	0.0226	0.000025	0.00208	0.00071	0.15
FM49	GSCH	K-12-451	83.15	84.41	0.00025	0.00025	0.030	0.000025	19.3	0.00025	0.00005	0.0005	0.015	0.00005	0.0080	7.49	0.0132	0.000025	0.0111	0.00025	0.15
FM5	QZT	K-12-479	92	95	0.00025	0.00025	0.053	0.000025	14.0	0.00025	0.00005	0.0005	0.015	0.00005	0.127	3.48	0.00281	0.000025	0.00653	0.00025	0.15
FM50	QZT	K-12-451	101.27	103.1	0.00025	0.00025	0.015	0.000025	13.6	0.00025	0.00005	0.0005	0.015	0.00005	0.0242	1.99	0.00531	0.000025	0.00196	0.00063	0.15
FM6	QZT	K-12-479	119.91	120.92	0.00025	0.00025	0.022	0.000025	16.4	0.00025	0.00005	0.0028	0.015	0.00011	0.0474	3.79	0.0105	0.000025	0.00265	0.00025	0.15
FM7	CQZT	K-12-479	110	111.1	0.00025	0.00025	0.041	0.000025	15.0	0.00025	0.00005	0.0005	0.015	0.00005	0.0538	9.50	0.0173	0.000025	0.00257	0.00025	0.15
FM8	QZT	K-12-479	65.16	66.96	0.00025	0.00025	0.026	0.000025	10.6	0.00025	0.00005	0.0005	0.015	0.00005	0.0202	5.89	0.00185	0.000025	0.00141	0.00025	0.15
FM9	GSCH	K-10-320	105.7	109	0.00025	0.00025	0.069	0.000025	32.8	0.00025	0.00005	0.0005	0.015	0.00005	0.0279	25.8	0.0340	0.000025	0.0469	0.00056	0.15

SAMPLE	MAJ_LITH	Hole	From_m	To_m	K_LCH (mg/L)	Se_LCH (mg/L)	Si_LCH (mg/L)	Ag_LCH (mg/L)	Na_LCH (mg/L)	Sr_LCH (mg/L)	Tl_LCH (mg/L)	Sn_LCH (mg/L)	Ti_LCH (mg/L)	U_LCH (mg/L)	V_LCH (mg/L)	Zn_LCH (mg/L)
FM1	TQZT	K-10-298	47	52	61.2	0.0034	3.13	0.000055	24.0	2.97	0.00015	0.00055	0.013	0.000248	0.0015	0.015
FM10	SSCH	K-10-320	109.3	110.7	58.7	0.00162	1.57	0.000025	10.4	0.165	0.00013	0.00025	0.005	0.00302	0.0024	0.005
FM11	TQZT	K-10-320	118.35	122.7	60.6	0.00500	1.69	0.000025	23.4	0.206	0.00012	0.00025	0.005	0.000964	0.0021	0.005
FM12	QZT	K-11-346	76.46	79	9.66	0.00081	10.2	0.000025	1.06	0.0320	0.00010	0.00025	0.005	0.00117	0.0024	0.005
FM13	CSCH	K-11-346	109.6	112.78	53.2	0.00025	2.34	0.000025	6.11	0.126	0.00013	0.00025	0.005	0.00216	0.0096	0.005
FM14	GSCH	K-11-346	119	120.75	33.5	0.00828	1.97	0.000025	27.1	0.0914	0.00005	0.00025	0.005	0.00940	0.0066	0.005
FM15	QZT	K-11-346	127	128.2	17.4	0.00084	2.00	0.000025	5.29	0.0925	0.00005	0.00025	0.005	0.000769	0.0053	0.005
FM16	QZT	K-12-405	110.49	110.7	72.7	0.00025	1.45	0.000025	7.30	0.207	0.00016	0.00025	0.005	0.000510	0.0046	0.005
FM17	SSCH	K-12-405	98.86	100.21	9.20	0.00054	7.98	0.000025	0.667	0.0225	0.00013	0.00025	0.005	0.00119	0.0062	0.005
FM18	SSCH	K-12-405	135.52	137.2	52.9	0.00025	9.26	0.000025	5.97	0.0308	0.00026	0.00025	0.048	0.000568	0.0155	0.013
FM19	TQZT	K-11-345	80.32	82.35	32.9	0.00531	2.37	0.000025	27.3	0.140	0.00005	0.00025	0.005	0.00265	0.0025	0.005
FM2	SSCH	K-10-298	60.48	63.99	46.4	0.00590	2.49	0.000025	11.2	0.857	0.00013	0.00025	0.005	0.000406	0.0010	0.005
FM20	SSCH	K-11-345	100.61	103.3	52.3	0.00025	3.27	0.000025	7.02	0.143	0.00011	0.00025	0.015	0.000127	0.0081	0.005
FM21	TQZT	K-11-345	106.68	108.22	63.2	0.0150	1.85	0.000126	32.2	0.267	0.00017	0.00025	0.005	0.00965	0.0036	0.005
FM22	QZT	K-11-345	119.6	121.92	20.8	0.00202	3.58	0.000025	7.54	0.111	0.00005	0.00025	0.005	0.00255	0.0021	0.005
FM23	GSCH	K-12-402	11.18	12.02	58.3	0.0133	2.30	0.000054	38.9	0.110	0.00005	0.00025	0.005	0.00200	0.0040	0.005
FM24	QZT	K-12-402	21.01	22.95	11.8	0.00096	10.6	0.000025	3.38	0.0637	0.00005	0.00025	0.005	0.00132	0.0027	0.005
FM25	QZT	K-12-402	66.17	69.5	41.6	0.00316	1.62	0.000025	4.57	0.0747	0.00021	0.00025	0.005	0.000663	0.0087	0.005
FM26	QZT	K-12-469	81.11	82.08	8.24	0.00222	2.08	0.000025	6.49	0.183	0.00005	0.00025	0.005	0.000520	0.0005	0.005
FM27	QZT	K-12-469	97	97.68	12.3	0.00362	5.40	0.000025	2.03	0.0497	0.00005	0.00025	0.005	0.000529	0.0026	0.005
FM28	CQZT	K-12-469	153.54	155.22	26.9	0.00215	1.90	0.000025	5.75	0.242	0.00005	0.00025	0.005	0.000372	0.0020	0.005
FM29	GNST	K-12-469	176.79	179	0.552	0.00025	6.97	0.000025	6.91	0.0317	0.00005	0.00025	0.005	0.000005	0.0120	0.005
FM3	TQZT	K-10-298	27.73	30.1	28.4	0.00166	1.82	0.000025	50.6	0.0185	0.00005	0.00025	0.005	0.00143	0.0586	0.005
FM30	QZT	K-12-421	90.43	91.56	8.37	0.00277	3.76	0.000025	2.81	0.0732	0.00005	0.00025	0.005	0.000880	0.0025	0.005
FM31	QZT	K-12-421	113.57	114.6	25.1	0.00839	2.11	0.000025	6.87	0.0691	0.00016	0.00025	0.005	0.00332	0.0023	0.005
FM32	TQZT	K-10-285	94.07	95.8	39.4	0.00177	3.80	0.000025	14.5	0.351	0.00005	0.00025	0.005	0.000060	0.0005	0.005
FM33	TQZT	K-10-285	112.12	113.05	41.7	0.0105	2.01	0.000100	11.4	0.0710	0.00013	0.00025	0.005	0.00384	0.0034	0.005
FM34	QZT	K-10-285	131.78	140.5	17.0	0.00061	5.62	0.000025	2.95	0.0403	0.00005	0.00025	0.005	0.000980	0.0016	0.005
FM35	QZT	K-12-467	85.96	87.45	7.77	0.00189	2.46	0.000025	3.60	0.0938	0.00005	0.00025	0.005	0.000731	0.0017	0.005
FM36	QZT	K-12-467	108.52	109.51	15.2	0.00213	2.38	0.000025	8.51	0.112	0.00005	0.00025	0.005	0.000943	0.0005	0.005
FM37	QZT	K-12-467	183.11	184.04	13.4	0.00087	8.17	0.000025	1.29	0.0276	0.00005	0.00025	0.005	0.000461	0.0031	0.005
FM38	QZT	K-11-357	106.55	107.97	6.51	0.00095	9.01	0.000025	0.841	0.0565	0.00005	0.00025	0.005	0.000741	0.0028	0.005
FM39	SSCH	K-11-357	145.36	146.41	46.1	0.00108	5.26	0.000025	5.85	0.0683	0.00013	0.00025	0.025	0.000382	0.0201	0.005
FM4	QZT	K-10-298	71.93	74.23	10.8	0.00170	7.74	0.000025	2.38	0.0809	0.00005	0.00025	0.005	0.000381	0.0015	0.005
FM40	GSCH	K-11-357	141.11	142.5	58.5	0.0303	2.02	0.000134	16.2	0.227	0.00011	0.00025	0.005	0.00311	0.0005	0.005
FM41	QZT	K-11-357	153.15	154.63	39.0	0.00551	1.97	0.000054	11.9	0.174	0.00016	0.00025	0.005	0.00658	0.0013	0.005
FM42	QZT	K-11-357	166.21	167	9.27	0.00069	4.51	0.000025	2.55	0.0794	0.00005	0.00025	0.005	0.000427	0.0011	0.005
FM43	QZT	K-12-398	53.82	56.07	23.4	0.00146	2.82	0.000025	10.8	0.0928	0.00005	0.00025	0.005	0.000950	0.0019	0.005
FM44	QZT	K-12-398	83.7	84.48	34.5	0.00233	2.74	0.000025	3.24	0.109	0.00005	0.00025	0.005	0.000226	0.0005	0.005
FM45	QZT	K-12-398	82.58	83.7	24.6	0.00325	2.35	0.000025	4.43	0.112	0.00013	0.00025	0.005	0.00358	0.0005	0.005
FM46	QZT	K-11-349	23.53	25.48	4.52	0.00174	8.73	0.000025	4.25	0.0421	0.00005	0.00025	0.005	0.00111	0.0010	0.005
FM47	QZT	K-11-349	70.35	71.73	7.96	0.00114	12.7	0.000025	1.45	0.0606	0.00005	0.00025	0.005	0.00123	0.0036	0.005
FM48	QZT	K-12-451	66.21	67.64	3.95	0.00119	10.6	0.000025	2.92	0.0484	0.00005	0.00025	0.005	0.000796	0.0010	0.005
FM49	GSCH	K-12-451	83.15	84.41	22.2	0.00563	1.92	0.000025	20.4	0.120	0.00005	0.00025	0.005	0.00792	0.0031	0.005
FM5	QZT	K-12-479	92	95	12.3	0.00271	2.28	0.000025	15.5	0.0934	0.00005	0.00025	0.005	0.000558	0.0077	0.005
FM50	QZT	K-12-451	101.27	103.1	5.66	0.00081	11.5	0.000025	1.84	0.0689	0.00005	0.00025	0.005	0.000307	0.0022	0.005
FM6	QZT	K-12-479	119.91	120.92	9.98	0.00025	9.81	0.000025	1.40	0.0588	0.00005	0.00025	0.005	0.000436	0.0016	0.005
FM7	CQZT	K-12-479	110	111.1	37.7	0.00176	2.08	0.000025	5.35	0.0664	0.00012	0.00025	0.005	0.000306	0.0057	0.005
FM8	QZT	K-12-479	65.16	66.96	17.0	0.00025	5.75	0.000025	1.91	0.0565	0.00005	0.00025	0.005	0.000572	0.0112	0.005
FM9	GSCH	K-10-320	105.7	109	71.1	0.0218	1.82	0.000061	29.8	0.413	0.00015	0.00025	0.005	0.00416	0.0017	0.005

Statistic	As_LCH (mg/L) | CQZT	As_LCH (mg/L) | CSCH	As_LCH (mg/L) | GNST	As_LCH (mg/L) | GSCH	As_LCH (mg/L) | QZT	As_LCH (mg/L) | SSCH	As_LCH (mg/L) | TQZT	Cd_LCH (mg/L) | CQZT	Cd_LCH (mg/L) | CSCH	Cd_LCH (mg/L) | GNST	Cd_LCH (mg/L) | GSCH
No. of observations	2	1	1	5	28	6	7	2	1	1	5
Minimum	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000025	0.000025	0.000025	0.000025
Maximum	0.001	0.001	0.001	0.009	0.012	0.003	0.004	0.000025	0.000025	0.000025	0.000025
1st Quartile	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000025	0.000025	0.000025	0.000025
Median	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.000025	0.000025	0.000025	0.000025
3rd Quartile	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.000025	0.000025	0.000025	0.000025
Mean	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.000025	0.000025	0.000025	0.000025
Variance (n-1)	0.000			0.000	0.000	0.000	0.000	0.000000			0.000000
Standard deviation (n-1)	0.000			0.004	0.002	0.001	0.001	0.000000			0.000000
Skewness (Pearson)	0.000	0.000	0.000	1.445	3.095	0.816	1.199				
Geometric mean	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000

Statistic	Cd_LCH (mg/L) | QZT	Cd_LCH (mg/L) | SSCH	Cd_LCH (mg/L) | TQZT	Cu_LCH (mg/L) | CQZT	Cu_LCH (mg/L) | CSCH	Cu_LCH (mg/L) | GNST	Cu_LCH (mg/L) | GSCH	Cu_LCH (mg/L) | QZT	Cu_LCH (mg/L) | SSCH	Cu_LCH (mg/L) | TQZT	Pb_LCH (mg/L) | CQZT
No. of observations	28	6	7	2	1	1	5	28	6	7	2
Minimum	0.000025	0.000025	0.000025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00005
Maximum	0.000025	0.000060	0.000055	0.0005	0.0005	0.0005	0.0005	0.0028	0.0023	0.0015	0.00005
1st Quartile	0.000025	0.000025	0.000025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00005
Median	0.000025	0.000025	0.000025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00005
3rd Quartile	0.000025	0.000025	0.000025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0013	0.0005	0.00005
Mean	0.000025	0.000031	0.000029	0.0005	0.0005	0.0005	0.0005	0.0006	0.0010	0.0006	0.00005
Variance (n-1)	0.000000	0.000000	0.000000	0.0000			0.0000	0.0000	0.0000	0.0000	0.00000
Standard deviation (n-1)	0.000000	0.000014	0.000011	0.0000			0.0000	0.0005	0.0008	0.0004	0.00000
Skewness (Pearson)		1.789	2.041					3.849	0.951	2.041	
Geometric mean	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000

Statistic	Pb_LCH (mg/L) | CSCH	Pb_LCH (mg/L) | GNST	Pb_LCH (mg/L) | GSCH	Pb_LCH (mg/L) | QZT	Pb_LCH (mg/L) | SSCH	Pb_LCH (mg/L) | TQZT	Ni_LCH (mg/L) | CQZT	Ni_LCH (mg/L) | CSCH	Ni_LCH (mg/L) | GNST	Ni_LCH (mg/L) | GSCH	Ni_LCH (mg/L) | QZT
No. of observations	1	1	5	28	6	7	2	1	1	5	28
Minimum	0.00005	0.00015	0.00005	0.00005	0.00005	0.00005	0.00025	0.00025	0.00025	0.00025	0.00025
Maximum	0.00005	0.00015	0.00005	0.00040	0.00128	0.00015	0.00025	0.00025	0.00025	0.00124	0.00182
1st Quartile	0.00005	0.00015	0.00005	0.00005	0.00005	0.00005	0.00025	0.00025	0.00025	0.00025	0.00025
Median	0.00005	0.00015	0.00005	0.00005	0.00011	0.00005	0.00025	0.00025	0.00025	0.00056	0.00025
3rd Quartile	0.00005	0.00015	0.00005	0.00005	0.00083	0.00005	0.00025	0.00025	0.00025	0.00060	0.00071
Mean	0.00005	0.00015	0.00005	0.00007	0.00044	0.00006	0.00025	0.00025	0.00025	0.00058	0.00049
Variance (n-1)			0.00000	0.00000	0.00000	0.00000	0.000			0.000	0.000
Standard deviation (n-1)			0.00000	0.00007	0.00057	0.00004	0.000			0.000	0.000
Skewness (Pearson)				4.549	0.738	2.041				0.911	1.816
Geometric mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Statistic	Ni_LCH (mg/L) | SSCH	Ni_LCH (mg/L) | TQZT	Ag_LCH (mg/L) | CQZT	Ag_LCH (mg/L) | CSCH	Ag_LCH (mg/L) | GNST	Ag_LCH (mg/L) | GSCH	Ag_LCH (mg/L) | QZT	Ag_LCH (mg/L) | SSCH	Ag_LCH (mg/L) | TQZT	Zn_LCH (mg/L) | CQZT	Zn_LCH (mg/L) | CSCH
No. of observations	6	7	2	1	1	5	28	6	7	2	1
Minimum	0.00025	0.00025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.005	0.005
Maximum	0.00269	0.00200	0.000025	0.000025	0.000025	0.000134	0.000054	0.000025	0.000126	0.005	0.005
1st Quartile	0.00025	0.00055	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.005	0.005
Median	0.00055	0.00057	0.000025	0.000025	0.000025	0.000054	0.000025	0.000025	0.000025	0.005	0.005
3rd Quartile	0.00143	0.00071	0.000025	0.000025	0.000025	0.000061	0.000025	0.000025	0.000078	0.005	0.005
Mean	0.00099	0.00076	0.000025	0.000025	0.000025	0.000060	0.000026	0.000025	0.000054	0.005	0.005
Variance (n-1)	0.000	0.000	0.000			0.000	0.000	0.000	0.000	0.000	
Standard deviation (n-1)	0.001	0.001	0.000			0.000	0.000	0.000	0.000	0.000	
Skewness (Pearson)	0.894	1.712				1.020	5.004		0.863		
Geometric mean	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005

Statistic	Zn_LCH (mg/L) | GNST	Zn_LCH (mg/L) | GSCH	Zn_LCH (mg/L) | QZT	Zn_LCH (mg/L) | SSCH	Zn_LCH (mg/L) | TQZT	Se_LCH (mg/L) | CQZT	Se_LCH (mg/L) | CSCH	Se_LCH (mg/L) | GNST	Se_LCH (mg/L) | GSCH	Se_LCH (mg/L) | QZT	Se_LCH (mg/L) | SSCH
No. of observations	1	5	28	6	7	2	1	1	5	28	6
Minimum	0.005	0.005	0.005	0.005	0.005	0.00176	0.00025	0.00025	0.00563	0.00025	0.00025
Maximum	0.005	0.005	0.005	0.013	0.015	0.00215	0.00025	0.00025	0.03030	0.00839	0.00590
1st Quartile	0.005	0.005	0.005	0.005	0.005	0.00186	0.00025	0.00025	0.00828	0.00083	0.00032
Median	0.005	0.005	0.005	0.005	0.005	0.00196	0.00025	0.00025	0.01330	0.00158	0.00081
3rd Quartile	0.005	0.005	0.005	0.005	0.005	0.00205	0.00025	0.00025	0.02180	0.00243	0.00149
Mean	0.005	0.005	0.005	0.006	0.006	0.00196	0.00025	0.00025	0.01586	0.00195	0.00161
Variance (n-1)		0.000	0.000	0.000	0.000	0.00000			0.00010	0.00000	0.00000
Standard deviation (n-1)		0.000	0.000	0.003	0.004	0.00028			0.01015	0.00174	0.00217
Skewness (Pearson)				1.789	2.041	0.00000	0.00000	0.00000	0.45250	2.09271	1.56208
Geometric mean	0.005	0.005	0.005	0.006	0.006	0.00195	0.00025	0.00025	0.01326	0.00139	0.00084

Statistic	Se_LCH (mg/L) | TQZT	Sb_LCH (mg/L) | CQZT	Sb_LCH (mg/L) | CSCH	Sb_LCH (mg/L) | GNST	Sb_LCH (mg/L) | GSCH	Sb_LCH (mg/L) | QZT	Sb_LCH (mg/L) | SSCH	Sb_LCH (mg/L) | TQZT
No. of observations	7	2	1	1	5	28	6	7
Minimum	0.00166	0.011	0.001	0.008	0.012	0.005	0.003	0.007
Maximum	0.01500	0.017	0.001	0.008	0.047	0.068	0.129	0.043
1st Quartile	0.00259	0.013	0.001	0.008	0.017	0.009	0.008	0.012
Median	0.00500	0.014	0.001	0.008	0.026	0.012	0.022	0.031
3rd Quartile	0.00791	0.016	0.001	0.008	0.036	0.017	0.026	0.033
Mean	0.00609	0.014	0.001	0.008	0.028	0.017	0.034	0.024
Variance (n-1)	0.00002	0.000			0.000	0.000	0.002	0.000
Standard deviation (n-1)	0.00494	0.004			0.014	0.014	0.047	0.014
Skewness (Pearson)	0.90394	0.000	0.000	0.000	0.293	2.215	1.608	-0.083
Geometric mean	0.00457	0.014	0.001	0.008	0.025	0.014	0.016	0.020

APPENDIX D

ALS File No.	L1325348	L1329350	L1332831	L1336418	L1339923	L1342555	L1346781	L1350536	L1353746	L1356658
Date Received	7/3/2013 12:00	7/10/2013 12:00	7/17/2013 12:00	7/24/2013 12:00	7/31/2013 12:00	8/7/2013 12:00	8/14/2013 12:00	21-Aug-13 12:00	8/28/2013 12:00	9/4/2013 12:00
Date	16-Jul-13	24-Jul-13	26-Jul-13	30-Jul-13	6-Aug-13	14-Aug-13	29-Aug-13	29-Aug-13	4-Sep-13	11-Sep-13
week	0	1	2	3	4	5	6	7	8	9
Sample ID	F&M N-AML-0	F&M N-AML-1	F&M N-AML-2	F&M N-AML-3	F&M N-AML-4	F&M N-AML-5	F&M N-AML-6	F&M N-AML-7	F&M N-AML-8	F&M N-AML-9
ALS Sample ID	L1325348-1	L1329350-1	L1332831-1	L1336418-1	L1339923-1	L1342555-1	L1346781-1	L1350536-1	L1353746-1	L1356658-1
Sample Preparation										
Total Volume In	750	500	500	500	500	500	500	500	500	500
Total Volume Out	375	475	425	500	460	460	465	485	480	450
Physical Tests										
Conductivity	577	648	470	470	382	417	434	429	463	437
Hardness (as CaCO3)		112	97.1	117	126	143	166	170	201	181
pH	8.4	8.35	8.3	8.25	8.21	8.22	8.26	8.13	8.13	8.14
Anions and Nutrients										
Acidity (as CaCO3)										
Alkalinity, Total (as CaCO3)	104	127	102	95.1	89.3	92.1	88.3	86.2	85.1	80.8
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	3.99	1.87	0.58	<0.50	<0.50	0.51	5.69	7.63	8.53	7.91
Fluoride (F)	0.629	0.97	1.03	0.842	0.72	0.616	0.558	0.513	0.41	0.427
Nitrate (as N)	0.0973	0.0103	0.0056	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0081	0.0034	0.004	<0.0010	0.0011	0.0025	0.0032	0.0020	0.0044	0.0016
Sulfate (SO4)	183	155	107	123	98.9	113	111	113	127	120
Anion Sum	6.06	5.85	4.35	4.51	3.88	4.24	4.26	4.31	4.61	4.35
Cation Sum	5.9	5.73	4.09	4.2	3.85	3.99	4.24	4.14	4.71	4.17
Cation - Anion Balance	-1.3	-1	-3.1	-3.5	-0.4	-3.1	-0.2	-2.1	1.1	-2.1
Dissolved Metals										
Aluminum (Al)-Dissolved	0.235	0.277	0.251	0.209	0.191	0.156	0.135	0.127	0.115	0.11
Antimony (Sb)-Dissolved	0.0105	0.00766	0.00946	0.00847	0.0069	0.00631	0.00571	0.00490	0.00477	0.00446
Arsenic (As)-Dissolved	0.00071	0.00097	0.00096	0.00084	0.0009	0.00081	0.00076	0.00075	0.00074	0.00072
Barium (Ba)-Dissolved	0.114	0.0379	0.04	0.0352	0.0424	0.0405	0.0342	0.0328	0.0332	0.0319
Beryllium (Be)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bismuth (Bi)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron (B)-Dissolved	0.05	0.073	0.061	0.067	0.045	0.048	0.042	0.037	0.036	0.031
Cadmium (Cd)-Dissolved	0.00001	0.000011	0.00001	0.000012	0.000012	0.000012	0.000012	0.000013	0.000015	0.000014
Calcium (Ca)-Dissolved	31.6	25.9	24.8	29.8	32.8	37.6	44.6	45.7	53.3	49.1
Chromium (Cr)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt (Co)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Copper (Cu)-Dissolved	0.0005	0.0005	0.0005	0.00067	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron (Fe)-Dissolved	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Lead (Pb)-Dissolved	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Lithium (Li)-Dissolved	0.0283	0.0229	0.0182	0.0188	0.013	0.0115	0.0108	0.00942	0.00895	0.00802
Magnesium (Mg)-Dissolved	14	11.5	8.56	10.3	10.7	11.9	13.2	13.5	16.4	14.2
Manganese (Mn)-Dissolved	0.0141	0.0185	0.0215	0.0273	0.0329	0.0384	0.0466	0.0574	0.0668	0.0641
Mercury (Hg)-Dissolved	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)-Dissolved	0.00399	0.0276	0.0242	0.0229	0.0151	0.0159	0.016	0.0156	0.0161	0.0145
Nickel (Ni)-Dissolved	0.00119	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Phosphorus (P)-Dissolved	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Potassium (K)-Dissolved	63.9	72.2	49.9	45.2	36.3	32.6	27.4	22.2	21	16.6
Selenium (Se)-Dissolved	0.00282	0.00115	0.00086	0.00099	0.00118	0.00159	0.00202	0.00231	0.00306	0.00282
Silicon (Si)-Dissolved	1.91	1.99	2.03	2.15	2.22	2.15	2.29	2.29	2.47	2.41
Silver (Ag)-Dissolved	0.00001	0.000031	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Sodium (Na)-Dissolved	34.9	37.3	19.4	15.9	8.64	6.63	5.02	3.66	3.45	2.54
Strontium (Sr)-Dissolved	0.204	0.21	0.191	0.206	0.225	0.237	0.248	0.246	0.258	0.251
Sulfur (S)-Dissolved	65.1	58.9	37.6	41.8	32.9	38.5	38.4	37.3	42.2	39.4
Thallium (Tl)-Dissolved	0.000115	0.000086	0.000059	0.000061	0.000049	0.00005	0.000058	0.000058	0.000061	0.000056
Tin (Sn)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	0.00145	0.000899	0.000685	0.000681	0.000595	0.00071	0.000801	0.000892	0.00109	0.0011
Vanadium (V)-Dissolved	0.0015	0.0011	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Zinc (Zn)-Dissolved	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

ALS File No.	L1360203	L1363809	L1367719	L1371157	L1374988	L1377604	L1381369	L1384790	L1387572	L1390711
Date Received	9/11/2013 12:00	9/18/2013 12:00	9/25/2013 12:00	10/2/2013 12:00	10/9/2013 12:00	10/16/2013 12:00	10/23/2013 12:00	10/30/2013 12:00	11/6/2013 12:00	11/13/2013 12:00
Date	18-Sep-13	25-Sep-13	2-Oct-13	9-Oct-13	16-Oct-13	23-Oct-13	41577	41584	41591	41598
week	10	11	12	13	14	15	16	17	18	19
Sample ID	F&M N-AML-10	F&M N-AML-11	F&M N-AML-12	F&M N-AML-13	F&M N-AML-14	F&M N-AML-15	F&M N-AML-16	F&M N-AML-17	F&M N-AML-18	F&M N-AML-19
ALS Sample ID	L1360203-1	L1363809-1	L1367719-1	L1371157-1	L1374988-1	L1377604-1	L1381369-1	L1384790-1	L1387572-1	L1390711-1
Sample Preparation										
Total Volume In	500	500	500	500	500	500	500	500	500	500
Total Volume Out	450	475	475	465	470	440	485	455	450	465
Physical Tests										
Conductivity	422	437	416	384	361	322	315	268	253	239
Hardness (as CaCO3)	182	203	188	169	167	148	146	122	110	107
pH	8.17	8.13	8.15	8.11	8.12	8.12	8.11	8.13	8.18	8.15
Anions and Nutrients										
Acidity (as CaCO3)	16.9	1	2.3	5.1	1	1.1	1.3	1.6	1.4	1
Alkalinity, Total (as CaCO3)	82.7	93.6	82.6	78.6	81.6	76.7	77.3	72.2	66.9	74
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	0.05
Chloride (Cl)	7.16	6.98	6.33	5.97	5.81	5.13	5.12	4.24	4.35	4.08
Fluoride (F)	0.408	0.359	0.376	0.334	0.35	0.32	0.343	0.338	0.431	0.29
Nitrate (as N)	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	0.005
Nitrite (as N)	0.0029	0.0035	0.0012	<0.0010	0.0011	0.0018	0.0029	0.0015	0.0022	0.0054
Sulfate (SO4)	110	129	115	102	93.1	74.1	68.2	53	46.9	41
Anion Sum	4.17	4.77	4.24	3.87	3.75	3.24	3.13	2.68	2.46	2.46
Cation Sum	4.11	4.54	4.19	3.75	3.67	3.29	3.21	2.71	2.44	2.38
Cation - Anion Balance	-0.8	-2.5	-0.6	-1.6	-1.1	0.8	1.3	0.4	-0.4	-1.7
Dissolved Metals										
Aluminum (Al)-Dissolved	0.109	0.0945	0.0965	0.1	0.1	0.119	0.114	0.132	0.136	0.146
Antimony (Sb)-Dissolved	0.00391	0.00403	0.00397	0.00364	0.0038	0.00356	0.0035	0.00319	0.00315	0.00294
Arsenic (As)-Dissolved	0.00084	0.00077	0.00082	0.00081	0.00085	0.00091	0.00095	0.00097	0.00107	0.00115
Barium (Ba)-Dissolved	0.0337	0.0304	0.0321	0.0361	0.0371	0.047	0.0488	0.0538	0.0593	0.063
Beryllium (Be)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bismuth (Bi)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron (B)-Dissolved	0.029	0.031	0.029	0.026	0.024	0.022	0.021	0.019	0.017	0.015
Cadmium (Cd)-Dissolved	0.000017	0.000022	0.000019	0.000015	0.000015	0.000013	0.000017	0.00001	0.000011	0.00001
Calcium (Ca)-Dissolved	50	54.6	52	48.1	47.5	42.2	42.3	35.3	31.3	30.7
Chromium (Cr)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt (Co)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Copper (Cu)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron (Fe)-Dissolved	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Lead (Pb)-Dissolved	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Lithium (Li)-Dissolved	0.00795	0.007	0.00733	0.00705	0.00608	0.00556	0.00496	0.00501	0.00461	0.00429
Magnesium (Mg)-Dissolved	13.8	16.1	14.2	11.8	11.6	10.4	9.89	8.34	7.66	7.45
Manganese (Mn)-Dissolved	0.0602	0.0648	0.059	0.0504	0.0485	0.0465	0.0406	0.0332	0.0309	0.0266
Mercury (Hg)-Dissolved	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)-Dissolved	0.0123	0.0138	0.0123	0.0118	0.0126	0.0112	0.0112	0.00881	0.00868	0.00823
Nickel (Ni)-Dissolved	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Phosphorus (P)-Dissolved	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Potassium (K)-Dissolved	14.8	15	13.3	11.8	10.7	10	8.83	8.1	7.8	7.52
Selenium (Se)-Dissolved	0.00221	0.00234	0.00171	0.00139	0.00129	0.00101	0.00097	0.00074	0.00074	0.00071
Silicon (Si)-Dissolved	2.51	2.6	2.68	2.75	2.89	2.73	2.94	2.82	2.79	2.64
Silver (Ag)-Dissolved	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Sodium (Na)-Dissolved	1.98	2.03	1.68	1.4	1.32	1.19	1.07	0.871	0.81	0.723
Strontium (Sr)-Dissolved	0.228	0.243	0.225	0.211	0.213	0.203	0.195	0.183	0.169	0.184
Sulfur (S)-Dissolved	36.4	42.9	37.5	33.4	30.4	23.8	23.5	17.2	15.4	13.8
Thallium (Tl)-Dissolved	0.000053	0.000055	0.000049	0.00005	0.000046	0.000044	0.000045	0.000038	0.000039	0.000036
Tin (Sn)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	0.00108	0.00122	0.00115	0.001	0.000995	0.000885	0.000835	0.000668	0.000633	0.000606
Vanadium (V)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.0012	0.0013	0.0014	0.0016	0.0018
Zinc (Zn)-Dissolved	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

WASTE ROCK MANAGEMENT PLAN

REVISION 4

November 2013

Prepared for:

ALEXCO KENO HILL MINING CORP.

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APPENDIX A - REVIEW OF LUCKY QUEEN WASTE ROCK MANAGEMENT CRITERIA – KENO HILL DISTRICT

APPENDIX B - REVIEW OF NET ACID GENERATION AND METAL LEACHING CONTROLLING AND CORRELATING FACTORS - KENO HILL SILVER DISTRICT

1 KENO HILL SILVER DISTRICT MINING OPERATIONS WASTE ROCK MANAGEMENT

1.1 INTRODUCTION

The Bellekeno Advanced Underground Exploration and Development Program, assessed under YESAB project number 2008-0039, presented a comprehensive Waste Rock Management Plan (WRMP) for the estimated 248,000 tonnes of waste rock to be excavated over 5 years. In addition to the WRMP assessed under YESAB project number 2008-0039, an additional Waste Rock Testing Plan, Mine Wall Sampling Plan, were submitted to the Yukon Water Board and Government of Yukon, Mining Land Use Department, under Sections 24 and 25 of Water Licence QZ07-078. These plans provided additional detail regarding geochemical and ABA testing of waste rock and mine walls exposed during excavation, and their essence incorporated into this plan. Under Section 23 of Water Licence QZ07-078, a Waste Rock Physical Inspection Plan was submitted. The Bellekeno Waste Rock Management Plan was based on studies by Altura Environmental Consulting (Altura). These studies described the Acid Rock Drainage/Metal Leachate (ARD/ML) controlling and correlating factors district wide (Altura, 2008a) and geoenvironmental characterization of the Bellekeno Zone (Altura 2008b).

Clause 13.6 of QML-0009 states that a maximum of 500,000 tonnes of waste rock are to be removed during the undertaking. This tonnage was to come from the Bellekeno mine, but as part of the amendment to QML-0009, Alexco plans to excavate and place on surface a combined maximum of 500,000 tonnes of waste rock from the Bellekeno, Onek, Lucky Queen and Flame & Moth Mines. In order to support use of the Waste Rock Management Plan for Flame & Moth, Access Consulting Group (Access) undertook geochemical characterization studies of the Flame & Moth deposit (Access, 2013b). Additionally, the waste rock management criteria for Lucky Queen were reviewed by Access (2013a) and modifications to its screening criteria are presented here within and the rationale presented in Access 2013a, which is included as Appendix A.

1.2 PURPOSE OF PLAN

This plan outlines practices for management of waste rock to be excavated from the Bellekeno, Lucky Queen Onek, and Flame & Moth deposits. The plan is intended to ensure that appropriate management procedures are followed in order to minimize impacts of waste rock brought to surface on land and water resources. Monitoring following waste rock management activities is intended to assess the effectiveness of the management measures, ensure that adaptive management approaches are implemented and to ensure that appropriate information is obtained by Alexco to assist in closure planning.

1.3 SCOPE OF PLAN

Aspects included in this Plan are:

- Definition of rock categories based on potential for reactivity (specifically, acid generation and/or metal leaching);
- Estimation of quantities of each category to be excavated to surface during Mining operations;
- Operational categorization of excavated rock;

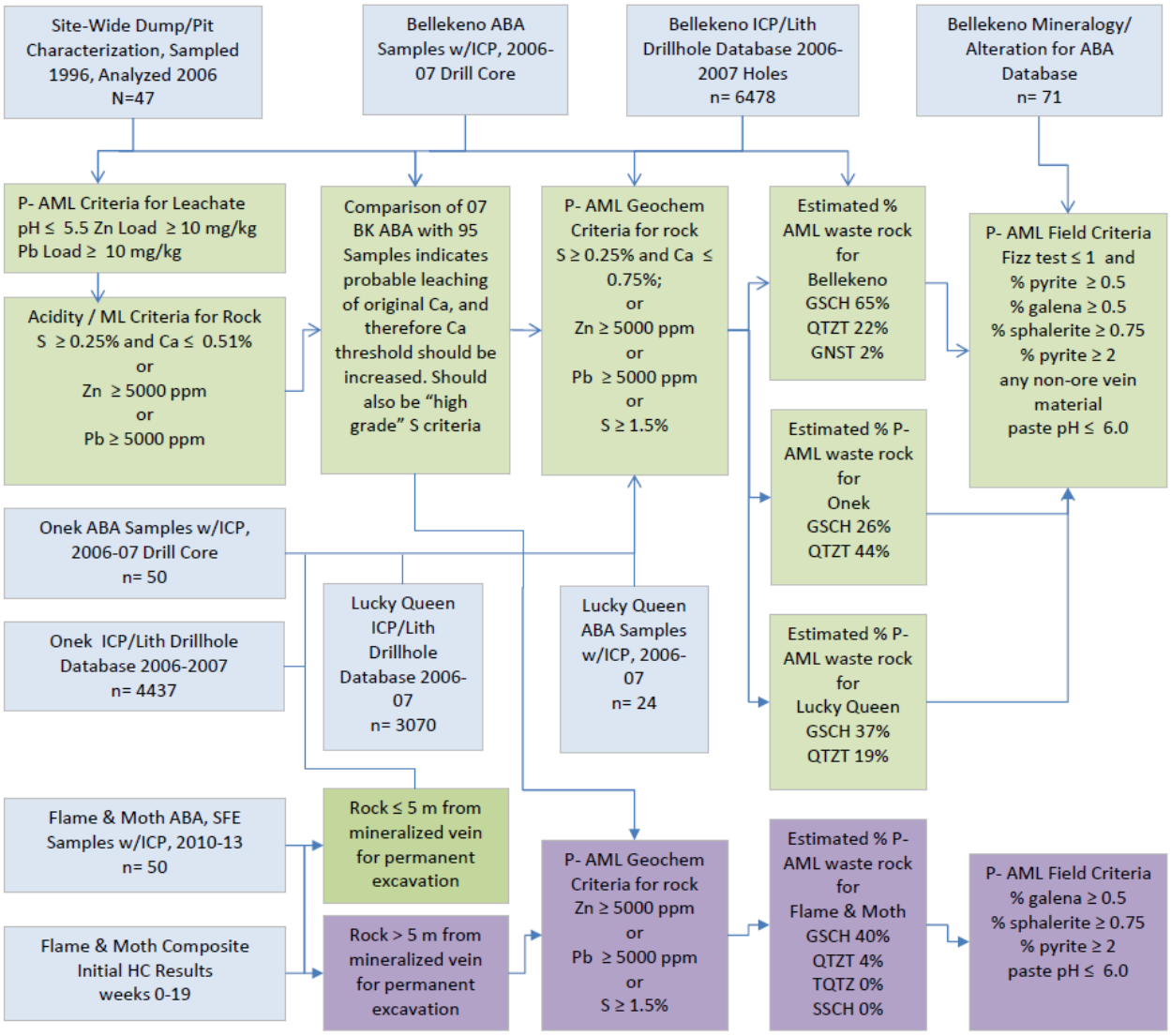
- Geochemical and ABA confirmatory testing;
- Mine wall geochemical and ABA testing;
- Control measures as required to mitigate effects of potential acid generation and/or metal leaching;
- Monitoring and physical inspection activities for waste rock storage areas; and
- Reporting of waste rock management activities.

2 ROCK CHARACTERIZATION

2.1 SUMMARY OF ROCK CHARACTERIZATION

Studies conducted throughout the Keno Hill Silver District (KHSD) and specifically within each of the mineralized target zones (Bellekeno, Onek, Lucky Queen and Flame and Moth) provide a foundation for correlating and understanding the weathering behavior or 'geoenvironmental' tendencies of rock in the KHSD. A summary of these waste rock characterization studies and their components and key results is shown in Figure 1.

Figure 1 Keno Hill Development Waste Rock Characterization Studies – Components and Key Results



2.2 OVERVIEW OF STUDIES

The geoenvironmental evaluations to support the original Bellekeno Waste Rock Management Plan (WRMP) consisted of data analysis and integration of four specific data components:

1) site-wide studies on weathered rock (47 samples);

2) acid base accounting of 2006-2007 Bellekeno drill core (71 samples);

3) Bellekeno drillhole multi-element and lithology database (6,478 samples), and

4) mineralogy and alteration logging data on acid base accounting samples.

In order to support the extension of use of the WRMP for the Onek and Lucky Queen deposits, data analysis of additional data components was undertaken, specifically:

1) acid base accounting on 2008-2010 Lucky Queen drill core (24 samples);

2) Lucky Queen multi-element and lithology database (3070 samples);

3) acid base accounting on 2008-2010 Onek drill core (50 samples); and

4) Onek multi-element and lithology database (4437 samples).

In order to support the extension of use of the WRMP for the Flame & Moth deposit, data analysis of additional data components was undertaken, specifically:

1) acid base accounting on 2010-2013 Flame & Moth drill core sourced from area of proposed permanent excavation (50 samples);

2) multi-element and lithology database 2010-2013 Flame & Moth drill core sourced from area of proposed permanent excavation (50 samples);

3) shake flask extraction test results from 2010-2013 Flame & Moth drill core sourced from area of proposed permanent excavation (50 samples);

4) initial humidity cell results (weeks 0-19) of a composite sample created from Flame & Moth drill core sourced from area of proposed permanent excavation.

These studies were used to derive the following components for the Waste Rock Management Plan:

1) P-AML geochemical screening criteria for each deposit;

2) estimated proportions of P-AML and N-AML material by rock type for the proposed development activities at each of the deposits; and

3) field criteria for differentiating P-AML and N-AML rock during excavation activities at each deposit.

2.2.1 Waste Rock Field Screening Criteria

One of the fundamental parts of the Waste Rock Management Plan is field screening of waste rock. Field screening criteria for identifying P-AML at Bellekeno, Onek and Lucky Queen have been developed as follows:

a) Slight or no effervescence of pulverized sample with 25% HCl (e.g. presence of none or only a few bubbles, fizz rating ≤1), and visual estimated pyrite >0.5%, or;

b) Any sample with one or more of the following:

   i. visual estimated sphalerite ≥ 0.75%

   ii. visual estimated galena ≥ 0.5%

   iii. visual estimated pyrite ≥ 2%

   iv. any mineralized vein material associated to the ore vein

   v. paste pH ≤ 6.0

2.2.2 P-AML Waste Rock Geochemical Screening Criteria

The standard geochemical screening criteria for identification of P-AML rock apply to all rock permanently excavated from the Bellekeno, Onek, and Lucky Queen deposits. In accordance with ACG 2013b, these standard geochemical screening criteria also apply to waste rock from Flame and Moth from within 5 m of the mineralized vein or the presence of vein associated stringers, whichever is further. The standard geochemical criteria are as follows:

a) Ca% ≤ 0.75% and Svia ICP ≥ 0.25 %;

b) or Svia ICP ≥ 1.5%;

c) or Pb ≥ 5000 ppm;

d) or Zn ≥ 5000 ppm.

In accordance with ACG 2013b, geochemical screening criteria for identification of P-AML rock for the Flame & Moth rock distal to (≥ 5 m or the presence of vein associated stringers, whichever is further) from the mineralized vein fault deposit is as follows:

b) or Svia ICP ≥ 1.5%;

c) or Pb ≥ 5000 ppm;

d) or Zn ≥ 5000 ppm.

YESAB recommended that AKHM establish a maximum zinc concentration for the use of N-AML waste rock as construction material near surface water. Appendix B, Review of Net Acid Generation and Metal Leaching Controlling factors – Keno Hill Silver District outlines the method for determining the zinc threshold of 1100 ppm zinc for placement of N-AML waste rock within 30 m of a surface water body.

2.2.3 Estimated Proportions of P-AML and N-AML Rock

Applying the geochemical screening criteria to the waste rock drillhole databases for each deposit shows the proportions of P-AML rock estimated for each lithology. Table 1 shows the results for Bellekeno, Table 2 shows the result for Onek, and Table 3 shows the results for Lucky Queen.

Table 1. Proportion of Samples Filtered as P-AML in Bellekeno Waste Rock Drillhole Database

Lithology		Number of Samples in Database	Number of Samples Screened as P-AML	Percentage of Samples Screened as P-AML
Description	Code			
Chloritic Schist	CHSCH	222	27	**12%**
Calcareous Quartzite	CQTZT	505	54	**11%**
Greenstone	GNST	567	10	**2%**
Graphitic Schist	GSCH	870	562	**65%**
Quartzite	QTZT	3293	719	**22%**
Schist, Undifferentiated	SCH	775	299	**39%**
Sericitic Schist	SSCH	205	37	**18%**

Table 2. Proportion of Samples Filtered as P-AML in Onek Waste Rock Drillhole Database

Lithology		Number of Samples	# of P-AML Samples	% of P-AML Samples
Description	Code			
Chloritic Schist	CHSCH	48	7	15%
Calcareous Quartzite	CQTZT	179	29	16%
Greenstone	GNST	193	25	13%
Graphitic Schist	GSCH	472	122	26%
Interbedded Carbonaceous Quartzite and Schist	ICQS	170	66	39%
Quartzite	QTZT	2440	1071	44%
Schist	SCH	136	39	29%
Sericite Schist	SSCH	138	39	28%
Thin Bedded Quartzite	TQTZT	343	189	55%

Note: Lithology units with less than 40 samples not included in calculation (CSCH and PHY)

Table 3. Proportion of Samples Filtered as P-AML in Lucky Queen Rock Drillhole Database

Lithology		Number of Samples	# of P-AML Samples	% of P-AML Samples
Description	Code			
Graphitic Schist	GSCH	399	149	37%
Quartzite	QTZT	2110	391	19%
Thin Bedded Quartzite	TQTZT	279	83	30%

Table 4. Proportion of Samples Filtered as P-AML in Flame & Moth Area of Proposed Permanent Excavation

Lithology		Number of Samples	# of P-AML Samples	% of P-AML Samples
Description	Code			
Graphitic Schist	GSCH	5	2	40%
Quartzite	QZT	28	1	4%
Thin Bedded Quartzite	TQZT	7	0	0%
Sericite Schist	SSCH	6	0	0%
Calcareous Quartzite	CQZT	2	0	0%
Greenstone	GNST	1	0	0%
Calcareous Schist	CSCH	1	0	0%
	Total	50	3	6%

3 ROCK MANAGEMENT

Waste rock excavated from underground operations can be categorized into the following categories:

- N-AML: Rock of non-economic grade, expected to be comprised of over 85% Central Quartzite unit (quartzite typically intercalated with minor amounts of schist), and less than 15% Greenstone. As presented in Section 1.2, the majority of the waste rock excavated is expected to be N-AML; rock field-classified as N-AML will be stored in designated locations on site.

- P-AML: Waste Rock and Mineralized Waste Rock of no Economic Interest: Rocks field-classified as P-AML (mainly pyrite rich graphitic schist) will be stored in designated P-AML waste rock storage facilities or permanently stored underground as cemented back fill within excavated stopes. In addition to P-AML wall rocks, some vein material especially along the margins of zoned veins contain mostly gangue minerals such as siderite, pyrite and quartz but do not contain economic amounts of Ag, Zn, or Pb minerals and therefore are of no economic interest. Due to their increased likelihood for acidic or metal leaching, all such mineralized non-economic rock is considered to be P-AML and will be stored in P-AML waste rock storage facilities or permanently stored underground as cemented back fill within excavated stopes.

- Mineralized Rock of Uncertain Economic Interest: Vein material which contains significant Ag, Zn or Pb minerals but is not obviously economic may be temporarily stockpiled at the mine site or mill site on lined contained pads. Confirmatory assay will determine whether this rock is milled, or is sent to the P-AML waste rock storage facility or hauled back underground.

Table 5 summarizes waste rock management categories and handling. Included for each category are environmental characteristics, use and storage specifications, geochemical criteria, and field screening criteria.

Table 5 Waste Rock Management Categories and Handling

	P-AML Waste Rock	N-AML Waste Rock	Mineralized Rock
Environmental Characteristics	Potentially acid-generating and/or metal leaching	Non- acid-generating and non-metal leaching	Ag, Pb, and Zn grades of economic interest. May contain minerals with potential for net acidity and/or metal leaching
Uses and Storage	Not suitable for general construction purposes To be stored permanently within lined P-AML WRSFs Some material may be removed from P-AML WRSFs and returned fur underground backfill at closure	May be used for general construction purposes	May be stockpiled temporarily at the portal sites or mill, then either milled or sent to P-AML waste rock storage facility

3.1 ROCK EXCAVATION ACTIVITIES

3.1.1 Waste Rock Screening

Samples for both field screening and compositing for further geochemical and ABA confirmatory testwork are collected using the Face Sampling Method, which is used in all new mine working developments. This method ensures accurate, representative characterization of each blast round and allows field screening tests to be performed in a timely manner so that waste rock can be most efficiently treated according to the waste rock management categories (Table 5).

3.1.2 Face Sampling Method

The Face Sampling Method (Figure 2) has been developed into the following procedure:

- First, the site geologist marks up the heading and center line of the development drive. The geologist demarks the side walls and back heights to be taken, then assesses the rock face by spray painting the boundaries between each lithology and paints the sample number of each lithology on the face. Next, the geologist makes a pencil sketch and takes a photograph of the face.

- The geologist then samples each lithology and visually estimates each lithology/sample for sulphide and carbonate content and records the data on the Face Sampling Form (see Figure 3).

- After being collected, the samples then are taken to a geology field laboratory (typically located near the mine portal) where they are dried using a convection dryer, then crushed and pulverized by a geologist or lab technician and stored until needed for compositing.

- The Face Sampling Form is completed and the waste rock management category is determined based on the field screening criteria, Section 2.2.2.

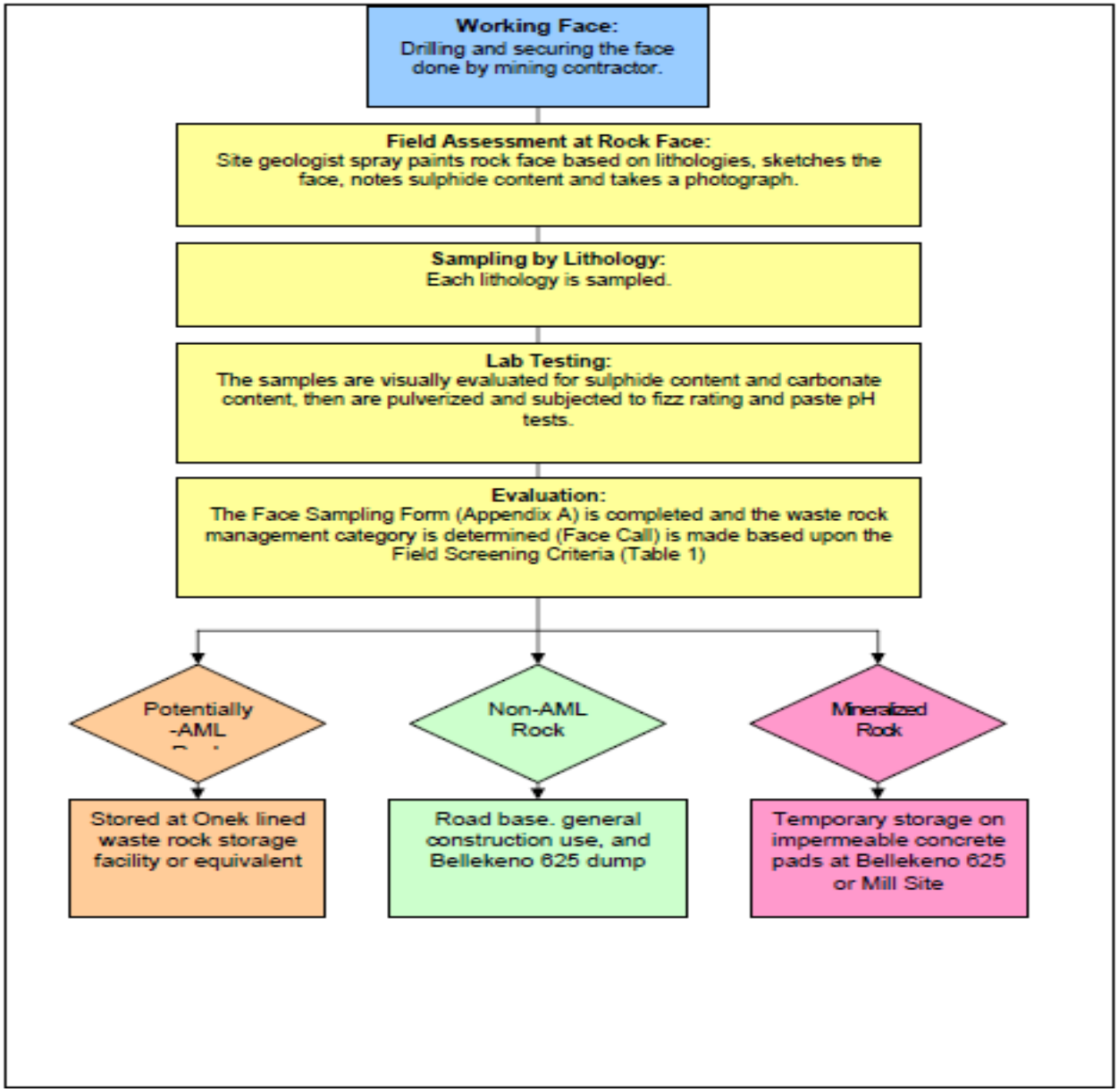
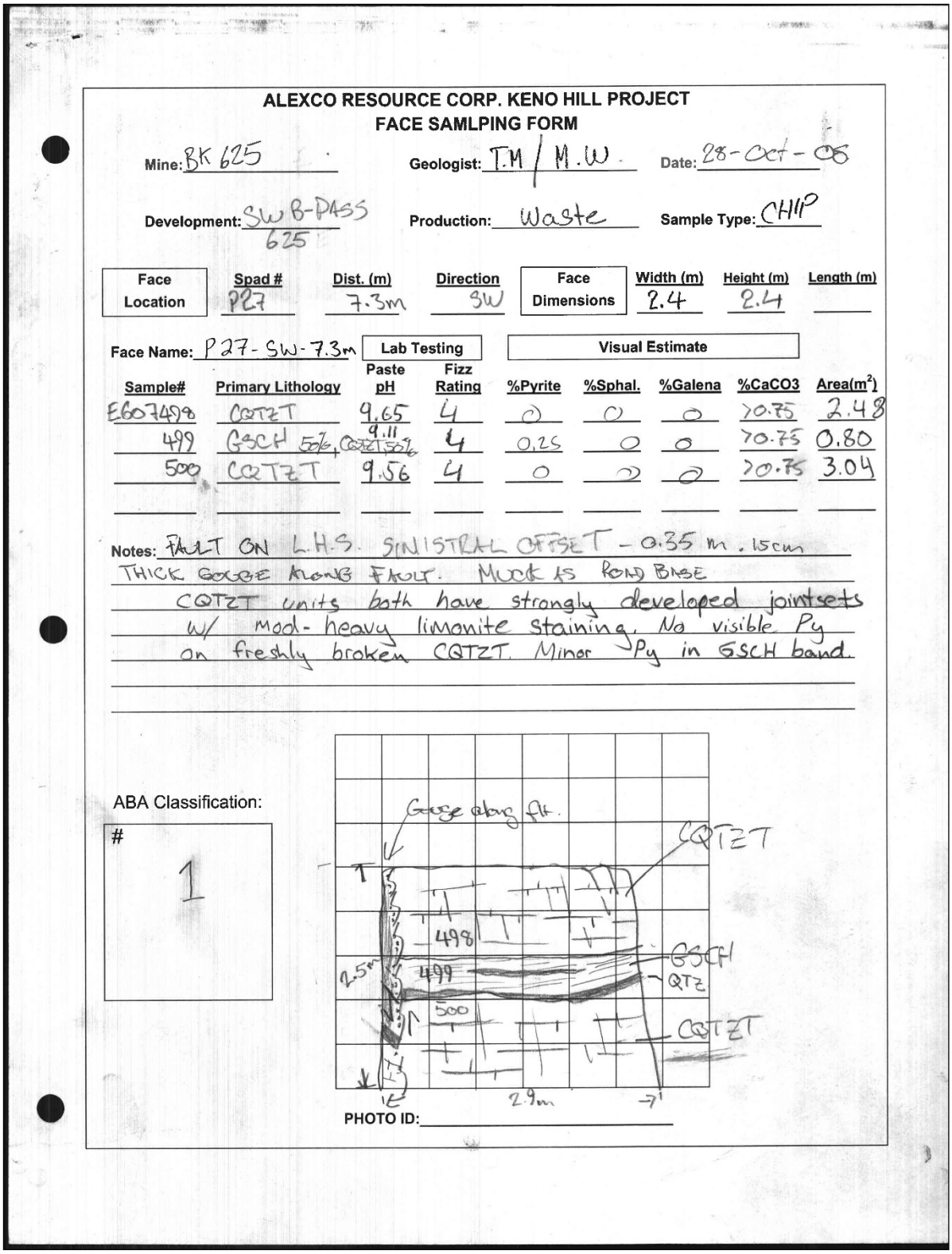


Figure 2 Face Sampling Method



ALEXCO RESOURCE CORP. KENO HILL PROJECT
FACE SAMLPING FORM

Mine: BK 625 Geologist: T.M / M.W. Date: 28-Oct-05

Development: SW B-PASS 625 Production: Waste Sample Type: CHIP

Face Location	Spad #	Dist. (m)	Direction	Face Dimensions	Width (m)	Height (m)	Length (m)
	P27	7.3m	SW		2.4	2.4	

Face Name: P27-SW-7.3m

Sample#	Primary Lithology	Lab Testing: Paste pH	Lab Testing: Fizz Rating	Visual Estimate: %Pyrite	%Sphal.	%Galena	%CaCO3	Area(m²)
E607498	QTZT	9.65	4	0	0	0	>0.75	2.48
499	GSCH 50% QTZT 50%	9.11	4	0.25	0	0	>0.75	0.80
500	QTZT	9.56	4	0	0	0	>0.75	3.04

Notes: FAULT ON L.H.S. SINISTRAL OFFSET - 0.35 m, 15cm THICK GOUGE ALONG FAULT. MUCK IS FOOTWALL QTZT units both have strongly developed jointsets w/ mod-heavy limonite staining. No visible Py on freshly broken QTZT. Minor Py in GSCH band.

ABA Classification:

#
1

PHOTO ID:

Figure 3 Example of Face Sampling Form

3.1.3 Evaluation and Waste Rock Management Category Designation

The results of all screening criteria are evaluated according to the criteria presented in Sections 2.2.1 & 2.2.2, and the entire round is designated to the appropriate waste rock management category (more commonly referred to as the "face call" or ABA classification, with 1 being N-AML, 2 being P-AML). A special case may occur when a given blast round contains a complex mixture of lithologies including both N-AML and P-AML units. If overall less than 30% of the working face is deemed as P-AML, and the remainder of the face consists of rock with a high neutralization potential (such as calcareous quartzite), the geologist may assign the entire blast round as N-AML. The rationale here is that upon blasting and transport, the rocks from all units are mixed and the small portion of P-AML rocks would be overwhelmed by the net neutralizing potential N-AML units, and bulk chemistry of the round would be N-AML. As an example, consider the following 240 tonne blast round which contains 30% graphitic schist (1.75% S, 1% Ca) intercalated with 70% calcareous quartzite (0.25% S, 2.8% Ca). This is an extreme example, as 1.75% sulfur is well above the 95th percentile for graphite schist analyses presented in the Altura 2008b. In contrast, Ca = 2.8% for the calcareous quartzite is the average value of calcareous quartzite samples from analyses used in Altura 2008b. Thus, upon blasting and transport the 240-tonne muck pile of mixed lithology has a bulk chemical composition of the following:

For Sulfur	1.75%*0.3		For Ca	1%*0.3
	+0.25%*0.7			+2.8%*0.7
	0.7%			2.26%

The bulk composition of this blast round falls well within the N-AML criteria of having S ≤ 1.5% and Ca ≥ 0.75%. Translating the geochemical data into the more industry standard NP:MPA ratio using the relationship derived Altura 2008b, NP = 25.76[%Ca] + 7.537 and MPA = %S*31.25. Using these relationships, the preceding example would have a NP:MPA ratio of 3.0, which is higher than the 2:1 ratio which is indicated by MEND (2009) to be unlikely to produce net acidity.

Some discretionary decisions on the part of the geologist are necessary; for example in a case of 20% of the working face comprised of a highly sulphidic zone in an otherwise benign working face, the geologist may opt to designate the entire round as P-AML due to the high concentration of P-AML potential in a small zone. It is also important to note that this scenario in which the blast face contains up to 30% P-AML rock is relatively uncommon, and in all cases, testing and determination is made on a conservative basis, meaning that the site geologist will only allow these P-AML containing blast rounds to be classified as N-AML if the remainder of the blast face is determined to have ample neutralization potential.

4 CONFIRMATORY GEOCHEMICAL AND ABA TESTING

Geochemical and ABA testing of waste rock forms an important component of the waste rock management program. The purpose of this testing is to provide additional verification of the effectiveness of the field screening criteria.

After initial field screening, samples are composited to ensure that they are representative of the blast rounds from which they are taken. First, samples from each face are combined based on their respective tonnages, which are calculated based on their areas on the digitized face photo (see Figure 4). These areas are multiplied by the length of the blast round to produce volumes. The volumes are then multiplied by average density according to their lithology to produce the tonnage represented by each sample. Sample composites are first made of each blast round (face), and are weighted according to their calculated tonnages. Additional compositing is done on these composite blast round samples depending on the analytical method and schedule, which is presented below. Where a number of blast rounds are composited, they are weighted to reflect the tonnage of each respective round.

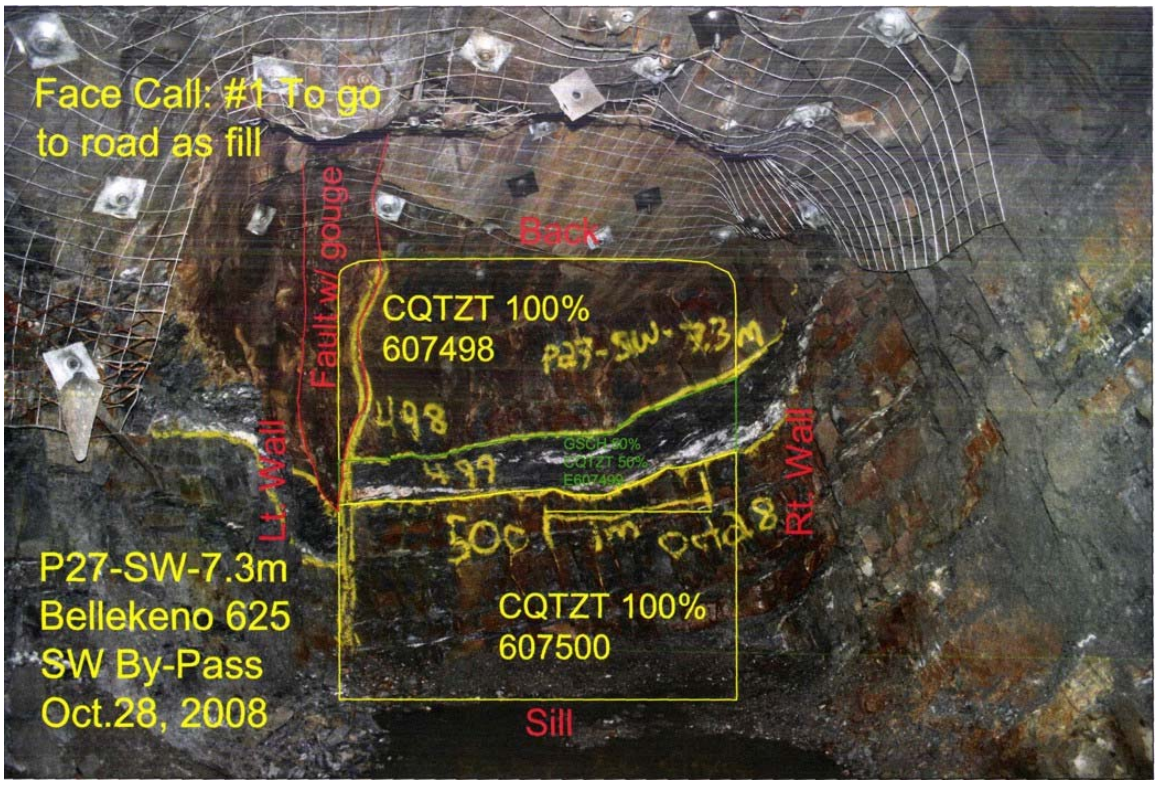


Figure 4 Face Photo of Bellekeno 625 Bypass Showing Sampling According to Lithology and Calculated Sample Areas

4.1 CONFIRMATORY TESTING SAMPLING FREQUENCY AND SCHEDULE

Acid base accounting (ABA) and inductively coupled plasma (ICP) sampling frequencies are done at a minimum of 1 ABA sample (1000 tonnes) per 4,000 tonnes and 1 ICP analysis per 1,000 tonnes in N-AML waste rock. In P-AML waste rock, the sampling density is increased to 1 ABA sample per 500 tonnes and 1 ICP analysis per 500 tonnes.

4.1.1 ICP Sampling Frequency

While meeting per tonnage sampling frequency, the more natural sampling unit is based on number of blast rounds (each represented by a face sample composite). This tonnage depends on several variables including the length of the round, the dimension of the heading, and whether or not there is overblast. Depending on the dimensions of the heading, this typically varies between 3 and 5 blasts per sample.

4.1.1.1 ICP Feedback Sampling for Field Screening Methods

In addition to routine, per tonnage frequency ICP composites described in 4.1, ICP samples will be analyzed for each sample constituting one of the faces in the 1000 tonne ABA composite. These results will be used as a feedback for the Face Sampling Method described in Section 3.1.2. The need for this provision will likely diminish after a reasonable data set is gathered.

4.1.1.2 ABA Sampling Frequency

Similar to ICP sample composites, ABA sampling will be composited based on the number of blast rounds and in accordance with per tonnage limits in order to be representative of the tonnage as a whole. Due to the ineffectiveness of the larger 10,000 tonne composite for verifying and providing feedback, a smaller and more regular 1000 tonne ABA composite for every 4000 tonnes of excavation was adopted in 2009 and has since been implemented with success. Development and production at Flame and Moth, Bellekeno, Onek and Lucky Queen will involve headings of a variety of sizes (2x2, 3x3 and 4x4 meters) but the general principle of a 1,000 tonne composite ABA sample per 4,000 tonnes will be taken regardless of blast round size.

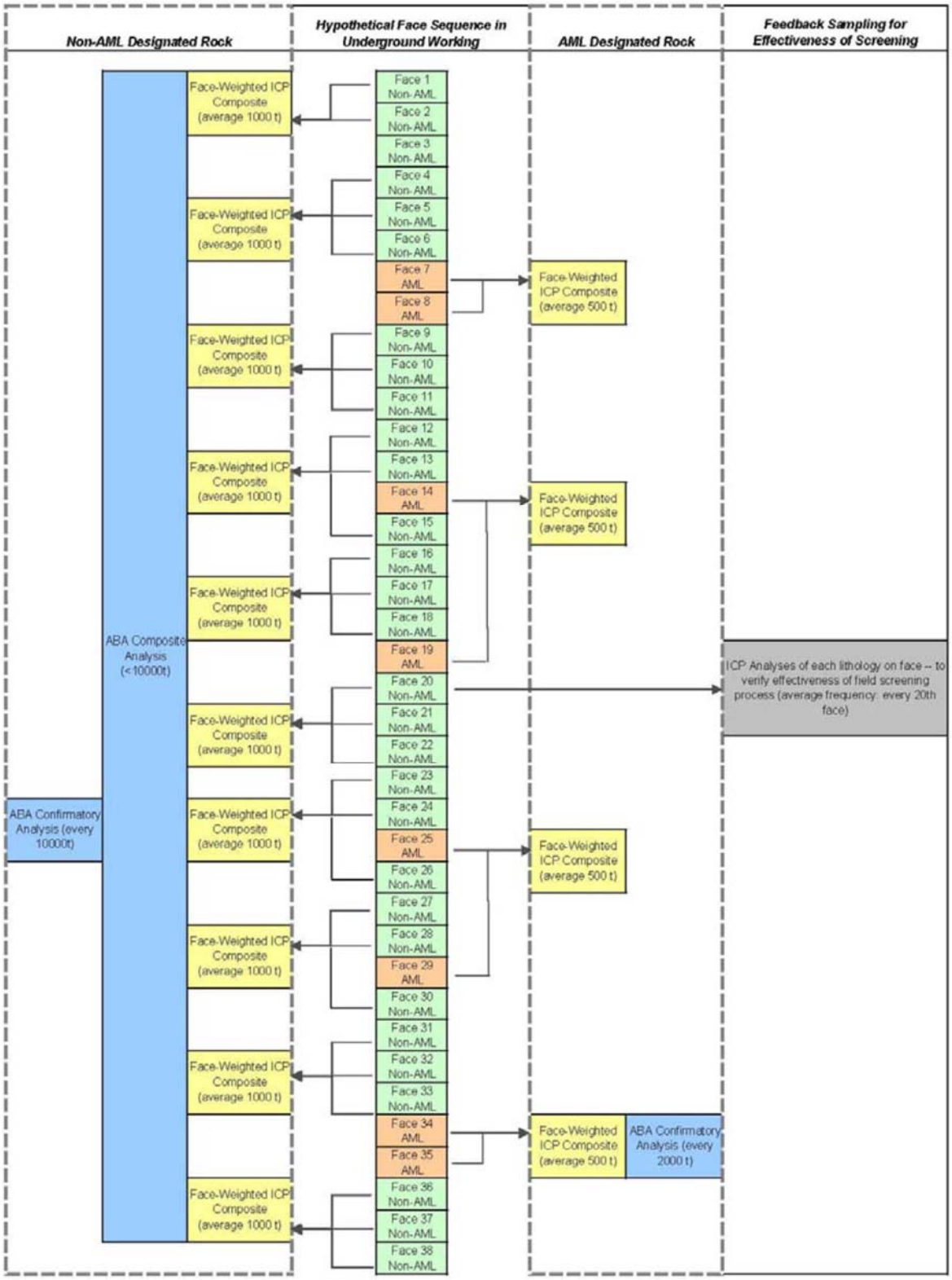


Figure 5 Waste Rock Sampling Schedule

It is important to note that the above criteria represents a high sample density. This is in large part driven by the fact that the proposed work is the first rock excavation activity in the district under Alexco's management, and as such it is important to conduct relatively detailed monitoring to develop a sound information base for decision-making and enhancements to future waste rock management strategies. As the understanding increases, such a high sample density will likely no longer be justified.

4.1.2 Time Lag

4.1.2.1 Time Lag between Excavation and Sampling

The time between blasting and exposure of a new face to sampling and the Face Call (waste rock management category designation) for a given round shall not exceed 48 hours notwithstanding unforeseen and extenuating circumstances such as breakdown of analytical or lab equipment.

4.1.2.2 Time Lag between Excavation and Receipt of Analytical Data

The total time between excavation and receipt of analytical data is dependent on a number of factors. First, the size of the composite sample being tested can extend the length of time between excavation and receipt of data especially for individual blast rounds near the beginning of the composite sample. For example, at a rate of development of two blast rounds per week at approximately 120 tonnes per round would take 28 days to accumulate the rock required to complete a composite ABA sample of 1,000 tonnes. In headings of non continuous mining this delay can extend out much further. Second, standard laboratory practices for individual analytical packages take varying amounts of time for completion (e.g. ABA analysis takes longer than ICP). In spite of these uncertainties we are able to suggest the following limits of time lag between excavation and receipt of analytical data for ABA and ICP analysis data.

4.1.2.3 Time Lag between Excavation and Receipt of ICP Data

The time between blasting and exposure of the final face comprising the composite to receipt of ICP analytical data shall not exceed two months notwithstanding extenuating circumstances such as breakdown of lab equipment or delays at the analytical laboratory.

4.1.2.4 Time Lag between Excavation and Receipt of ABA Data

The time between blasting and exposure of the final face comprising the composite to receipt of ABA analytical data shall not exceed three months; notwithstanding extenuating circumstances such as breakdown of lab equipment, or delays at the analytical laboratory.

4.2 MINE WALL TESTING

Monitoring in both the excavated areas and the rock storage areas forms an integral and vital component of any waste rock management program, as it determines the effectiveness of the management measures and provides valuable information for waste rock management strategies of future developments and closure measures at the Bellekeno mine. Mine wall testing at the Bellekeno underground development will provide additional confirmation of the geochemical character mine walls through multi-element and acid-base accounting analysis. Mine wall testing will not be completed at Onek and Lucky Queen as the mines are anticipated to be above the groundwater table, whereas the mine wall testing plan is intended to inform the prediction of the Bellekeno adit discharge quality once it is flooded. Mine wall testing is not proposed for Flame and Moth for similar reasons.

4.2.1 Mine Wall Sampling for ICP and ABA Analysis

On average, one geochemical sample will be taken for each 10 lineal metres of underground working for analysis by routine multi element ICP, including sulphur. Also on average, one acid base accounting sample will be taken for each 40 lineal metres of workings. The specific sampling method will be determined by the site geologist in order to obtain the most representative result. This provision is necessary because of the lithological complexity of the Keno Hill area and the tendency of ABA and geochemical characteristics of the rocks to vary widely between each lithological unit. Thus the sampling method must vary depending on the direction of the heading and how it cuts the metamorphic layering. For example, a drift or heading which cuts across the lithological layering might be most representatively sampled by doing a continuous chip sampling along the mine working. In a heading which parallels the lithological layering, the most representative sampling method might be vertical rib samples. With each sample taken, details of the sampling method used will be duly recorded. Table 5 shows a hypothetical mine wall sampling schedule.

Table 6: Mine Wall Sampling Schedule

ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	ABA sample over same interval
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	ABA sample over same interval
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	ABA sample over same interval
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	
ICP sample up to 10 m continuous sample	ABA sample over same interval

4.2.1.1 ICP samples sizes for mine wall testing

Although the specific sample method will depend on the mine heading, ICP sampling will be composited to a maximum of 10 m per sample.

4.2.1.2 ABA samples sizes for mine wall testing

Although the specific sample method will depend on the mine heading, ABA sampling will be composited to a maximum of 10 m per sample, and will duplicate every fourth ICP sample as confirmatory to the ICP sampling.

4.2.2 Time Lag

The confirmatory geochemical and ABA testing plan attempts to minimize the time lag between excavation of waste rock and receipt of analytical results. In contrast, a greater time lag between exposure of mine walls and sampling is deliberately pursued for this Mine Wall Testing Plan. The purpose for this is to allow for some natural oxidation and weathering to take place on the exposed rock in order to gain insight into possible changes in chemical or ABA characteristics of mine walls over time. This plan is designed to give the longest possible time lag between excavation and sampling while meeting the requirement of Section 25.c of Water Licence QZ07 078: "at a minimum, the annual testing completed will be representative of all new excavation during that given year".

4.2.2.1 Time Lag between Excavation and Sampling

The time lag between excavation and sampling will be no less than six months and no more than nine months.

4.2.2.2 Time Lag between Excavation and Receipt of Analytical Data

Time lag between excavation and receipt of analytical data will not exceed one year; notwithstanding major delays caused by breakdown of lab equipment or delays at the analytical lab.

4.2.3 Analytical Methods

Samples for both confirmatory testing and mine wall sampling will submitted to a certified laboratory and will be analysed according to the following protocols.

4.2.3.1 ICP Analyses

Samples submitted for ICP analysis will be pulverized and analysed for multi-elements via ICP-AES using either aqua regia, 4-acid, or strong acid digestion. Sulphur will be included in the analytical suite.

4.2.3.2 ABA Analyses

Samples submitted for acid base accounting will be pulverized and analysed via modified or Sobek acid base accounting methods, including total sulphur via Leco furnace, sulphate via either sodium carbonate leach or HCl digestion, neutralization potential via modified or Sobek method, total inorganic carbon, and paste pH at a 1:1 solids to water ratio. Siderite correction methods will be used if samples are from within 5 m of the mineralized vein or are suspected to contain siderite.

5 WASTE ROCK MONITORING

Programs for ongoing physical and water quality surveillance of waste rock storage facilities through inspections and drainage monitoring have been established as part of the Advanced Exploration Program. Physical surveillance of waste rock storage areas will occur on a weekly basis at the following locations:

- All P-AML waste rock storage facility or equivalents;
- All N-AML waste rock disposal areas including roads between Bellekeno East Portal and Bellekeno 625, the 'power line road' that runs along the north slope of Sourdough Hill, the bypass road constructed along the north side of Keno City, the Bellekeno, Onek and Lucky Queen waste rock disposal areas, and all other locations where N-AML rock is used as fill or construction material.

5.1 PHYSICAL INSPECTION METHODS

The purpose of the physical inspection is to observe and record sufficient information to permit development of a course of action; repair or rehabilitation if it is required. Specifically:

- Physical stability such as settling and excessive erosion (tension cracks, bulges at the toe; on waste rock road surfaces, washouts, rutting and culvert seating);
- Evidence of permafrost degradation in any areas of physical disturbance;
- Evidence of sulphide oxidation (such as snow melt areas, presence of oxidation products); and
- Occurrence of drainage or seeps from rock storage areas. If drainage is noted, flow volume will be estimated and basic field parameters of pH and conductivity recorded as well as sampled for metals. More detailed monitoring will be initiated as required and based on specific results if field monitoring results indicate:
    i. pH significantly declining between measurements or dropping below 7.0, and/or
    ii. zinc concentrations show a significant increasing trend or zinc above 0.5 mg/L.

Inspection checklists will be filled out on a weekly basis to ensure structural integrity of mine components and that runoff and discharge is being appropriately managed. The following rating system will be used in the field reporting to evaluate the structural integrity of the areas to be physically inspected:

Excellent	"As New" Condition.
Good	System or element is sound and performing its function; although it shows signs of use and may require some minor repairs, mostly routine.
Fair	System or element is still performing adequately at this time, but needs "priority" and/or "routine" repair to prevent future deterioration and to

	restore it to good condition. A fair rating will be reported to site manager after the inspection.
Poor	System or element cannot be relied upon to continue to perform its original function without "immediate" and/or "priority" repairs. A poor rating will be reported to site manager after the inspection.

If issues are identified during the weekly inspections of waste rock storage areas, the site manager will be informed immediately and the appropriate mitigative measures will be implemented. An inspection by a qualified geotechnical engineer would be undertaken for physical stability if necessary. Additional erosion and sediment controls may need to be implemented as required. Appropriate mitigative measures will be implemented should acidic or metal rich drainage be detected in order to prevent adverse impacts to receiving waters.

If geotechnical inspections are required, they will be carried out during the summer months when the surface and sides of the various rock-fill structures are not obscured by snow.

The lined P-AML storage pad areas will be monitored for drainage volume with field parameters (pH and conductivity) measured on a monthly basis from May to October. Providing there is sufficient water accumulation, a full suite of water quality analyses will be conducted at least twice per year. The sumps will be monitored monthly using a Heron Instruments Dipper-T probe to determine the accumulation amount of water within the storage facility. Periodically, water will be directed to licenced water treatment and discharge facilities for discharge or treatment prior to discharge if required. Water from any additional P-AML waste rock storage facilities will be treated in the same way. See also the Water Management Plan (Section 6.1). Upon closure, these facilities will be covered with an impermeable liner and will not require ongoing maintenance. See the conceptual closure plan in Section 8 for more details.

6 ADAPTIVE MANAGEMENT

In addition to measures described above, an Adaptive Management Plan (AMP) has been prepared for the entire development. As a requirement of Type A Water Licence QZ09-092, Alexco has written an AMP specific to the Bellekeno, Onek, and Lucky Queen undertakings. It is expected that the amended water licence for the addition of Flame & Moth to the production stream will require an update to the AMP.

7 REPORTING

Documentation of waste rock management activities including operational field screening and segregation and ongoing geochemical monitoring and analyses will be compiled and included in the annual mining land use, Quartz Mining License and Water Licence annual reports.

8 CLOSURE AND RECLAMATION

Reclamation and closure of P-AML waste rock storage facilities and N-AML waste rock disposal areas are discussed in the Reclamation and Closure Plan for QML-0009. As part of Closure and Reclamation studies, kinetic testing of N-AML and P-AML waste rock will be initiated in 2014. Kinetic testing will look at the acid generation and metal leaching potential of the waste rock units through humidity cells or field bins.

APPENDIX A

Memorandum

To: Brad Thrall, Alexco Keno Hill Mining Corp.

From: Ethan Allen and Kai Woloshyn

CC: Scott Davidson

Date: February 15, 2013

Re: Review of Lucky Queen Waste Rock Management Criteria – Keno Hill District, Yukon

1 INTRODUCTION

Criteria for Alexco Keno Hill Mining Corporation's (AHKM) waste rock management plan (WRMP) was derived primarily from analysis of Keno Hill District (KHD) static testing results by Altura Environmental Consulting Inc. (Altura 2008a) and geoenvironmental characterization of the Bellekeno deposit also by Altura, (2008b). These studies were used to derive geochemical and field screening criteria to distinguish between rock with the potential to generate net acidity or metal leaching (P-AML) and rocks with low potential for generating net acidity or metal leaching (N-AML). Access Consulting Group (Access) conducted a geochemical characterization of the Lucky Queen deposit (Access, 2011) in which the waste rock management criteria were modified due to the low overall neutralizing potential at Lucky Queen.

The field screening criteria relies partly on a visual estimate of sulphide content. Alexco reports that modified waste rock management criteria at Lucky Queen have been difficult for site operations personnel to implement because of the low sulphur cutoff which is used for one of the criterion used to distinguish between P-AML and N-AML rock. This limitation in the ability to accurately resolve the visual sulphide content results in ambiguity, which leads to cautionary de facto designation as P-AML of nearly all of the excavated rock.

Amendment of mine waste by addition of neutralization materials is has been used extensively to improve the acid base accounting (ABA) characteristics of mine waste materials in order to delay or prevent acid rock drainage (ARD) (e.g. Rose et al., 1995; Skousen and Larew, 1994; Wiram and Naumann, 1995).

This memo undertakes a review of the Lucky Queen geochemical data and presents options and recommendations regarding the addition of neutralizing materials in order to amend Lucky Queen waste rock

The objective of this memo is to provide information toward the development of revised waste rock management criteria for Lucky Queen which will be achievable for site operations personnel.

2 METHODS

Thresholds for metal leaching of zinc and lead in Altura (2008a) were based on the distribution of samples of 24-hour shake flask extraction (SFE) testing results of 47 samples from district wide historical waste rock and pit dumps. Criteria of 10 mg/kg Zn and 3 mg/kg Pb were selected based on the logarithmic distribution plots and horizontal inflection points which indicated division between populations of samples which showed higher and lower metal leaching.

In addition to the 47 samples used by Altura (2008a), additional static testing data from SRK, 2012 (78 samples) and Access Consulting Group (ACCESS, 2012), 40 samples for a total of 165 samples were used in this study. The 78 samples analyzed reported by SRK (2012) reported results after 18 hours. The remaining data used 24 hour shake flask extraction. Deionized water as the extracting fluid and used a 3:1 liquid to solids ratio. Corresponding ICP metals data by ICP-MS or ICP-OES was used for each sample. ABA data was also available for most samples but was not used in the analysis.

3 RESULTS

Prior to combining the data, 18 hour SFE test results for selected parameters of interest were compared with the 24 hour tests in order to determine if there was any significant increase in dissolution and apparently leachability in the 24 hour tests. Box plots comparing 18 hour and 24 hour test results for calcium, lead and zinc leaching are presented in Figure 1. Median values for all of these parameters are similar to, or greater in the 18 hour tests. This indicates that the additional time does not increase leachability, and that the test results are comparable.

Fresh samples (N =29) were compared with weathered samples (N= 136) in order to determine if fresh samples contained higher contained calcium, as Altura (2008b) adjusted the calcium criteria by a factor of 1.5 since correlation factors were derived using weathered rock while the waste rock management plan was implemented for fresh rock. Figure 2 shows that fresh samples contain significantly more calcium than weathered samples.

3.1 SAMPLE REACTIVITY CRITERIA

Following the methodology of Altura (2008a), the leachate extraction dataset was examined to determine levels of leachate pH, Zn loading and Pb loading that serve to divide populations and determine potential alternative, more conservative population breaks existed from those used by Altura (2008a). Figure 2 through Figure 5 in Attachment 1 show histograms and cumulative distribution plots for leachate pH and leachate concentration (converted to mg/kg) for zinc, lead and cadmium.

Net Acidity: Leachate pH criteria of <5.5 was selected by Altura (2008a) to differentiate samples generating net acidity. Although the additional data presented in Figure 3 do not show two distinct populations, pH 5.5 is located at the edge of a horizontal inflection point in the cumulative relative frequency curve. These results confirm that the leachate pH criteria of <5.5 is appropriate for differentiating the samples generating net acidity.

Metal Leaching: Altura (2008a) used 10 mg/kg zinc and 3 mg/kg lead as the criteria for metal leaching based on logarithmic distribution plots. The additional data presented in Figure 3 result in a less clear division in populations than was found by Altura (2008a). However, a distinct inflection point still exists between 2 and 3 mg/kg on the cumulative distribution plot, indicating that 3 mg/kg is still appropriate for dividing populations between low and high lead leaching.

Figure 5 shows that the additional data still indicate an inflection point at 10 mg/kg leachable zinc. Another inflection point exists at 2 mg/kg. 2 mg/kg is chosen as a second, more conservative threshold to distinguish between populations and can be used to determine a lower contained zinc threshold for waste rock to be used for construction near water courses.

3.2 Review of Key Controlling and Correlating Factors for Sample Reactivity

Contained calcium and sulphur via trace metals ICP are plotted in Figure 6 and Figure 7 with color as leachate pH and leachate dissolved zinc, respectively. Color gradient inflection points were chosen to be the same as those used by Altura (2008a) for ease of comparison. Figure 6 shows that the upper left quadrant bound by 0.25% sulphur and 0.51% contains the majority of samples with leachate pH below 5. This quadrant also contains a number of samples with pH > 5.5. The threshold for calcium was increased to 0.75% by Altura (2008b) for application to waste rock management criteria in order to account for the difference between the weathered rock (on which the ARD/ML study was based on) and fresh rock, which contains more calcium. The expanded dataset includes both weathered and fresh rock samples. Figure 7 shows that samples with zinc leaching greater than 2 mg/kg are largely constrained to samples with greater than 0.25% sulphur and less than 0.75% calcium. 9 of 79 samples with < 0.25% S and > 0.51% Ca showed zinc leaching above 1 mg/kg, with 3 of samples greater than 10 mg/kg. Of these samples, 7 had contained zinc of greater than 1100 ppm.

Figure 8 shows leachable zinc versus contained zinc with color gradient as leachate pH. Criteria of 10 mg/kg (Altura, 2008a) and 2 mg/kg ppm zinc are shown with corresponding cut-offs of 5000 and 1100 ppm zinc. As can be seen in Figure 8, 9 samples with contained zinc of between 5000 and 1100 ppm with pH > 5.5 exhibit zinc leaching of greater than 10 mg/kg with one sample reaching 224.1 mg/kg. Reducing the zinc criteria to 1100 ppm eliminates all but one sample with pH > 5.5 which shows zinc leaching of greater than 2 mg/kg.

Figure 8Figure 9 shows that a cut-off of 5000 ppm eliminates all samples with leachable lead of >3 mg/kg and pH < 5.5. A number of samples (16) exhibit pH < 5.5 but do not show lead leaching over 3 mg/kg.

In summary, key controlling and correlating factors for sample reactivity derived by Altura to identify samples with the potential for generating net acidity (pH > 5.5) remain accurate when including the additional data. Derived ICP criteria of 5000 ppm lead were accurate for identifying samples with elevated leachable lead of >3 mg/kg for the additional data. The derived ICP criteria of 5000 ppm zinc was largely accurate but did not identify all samples with neutral pH and leachable zinc of <10 mg/kg zinc (9 samples with leachable zinc >10 mg/kg vs. 101 samples <10 mg/kg).

A lower zinc cutoff of 1100 ppm resulted in selection of all samples below 2 mg/kg zinc leaching with pH > 5.5 except for one sample which showed 3.15 mg/kg leachable zinc. This lower contained zinc threshold is recommended where selective identification of rock with ultra-low leachable zinc is desirable, i.e. for construction near water bodies.

4 INPUT TERMS FOR MASS LOADING MODELS

GoldSim mass loading modelling has been completed for the Christal Creek and Lightning Creek watersheds. The predictive modeling has included the proposed deposition of N-AML waste rock from Bellekeno, Onek and Lucky Queen. The potential metal leaching load for the contaminants of concern, cadmium and zinc, from the N-AML waste rock was calculated using 50% of the Waste Rock Management Plan N-AML metal leaching criteria thresholds (10 mg zinc /kg waste rock and 1.1 mg cadmium /kg waste rock) . This approach is an overly conservative estimation in metal leaching the mean capability for N-AML waste rock for cadmium and zinc. Table 1 provides summary statistics for N-AML waste rock in the KHSD.

In addition, geochemical data sets tend to be positively skewed (Scott and Pain, 2008) which can result in the highest (threshold) value in being orders of magnitude higher than the median or geometric mean. With a positively skewed data set, half the threshold value is also likely to be significantly higher than the median or geometric mean value.

In order to come up with more representative terms for potential loading from waste rock, the data were filtered as per the waste rock management plan for Bellekeno and Onek for all of the geochemical thresholds (screening criteria) as above. With the samples filtered for these criteria, 75 of 165 were selected. Summary statistics for this subset are shown in Table 1 below:

Table 1: Summary statistics for key parameters, filtered as N-AML

Statistic	LCH_Pb (mg/kg)	LCH_Zn (mg/kg)	LCH_Cd (mg/kg)	Pb (ppm)	Zn (ppm)	Cd (ppm)	Ca (%)	S (%)
No. of observations	75	75	75	75	75	75	75	75
Minimum	0.000	0.009	0.0000	1.000	11.000	0.050	0.020	0.010
Maximum	1.626	224.100	5.4300	3506.370	3221.700	55.140	8.320	1.280
1st Quartile	0.001	0.014	0.0002	9.450	108.500	0.300	0.085	0.020
Median	0.007	0.030	0.0013	79.000	276.000	2.900	0.970	0.050
3rd Quartile	0.058	0.254	0.0181	674.500	596.800	9.300	2.470	0.230
Mean	0.090	3.974	0.1133	519.038	509.384	7.251	1.920	0.179
Variance (n-1)	0.058	685.897	0.4246	727183	504541	110	5.858	0.064
Standard deviation (n-1)	0.242	26.190	0.6516	852.751	710.311	10.477	2.420	0.253
Skewness (Pearson)	4.510	8.106	7.5552	2.104	2.550	2.391	1.431	1.993
Skewness (Fisher)	4.603	8.272	7.7102	2.147	2.602	2.440	1.460	2.034
Skewness (Bowley)	0.789	0.863	0.8667	0.791	0.314	0.422	0.258	0.714
Geometric mean	0.009	0.071	0.0015	79.268	228.024	1.989	0.562	0.070

As can be seen in Table 1, after filtering the dataset according to the waste rock management plan geochemical screening criteria, for N-AML samples, the maximum value for leachable zinc is 224.1mg/kg while the median is 0.036 mg/kg and the geometric mean is 0.075 mg/kg, or approximately 4 orders of magnitude apart. The geometric mean for leachable cadmium is 0.0015 and the median is 0.0013 for this subset. It is suggested that the geometric mean might be more appropriate for a realistic estimate of potential

N-AML waste rock pore water concentration. Significant positive skewness is noted for all parameters but particularly leachable lead, cadmium and zinc.

Filtering the data according to the waste rock management plan geochemical screening criteria but with the zinc threshold of 1100 ppm results in 67 of 165 samples selected. Summary statistics for this subset are shown in Table 2:

Table 2: Summary statistics for key parameters, filtered as N-AML and samples <1100 ppm zinc

Statistic	LCH_Pb (mg/kg)	LCH_Zn (mg/kg)	LCH_Cd (mg/kg)	Pb (ppm)	Zn (ppm)	Cd (ppm)	Ca (%)	S (%)
No. of observations	67	67	67	67	67	67	67	67
Minimum	0.000	0.009	0.0000	1.000	11.000	0.050	0.020	0.010
Maximum	1.626	38.100	1.6200	3506.370	1100.000	27.430	8.320	0.710
1st Quartile	0.001	0.011	0.0002	7.450	100.500	0.265	0.070	0.020
Median	0.006	0.030	0.0008	48.000	182.000	2.000	0.810	0.040
3rd Quartile	0.042	0.134	0.0072	530.450	439.500	7.650	2.470	0.175
Mean	0.089	0.894	0.0406	439.827	299.700	4.673	1.898	0.133
Variance (n-1)	0.064	23.094	0.0415	681547	71341	36.078	6.258	0.032
Standard deviation (n-1)	0.254	4.806	0.2036	825.559	267.097	6.006	2.502	0.178
Skewness (Pearson)	4.390	7.204	7.2132	2.413	1.025	1.750	1.417	1.713
Skewness (Fisher)	4.492	7.370	7.3795	2.469	1.049	1.790	1.450	1.752
Skewness (Bowley)	0.758	0.683	0.8167	0.845	0.519	0.530	0.383	0.742
Geometric mean	0.007	0.051	0.0010	58.646	174.765	1.465	0.492	0.058

Using the geochemical screening criteria in the waste rock management plan with a lower zinc cutoff of 1100 ppm results in a maximum value of 38.1 mg/kg leachable zinc with a median value of 0.03 mg/kg and geometric mean value of 0.051 mg/kg zinc. The geometric mean for leachable cadmium is 0.001 and the median is 0.0008 for this subset.

5 CONCLUSIONS

- Leachate pH of <5.5 is appropriate for differentiating samples generating net acidity although a significant proportion of samples with >0.25% S and <0.75% Ca do not demonstrate pH < 5.5

- Sample reactivity criteria for lead leaching of 3 mg/kg is indicated by the distribution of samples and corresponds well with a contained lead content of 5000 ppm, excluding samples with pH < 5.5

- Sample reactivity criteria for zinc leaching of 10 mg/kg is indicated by the distribution of samples. A second inflection point at 2 mg/kg can be used to derive a more conservative criterion for zinc. The contained zinc threshold >5000 ppm identifies most samples with pH >5.5 having leachable zinc of >10 mg/kg. However, approximately 10% of the samples with <5000 ppm and pH >5.5 show zinc leaching above 10 mg/kg. The lower contained zinc threshold of >1100 ppm identifies all but one sample with pH >5.5 above 2 mg/kg leachable zinc.

- Modified waste rock management geochemical criteria with a lower contained zinc threshold of <1100 ppm is recommended to select waste rock to be used near (within 30m) of a water course. This corresponds with a field screening criterion of 0.165% sphalerite (trace to no visible sphalerite is recommended). If waste rock from Lucky Queen is selected for construction near a water course, specific waste rock management criteria derived for Lucky Queen (Access, 2011b) are recommended.

Lucky Queen waste rock management criteria differ in that a lower sulphur criterion of 0.15% is used because available neutralizing potential is lower at Lucky Queen.

- The use of the geometric mean values for samples filtered according to all criteria of the geochemical screening criteria is recommended for calculating a representative or realistic estimate of potential concentrations and metal loads from N-AML waste rock disposal areas.

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Access (2011a). Geochemical Rock Characterization, Lucky Queen. Memorandum prepared for Alexco Keno Hill Mining Corp, December 2011.

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Wiram, V.P., and H.E. Naumann, 1995. Alkaline additions to the backfill: A key mining/ reclamation component to acid mine drainage prevention. In: Proceedings 16th Annual Surface Mine Drainage Task Force Symposium, West Virginia University, Morgantown, WV.

Attachments:

Attachment 1: Figures

ATTACHMENT 1

FIGURES

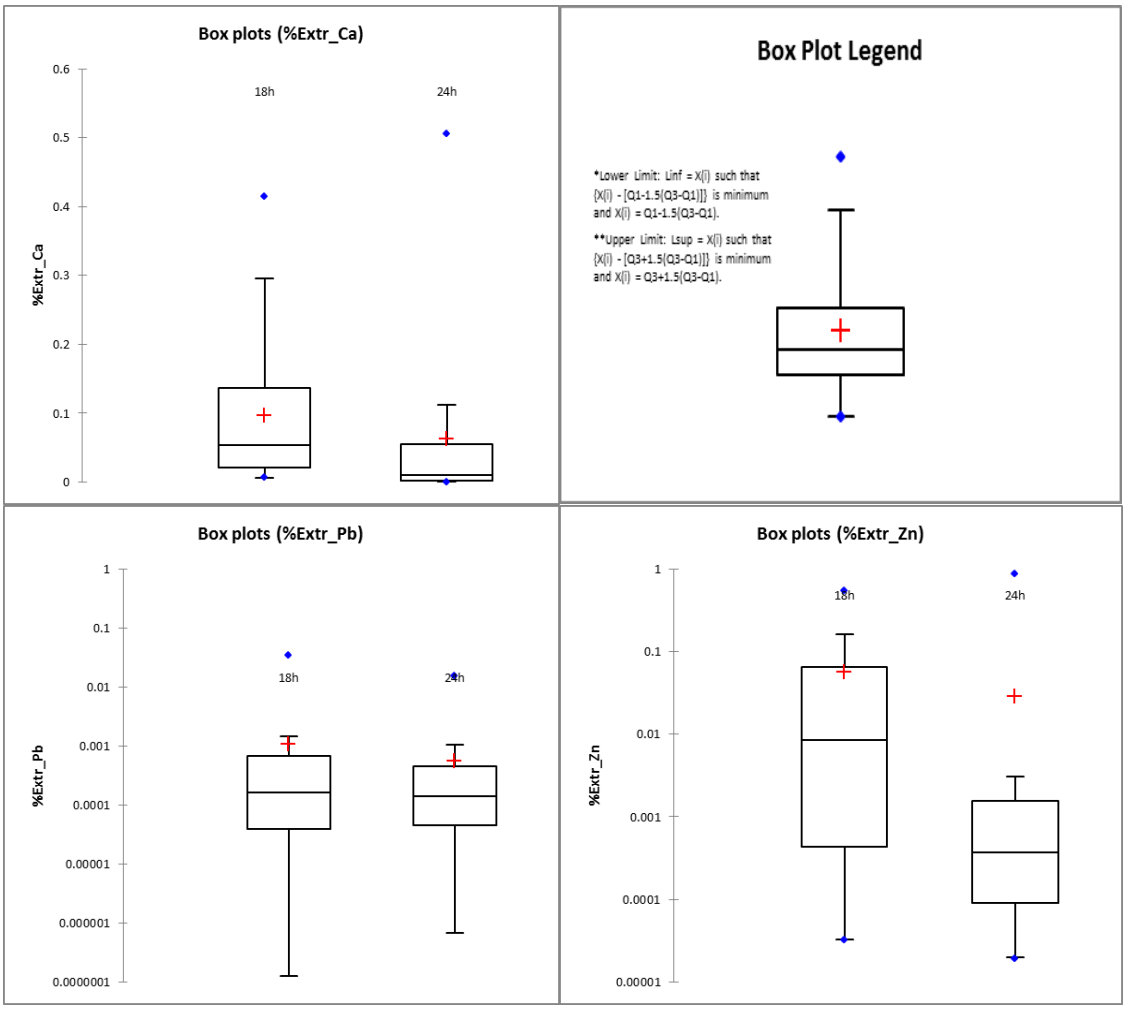


Figure 1: Percent extraction for select parameters, 18 hour vs. 24 hour shake flask extraction tests

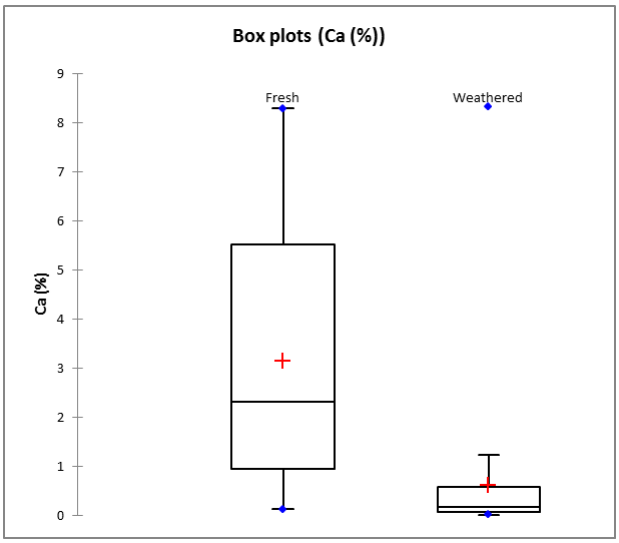
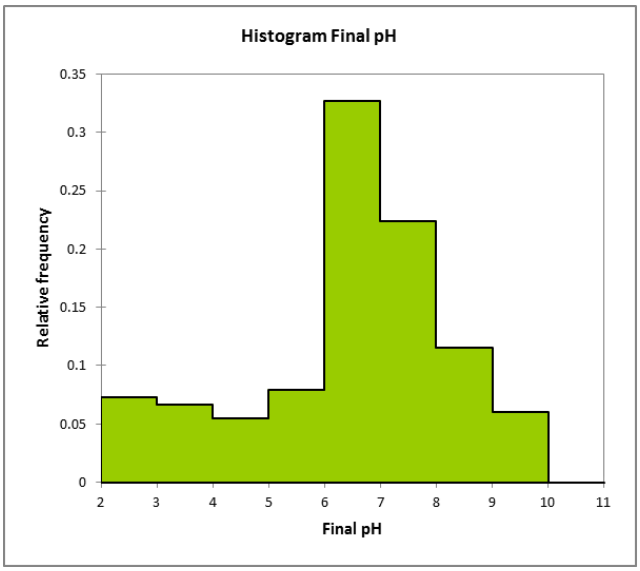


Figure 2: Contained calcium in fresh vs. weathered samples



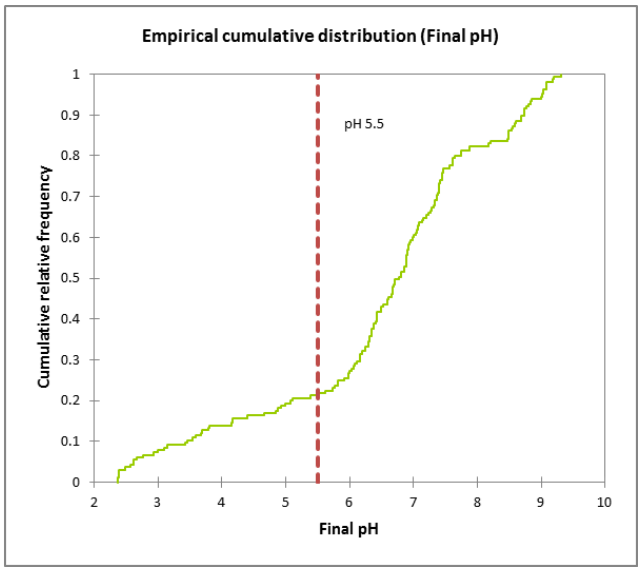
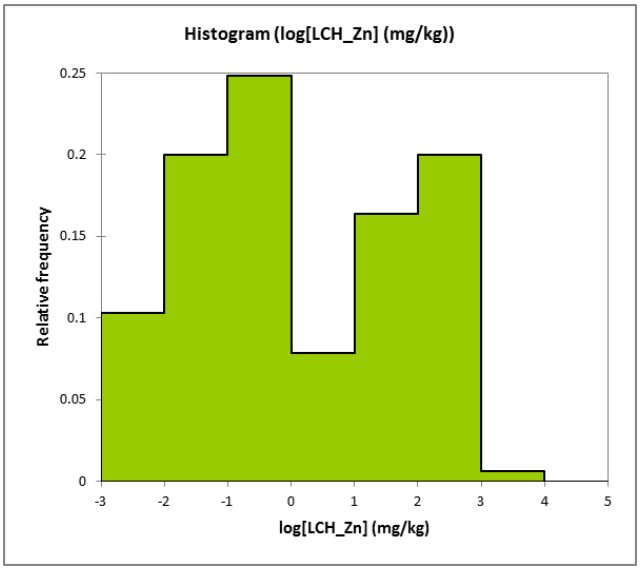


Figure 3: Histograms and cumulative distribution curve for pH



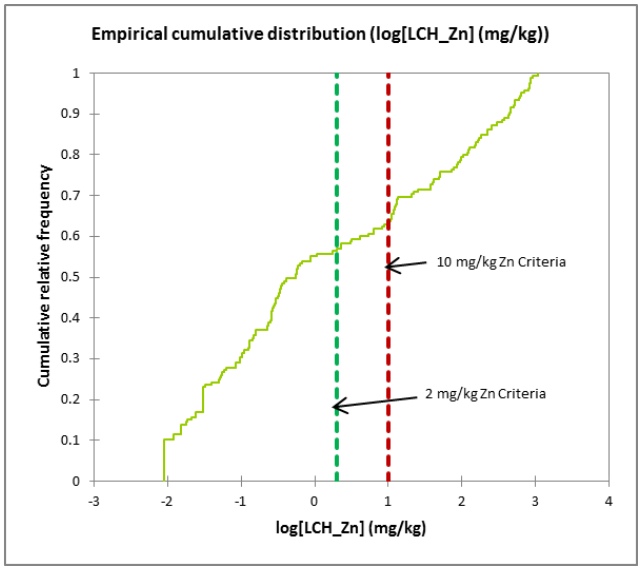
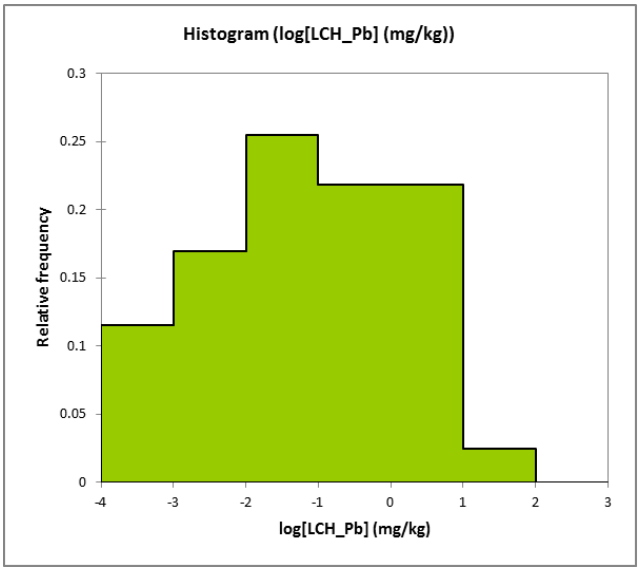


Figure 4: Histograms and cumulative distribution curve for leachable zinc



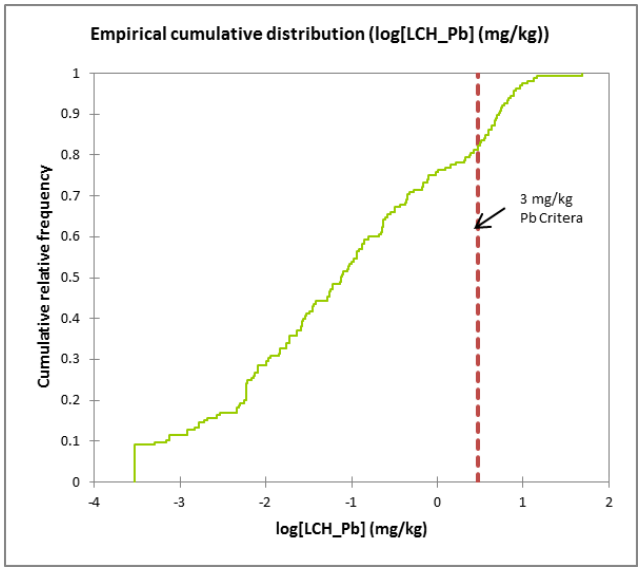


Figure 5: Histograms and cumulative distribution curve for leachable lead

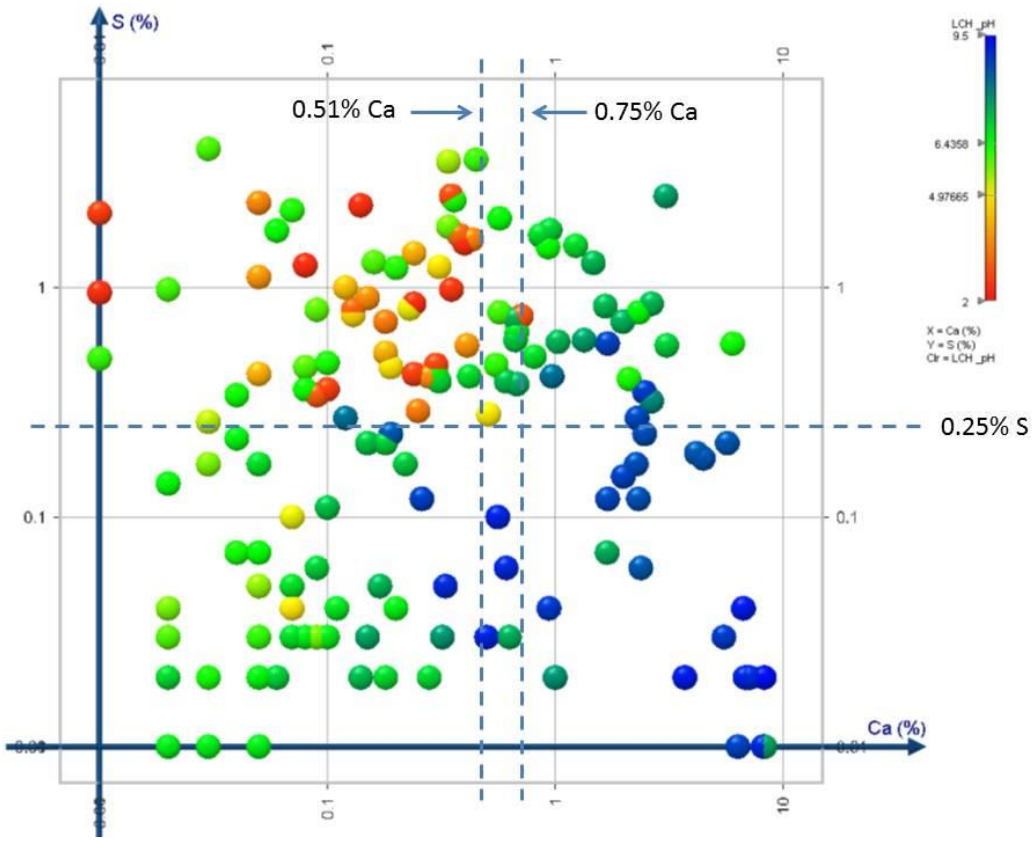


Figure 6: Calcium vs Sulphur rock analyses with leachate pH color gradient

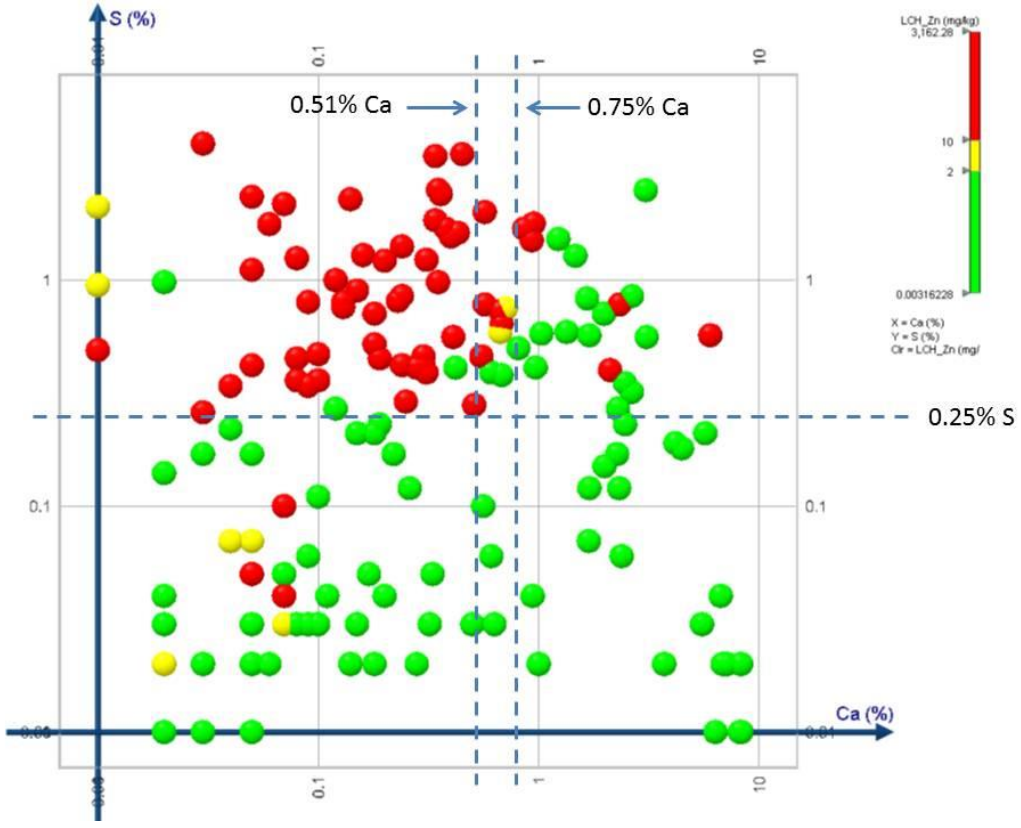


Figure 7: Calcium vs Sulphur rock analyses with leachate dissolved zinc as color interval

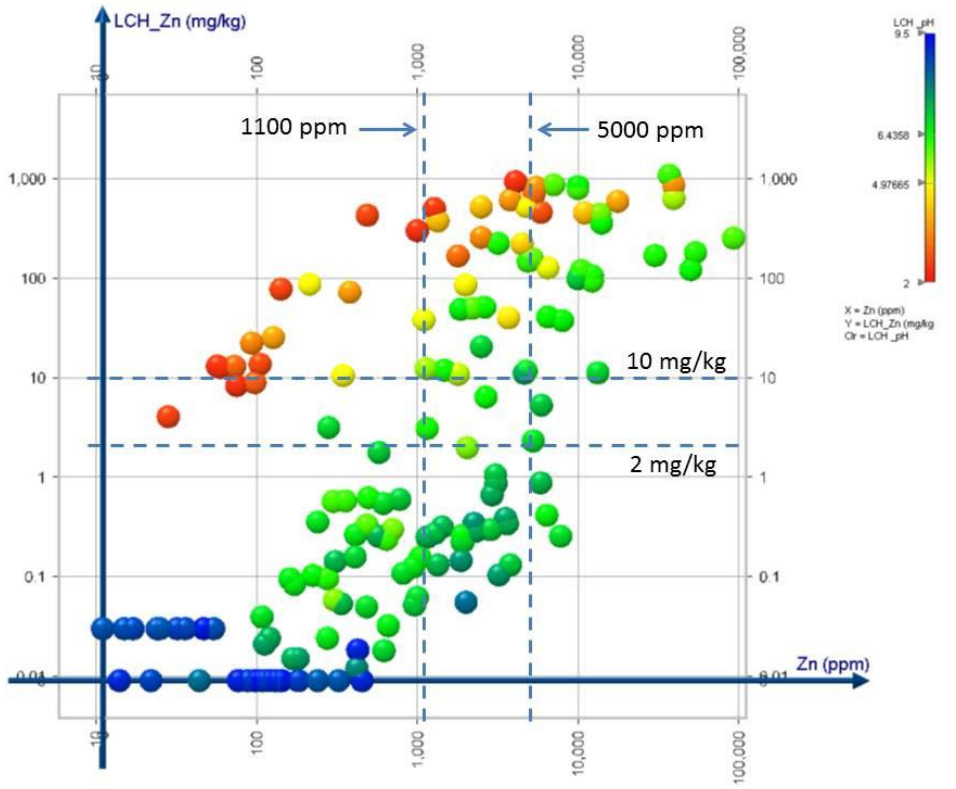


Figure 8: Leachate dissolved zinc vs. contained zinc with leachate pH as color gradient

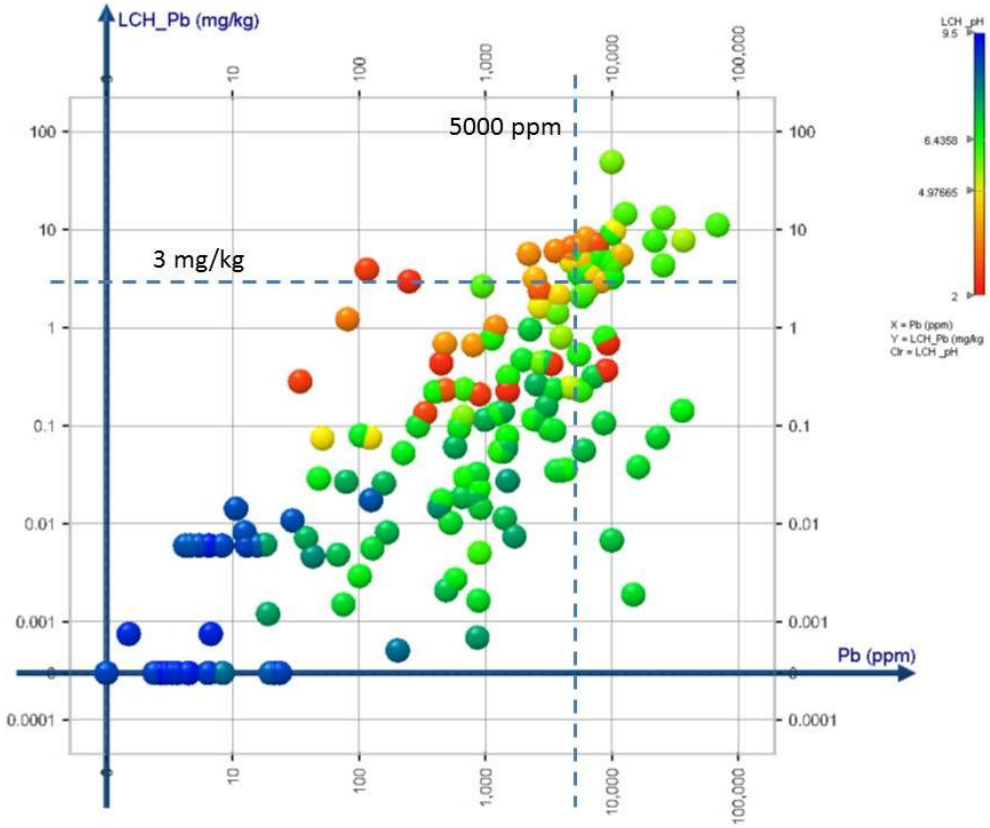


Figure 9: Leachate dissolved lead vs. contained lead with leachate pH as color gradient

APPENDIX B

Memorandum

To: Brad Thrall, Alexco Keno Hill Mining Corp.

From: Ethan Allen and Kai Woloshyn

CC: Scott Davidson

Date: November 15, 2012

Re: Review of Net Acid Generation and Metal Leaching Controlling and Correlating Factors – Keno Hill District

1 INTRODUCTION

Criteria for Alexco Keno Hill Mining Corporation's (AHKM) waste rock management plan (WRMP) was derived primarily from analysis of Keno Hill District (KHD) static testing results by Altura Environmental Consulting Inc. (Altura 2008a) and geoenvironmental characterization of the Bellekeno deposit also by Altura, (2008b). These studies were used to derive geochemical and field screening criteria to distinguish between rock with the potential to generate net acidity or metal leaching (P-AML) and rocks with low potential for generating net acidity or metal leaching (N-AML).

During AHKM's Lucky Queen-Onek new mine permitting YESAB assessment 2011-0315, Ecometrix Inc. (2012) suggested that "AKHM evaluate the risk of using N-AML waste rock with elevated zinc content as construction and upgrade materials and establish appropriate mitigation measures for the use of these materials near waterways, criteria for use may include factors such as a zinc content limit or minimum distance requirement from surface water."

The purpose of this review is to re-examine correlating and controlling factors for net acid generation and metal leaching (AML) in the KHD and assist with selection of a more stringent criteria for waste rock from development with elevated zinc concentrations to be used for infrastructure construction near water bodies (e.g. road construction at creek crossings).

2 METHODS

Thresholds for metal leaching of zinc and lead in Altura (2008a) were based on the distribution of samples of 24-hour shake flask extraction (SFE) testing results of 47 samples from district wide historical waste rock and pit dumps. Criteria of 10 mg/kg Zn and 3 mg/kg Pb were selected based on the logarithmic distribution plots and horizontal inflection points which indicated division between populations of samples which showed higher and lower metal leaching.

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study. The 78 samples analyzed reported by SRK (2012) reported results after 18 hours. The remaining data used 24 hour shake flask extraction. Deionized water as the extracting fluid and used a 3:1 liquid to solids ratio. Corresponding ICP metals data by ICP-MS or ICP-OES was used for each sample. ABA data was also available for most samples but was not used in the analysis.

3 RESULTS

Prior to combining the data, 18 hour SFE test results for selected parameters of interest were compared with the 24 hour tests in order to determine if there was any significant increase in dissolution and apparently leachability in the 24 hour tests. Box plots comparing 18 hour and 24 hour test results for calcium, lead and zinc leaching are presented in Figure 1. Median values for all of these parameters are similar to, or greater in the 18 hour tests. This indicates that the additional time does not increase leachability, and that the test results are comparable.

Fresh samples (N =29) were compared with weathered samples (N= 136) in order to determine if fresh samples contained higher contained calcium, as Altura (2008b) adjusted the calcium criteria by a factor of 1.5 since correlation factors were derived using weathered rock while the waste rock management plan was implemented for fresh rock. Figure 2 shows that fresh samples contain significantly more calcium than weathered samples.

3.1 SAMPLE REACTIVITY CRITERIA

Following the methodology of Altura (2008a), the leachate extraction dataset was examined to determine levels of leachate pH, Zn loading and Pb loading that serve to divide populations and determine potential alternative, more conservative population breaks existed from those used by Altura (2008a). Figure 2 through Figure 5 in Attachment 1 show histograms and cumulative distribution plots for leachate pH and leachate concentration (converted to mg/kg) for zinc, lead and cadmium.

Net Acidity: Leachate pH criteria of <5.5 was selected by Altura (2008a) to differentiate samples generating net acidity. Although the additional data presented in Figure 3 do not show two distinct populations, pH 5.5 is located at the edge of a horizontal inflection point in the cumulative relative frequency curve. These results confirm that the leachate pH criteria of <5.5 is appropriate for differentiating the samples generating net acidity.

Metal Leaching: Altura (2008a) used 10 mg/kg zinc and 3 mg/kg lead as the criteria for metal leaching based on logarithmic distribution plots. The additional data presented in Figure 3 result in a less clear division in populations than was found by Altura (2008a). However, a distinct inflection point still exists between 2 and 3 mg/kg on the cumulative distribution plot, indicating that 3 mg/kg is still appropriate for dividing populations between low and high lead leaching.

Figure 5 shows that the additional data still indicate an inflection point at 10 mg/kg leachable zinc. Another inflection point exists at 2 mg/kg. 2 mg/kg is chosen as a second, more conservative threshold to distinguish between populations and can be used to determine a lower contained zinc threshold for waste rock to be used for construction near water courses.

3.2 REVIEW OF KEY CONTROLLING AND CORRELATING FACTORS FOR SAMPLE REACTIVITY

Contained calcium and sulphur via trace metals ICP are plotted in Figure 6 and Figure 7 with color as leachate pH and leachate dissolved zinc, respectively. Color gradient inflection points were chosen to be the same as those used by Altura (2008a) for ease of comparison. Figure 6 shows that the upper left quadrant bound by 0.25% sulphur and 0.51% contains the majority of samples with leachate pH below 5. This quadrant also contains a number of samples with pH > 5.5. The threshold for calcium was increased to 0.75% by Altura (2008b) for application to waste rock management criteria in order to account for the difference between the weathered rock (on which the ARD/ML study was based on) and fresh rock, which contains more calcium. The expanded dataset includes both weathered and fresh rock samples. Figure 7 shows that samples with zinc leaching greater than 2 mg/kg are largely constrained to samples with greater than 0.25% sulphur and less than 0.75% calcium. 9 of 79 samples with < 0.25% S and > 0.51% Ca showed zinc leaching above 1 mg/kg, with 3 of samples greater than 10 mg/kg. Of these samples, 7 had contained zinc of greater than 1100 ppm.

Figure 8 shows leachable zinc versus contained zinc with color gradient as leachate pH. Criteria of 10 mg/kg (Altura, 2008a) and 2 mg/kg ppm zinc are shown with corresponding cut-offs of 5000 and 1100 ppm zinc. As can be seen in Figure 8, 9 samples with contained zinc of between 5000 and 1100 ppm with pH > 5.5 exhibit zinc leaching of greater than 10 mg/kg with one sample reaching 224.1 mg/kg. Reducing the zinc criteria to 1100 ppm eliminates all but one sample with pH > 5.5 which shows zinc leaching of greater than 2 mg/kg.

Figure 8Figure 9 shows that a cut-off of 5000 ppm eliminates all samples with leachable lead of >3 mg/kg and pH < 5.5. A number of samples (16) exhibit pH < 5.5 but do not show lead leaching over 3 mg/kg.

In summary, key controlling and correlating factors for sample reactivity derived by Altura to identify samples with the potential for generating net acidity (pH > 5.5) remain accurate when including the additional data. Derived ICP criteria of 5000 ppm lead were accurate for identifying samples with elevated leachable lead of >3 mg/kg for the additional data. The derived ICP criteria of 5000 ppm zinc was largely accurate but did not identify all samples with neutral pH and leachable zinc of <10 mg/kg zinc (9 samples with leachable zinc >10 mg/kg vs. 101 samples <10 mg/kg).

A lower zinc cutoff of 1100 ppm resulted in selection of all samples below 2 mg/kg zinc leaching with pH > 5.5 except for one sample which showed 3.15 mg/kg leachable zinc. This lower contained zinc threshold is recommended where selective identification of rock with ultra-low leachable zinc is desirable, i.e. for construction near water bodies.

4 INPUT TERMS FOR MASS LOADING MODELS

GoldSim mass loading modelling has been completed for the Christal Creek and Lightning Creek watersheds. The predictive modeling has included the proposed deposition of N-AML waste rock from Bellekeno, Onek and Lucky Queen. The potential metal leaching load for the contaminants of concern, cadmium and zinc, from the N-AML waste rock was calculated using 50% of the Waste Rock Management Plan N-AML metal leaching criteria thresholds (10 mg zinc /kg waste rock and 1.1 mg cadmium /kg waste rock) . This approach is an overly conservative estimation in metal leaching the mean capability for N-AML waste rock for cadmium and zinc. Table 1 provides summary statistics for N-AML waste rock in the KHSD.

In addition, geochemical data sets tend to be positively skewed (Scott and Pain, 2008) which can result in the highest (threshold) value in being orders of magnitude higher than the median or geometric mean. With a

positively skewed data set, half the threshold value is also likely to be significantly higher than the median or geometric mean value.

In order to come up with more representative terms for potential loading from waste rock, the data were filtered as per the waste rock management plan for Bellekeno and Onek for all of the geochemical thresholds (screening criteria) as above. With the samples filtered for these criteria, 75 of 165 were selected. Summary statistics for this subset are shown in Table 1 below:

Table 1: Summary statistics for key parameters, filtered as N-AML

Statistic	LCH_Pb (mg/kg)	LCH_Zn (mg/kg)	LCH_Cd (mg/kg)	Pb (ppm)	Zn (ppm)	Cd (ppm)	Ca (%)	S (%)
No. of observations	75	75	75	75	75	75	75	75
Minimum	0.000	0.009	0.0000	1.000	11.000	0.050	0.020	0.010
Maximum	1.626	224.100	5.4300	3506.370	3221.700	55.140	8.320	1.280
1st Quartile	0.001	0.014	0.0002	9.450	108.500	0.300	0.085	0.020
Median	0.007	0.030	0.0013	79.000	276.000	2.900	0.970	0.050
3rd Quartile	0.058	0.254	0.0181	674.500	596.800	9.300	2.470	0.230
Mean	0.090	3.974	0.1133	519.038	509.384	7.251	1.920	0.179
Variance (n-1)	0.058	685.897	0.4246	727183	504541	110	5.858	0.064
Standard deviation (n-1)	0.242	26.190	0.6516	852.751	710.311	10.477	2.420	0.253
Skewness (Pearson)	4.510	8.106	7.5552	2.104	2.550	2.391	1.431	1.993
Skewness (Fisher)	4.603	8.272	7.7102	2.147	2.602	2.440	1.460	2.034
Skewness (Bowley)	0.789	0.863	0.8667	0.791	0.314	0.422	0.258	0.714
Geometric mean	0.009	0.071	0.0015	79.268	228.024	1.989	0.562	0.070

As can be seen in Table 1, after filtering the dataset according to the waste rock management plan geochemical screening criteria, for N-AML samples, the maximum value for leachable zinc is 224.1mg/kg while the median is 0.036 mg/kg and the geometric mean is 0.075 mg/kg, or approximately 4 orders of magnitude apart. The geometric mean for leachable cadmium is 0.0015 and the median is 0.0013 for this subset. It is suggested that the geometric mean might be more appropriate for a realistic estimate of potential N-AML waste rock pore water concentration. Significant positive skewness is noted for all parameters but particularly leachable lead, cadmium and zinc.

Filtering the data according to the waste rock management plan geochemical screening criteria but with the zinc threshold of 1100 ppm results in 67 of 165 samples selected. Summary statistics for this subset are shown in Table 2:

Table 2: Summary statistics for key parameters, filtered as N-AML and samples <1100 ppm zinc

Statistic	LCH_Pb (mg/kg)	LCH_Zn (mg/kg)	LCH_Cd (mg/kg)	Pb (ppm)	Zn (ppm)	Cd (ppm)	Ca (%)	S (%)
No. of observations	67	67	67	67	67	67	67	67
Minimum	0.000	0.009	0.0000	1.000	11.000	0.050	0.020	0.010
Maximum	1.626	38.100	1.6200	3506.370	1100.000	27.430	8.320	0.710
1st Quartile	0.001	0.011	0.0002	7.450	100.500	0.265	0.070	0.020
Median	0.006	0.030	0.0008	48.000	182.000	2.000	0.810	0.040
3rd Quartile	0.042	0.134	0.0072	530.450	439.500	7.650	2.470	0.175
Mean	0.089	0.894	0.0406	439.827	299.700	4.673	1.898	0.133
Variance (n-1)	0.064	23.094	0.0415	681547	71341	36.078	6.258	0.032
Standard deviation (n-1)	0.254	4.806	0.2036	825.559	267.097	6.006	2.502	0.178
Skewness (Pearson)	4.390	7.204	7.2132	2.413	1.025	1.750	1.417	1.713
Skewness (Fisher)	4.492	7.370	7.3795	2.469	1.049	1.790	1.450	1.752
Skewness (Bowley)	0.758	0.683	0.8167	0.845	0.519	0.530	0.383	0.742
Geometric mean	0.007	0.051	0.0010	58.646	174.765	1.465	0.492	0.058

Using the geochemical screening criteria in the waste rock management plan with a lower zinc cutoff of 1100 ppm results in a maximum value of 38.1 mg/kg leachable zinc with a median value of 0.03 mg/kg and geometric mean value of 0.051 mg/kg zinc. The geometric mean for leachable cadmium is 0.001 and the median is 0.0008 for this subset.

5 CONCLUSIONS

- Leachate pH of <5.5 is appropriate for differentiating samples generating net acidity although a significant proportion of samples with >0.25% S and <0.75% Ca do not demonstrate pH < 5.5

- Sample reactivity criteria for lead leaching of 3 mg/kg is indicated by the distribution of samples and corresponds well with a contained lead content of 5000 ppm, excluding samples with pH < 5.5

- Sample reactivity criteria for zinc leaching of 10 mg/kg is indicated by the distribution of samples. A second inflection point at 2 mg/kg can be used to derive a more conservative criterion for zinc. The contained zinc threshold >5000 ppm identifies most samples with pH >5.5 having leachable zinc of >10 mg/kg. However, approximately 10% of the samples with <5000 ppm and pH >5.5 show zinc leaching above 10 mg/kg. The lower contained zinc threshold of >1100 ppm identifies all but one sample with pH >5.5 above 2 mg/kg leachable zinc.

- Modified waste rock management geochemical criteria with a lower contained zinc threshold of <1100 ppm is recommended to select waste rock to be used near (within 30m) of a water course. This corresponds with a field screening criterion of 0.165% sphalerite (trace to no visible sphalerite is recommended). If waste rock from Lucky Queen is selected for construction near a water course, specific waste rock management criteria derived for Lucky Queen (Access, 2011b) are recommended.

Lucky Queen waste rock management criteria differ in that a lower sulphur criterion of 0.15% is used because available neutralizing potential is lower at Lucky Queen.

- The use of the geometric mean values for samples filtered according to all criteria of the geochemical screening criteria is recommended for calculating a representative or realistic estimate of potential concentrations and metal loads from N-AML waste rock disposal areas.

References:

Access (2011a). Geochemical Rock Characterization, Lucky Queen. Memorandum prepared for Alexco Keno Hill Mining Corp, December 2011.

Access Consulting Group (2011a). Geochemical Rock Characterization, Onek. Memorandum prepared for Alexco Keno Hill Mining Corp, December 2011.

Altura Environmental Consulting (2008a). Review of Historic Keno Static Test Data to Define ARD/ML – Controlling and Correlating Factors. Letter report prepared for Access Consulting Group, January 4, 2008.

Altura Environmental Consulting (2008b). Geoenvironmental Rock Characterization, Bellekeno Zone. Letter report prepared for Access Consulting Group, January 8, 2008.

Ecometrix (2012) Lucky Queen and Onek Deposit Production Project – Review of Effects on Aquatic Resources. Report prepared for Yukon Environmental and Socio-economic Assessment Board Mayo Designated Office, July 2012.

Scott, K.M., Pain, C.F. (2008). *Regolith Science*. Springer. Collingwood, Australia.

SRK Consulting Canada Inc. (2012). Supplemental Waste Rock Characterization. Memorandum prepared for Access Consulting Group, April 25, 2012

Attachments:

Attachment 1: Figures

ATTACHMENT 1

FIGURES

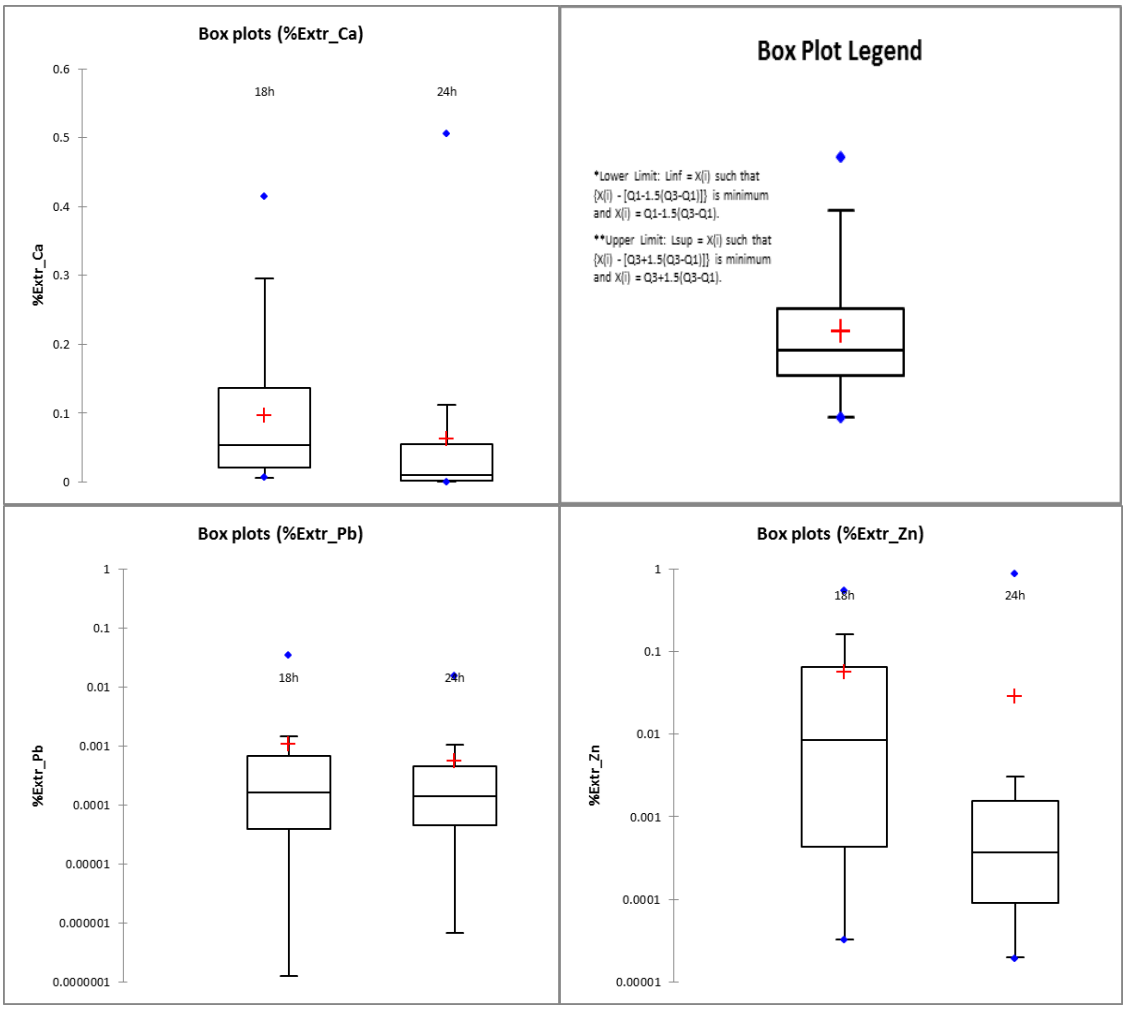


Figure 1: Percent extraction for select parameters, 18 hour vs. 24 hour shake flask extraction tests

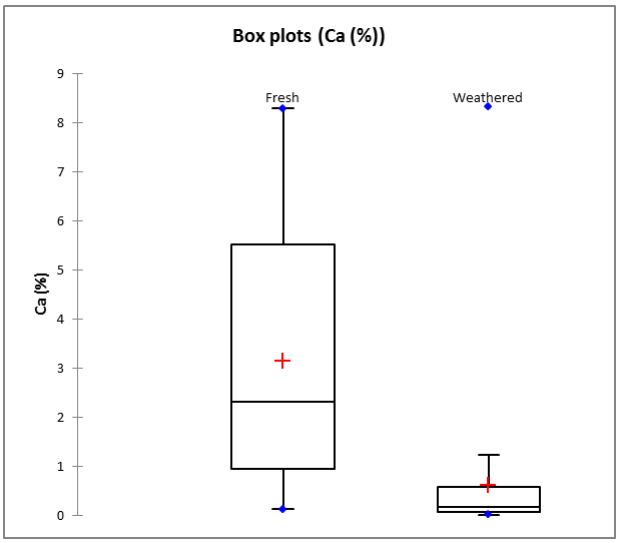
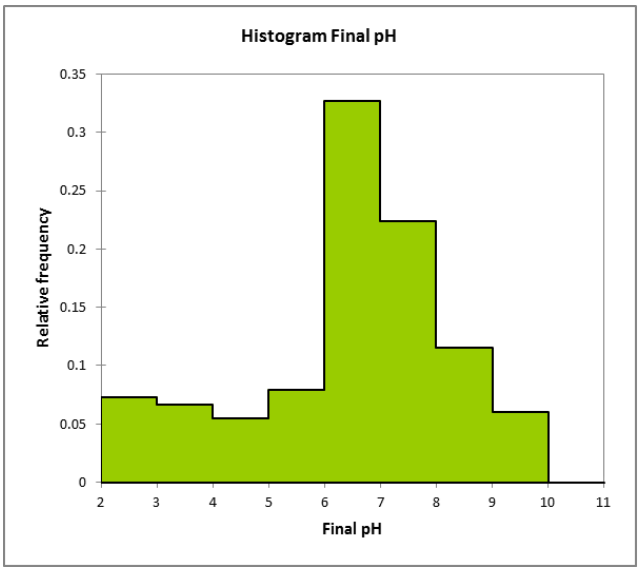


Figure 2: Contained calcium in fresh vs. weathered samples



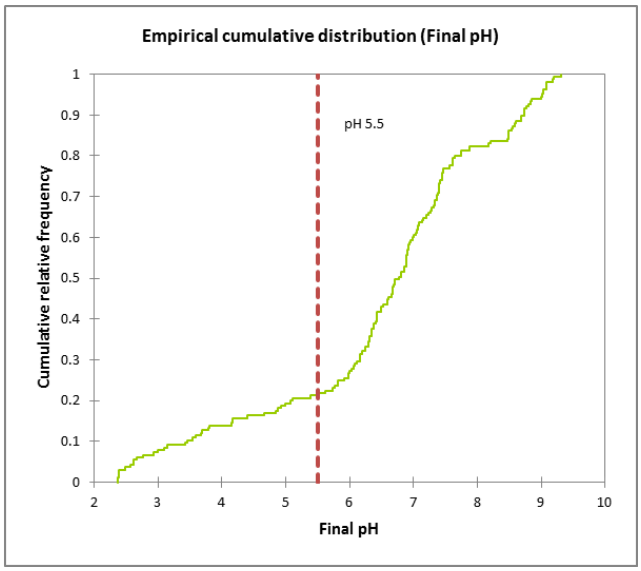
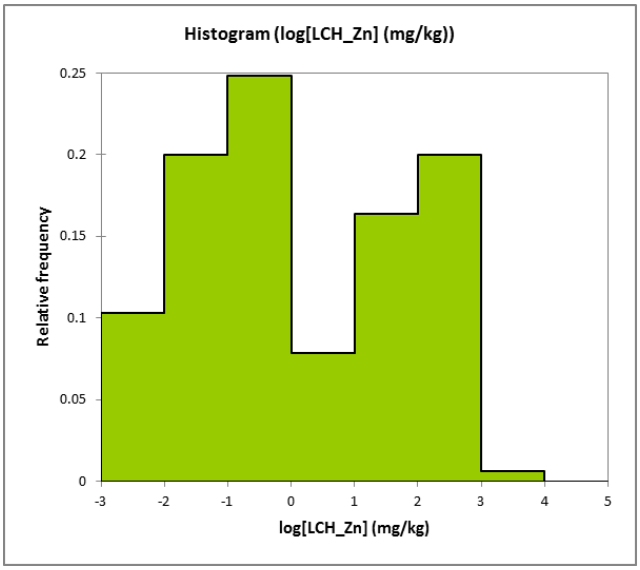


Figure 3: Histograms and cumulative distribution curve for pH



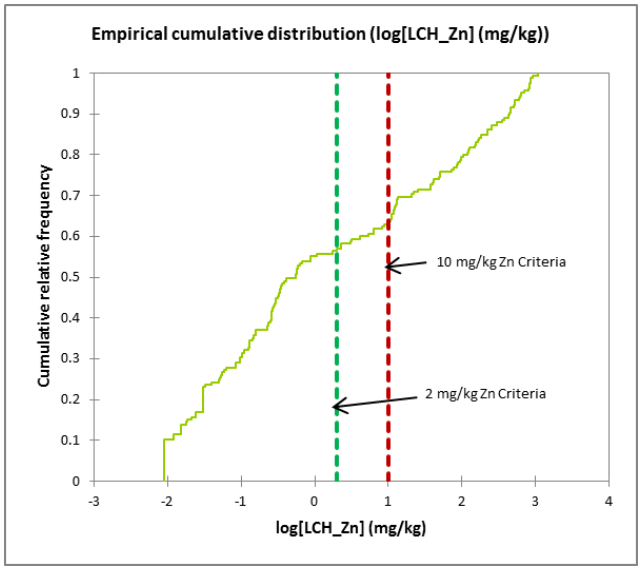
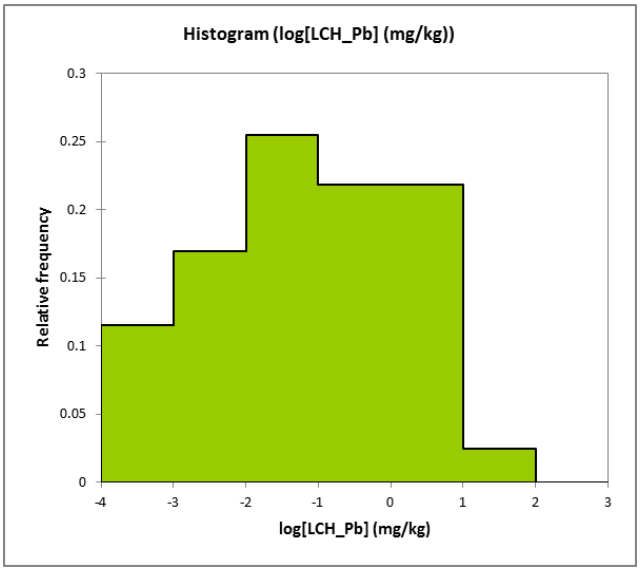


Figure 4: Histograms and cumulative distribution curve for leachable zinc



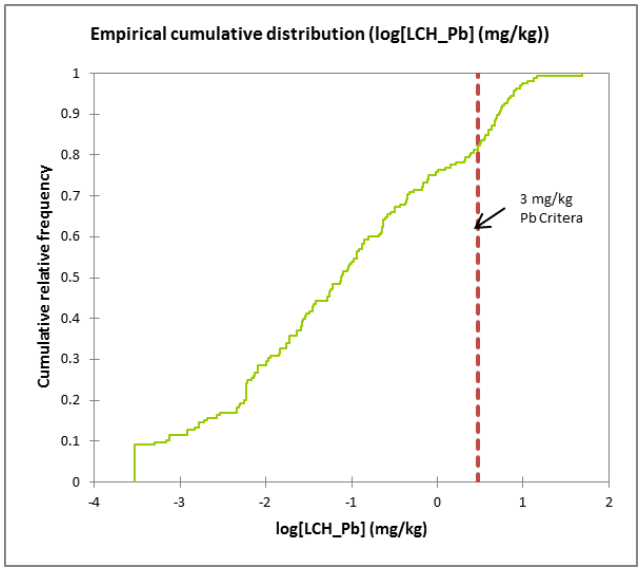


Figure 5: Histograms and cumulative distribution curve for leachable lead

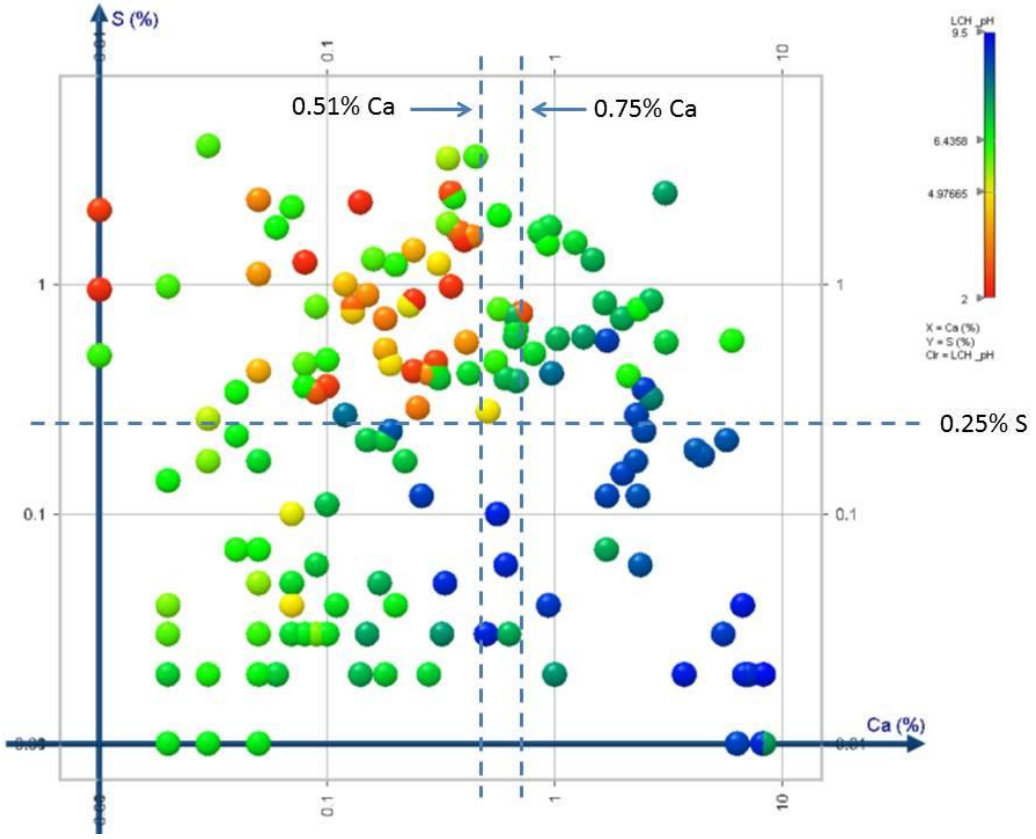


Figure 6: Calcium vs Sulphur rock analyses with leachate pH color gradient

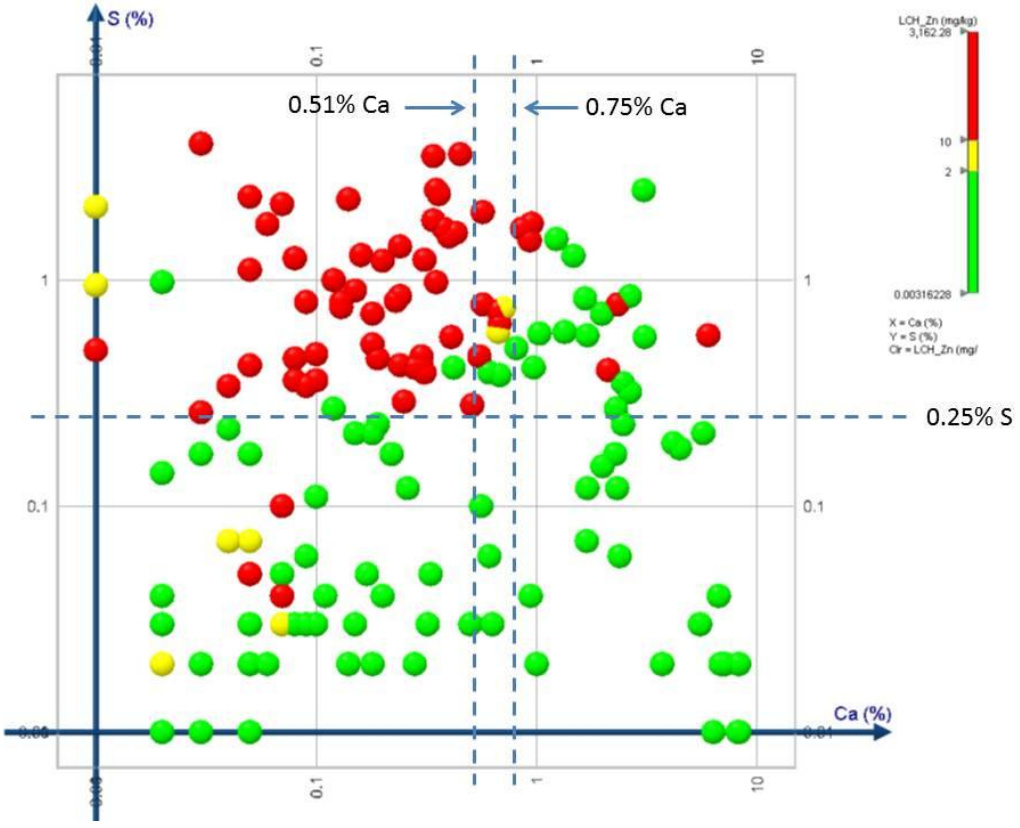


Figure 7: Calcium vs Sulphur rock analyses with leachate dissolved zinc as color interval

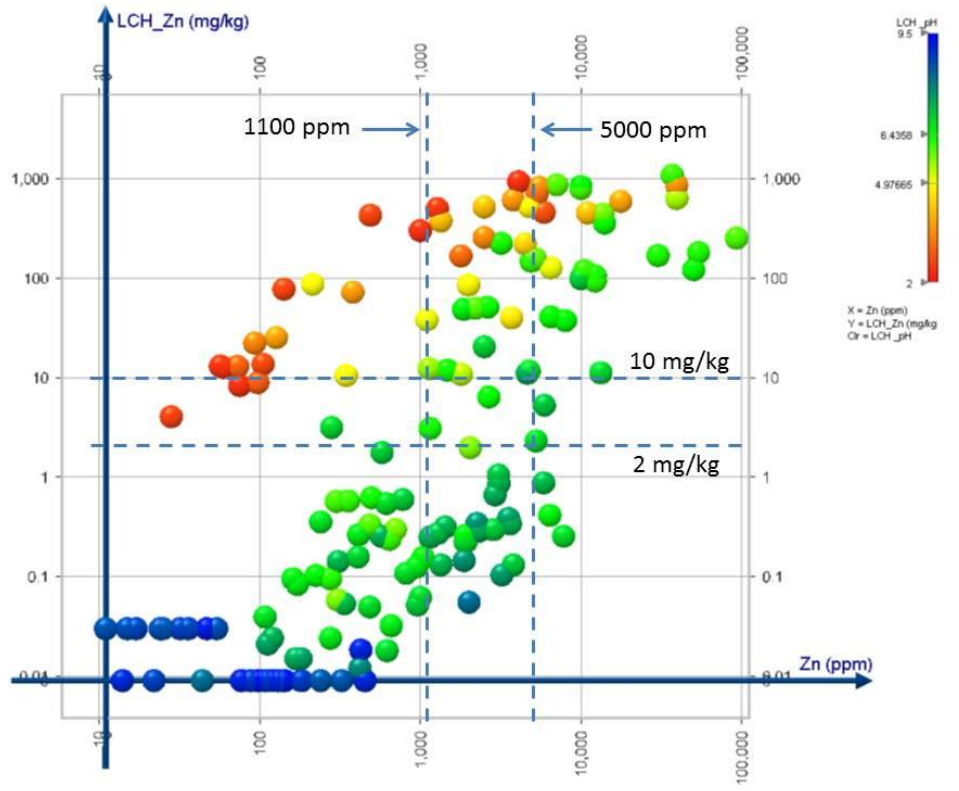


Figure 8: Leachate dissolved zinc vs. contained zinc with leachate pH as color gradient

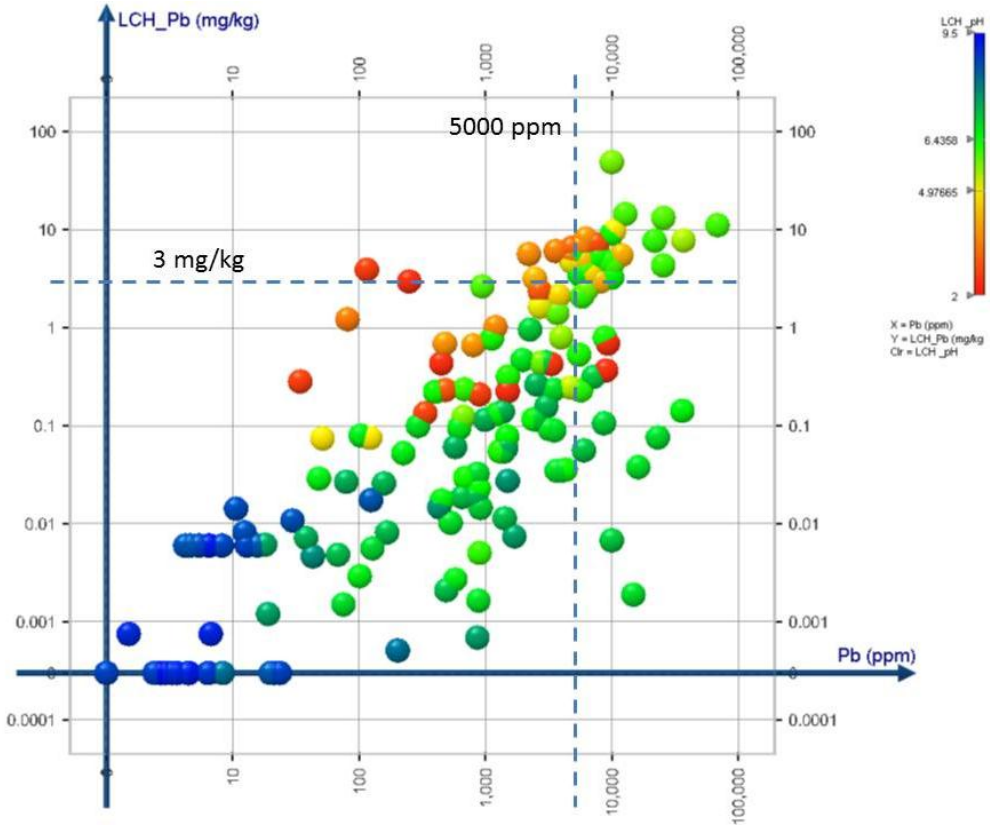


Figure 9: Leachate dissolved lead vs. contained lead with leachate pH as color gradient

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Memorandum

To: Alexco Resource Corp.

From: Catherine Henry

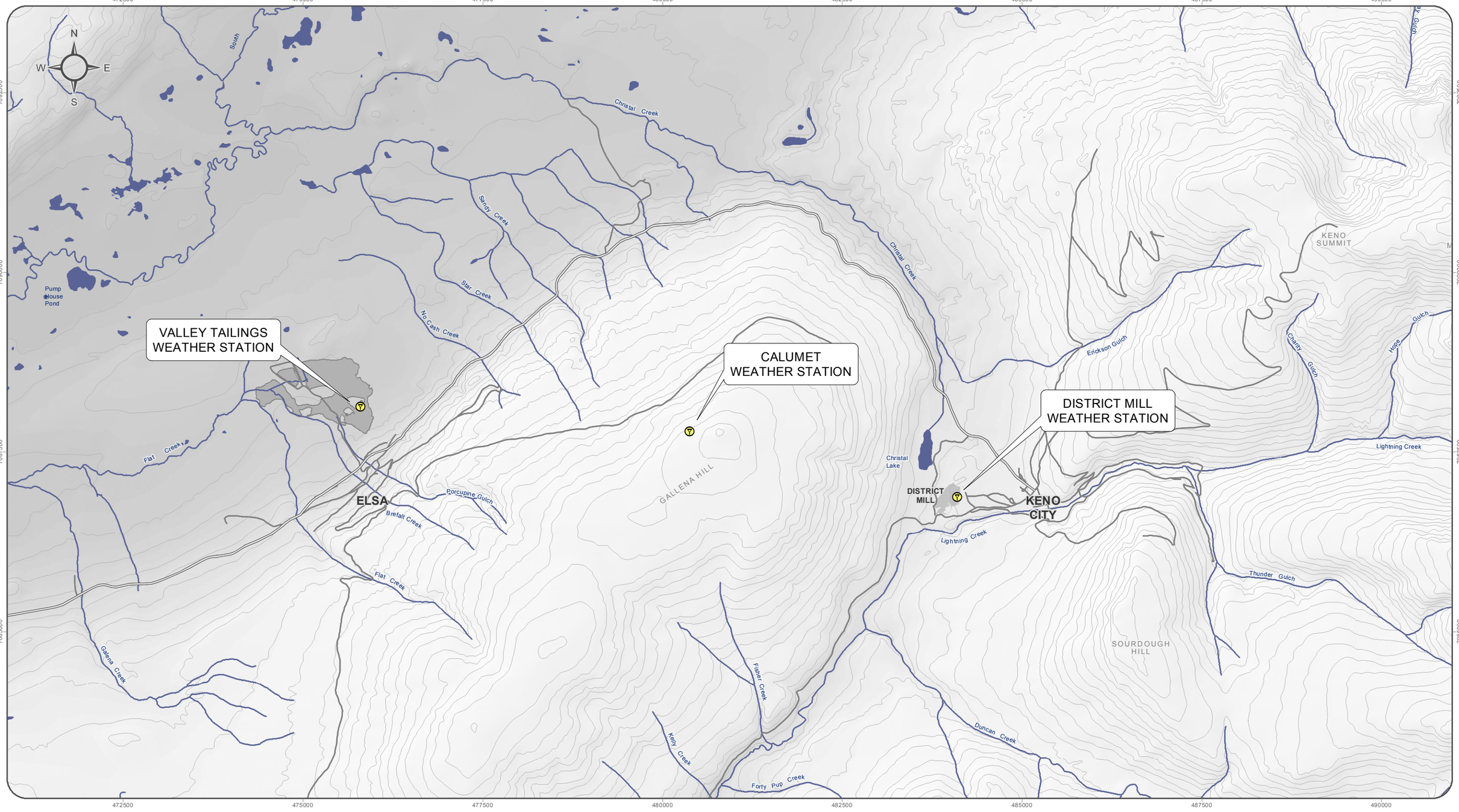
CC: Kai Woloshyn

Date: November 14, 2013

Re: Meteorological Data Summary, Keno, YT

1. INTRODUCTION

This memo describes the meteorological data collected since 2007 at the Calumet weather station, since 2011 at the District Mill meteorological station and since 2012 at the Valley Tailings meteorological station. The three weather stations are shown on Figure 1 below.



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Quartz claim boundaries current as of February 24th, 2011. Ownership data current as of December 20th, 2010. Data source: http://geomaticsyukon.ca.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:50,000 (when printed on 11 x17 inch paper)

0 1 2 3 Kilometers

Weather Station
Highway
Secondary Road
Contours (100 ft)
Watercourse
Waterbody

ALEXCO ACCESS

FIGURE 1
KENO METEOROLOGICAL STATIONS

NOVEMBER 2013

I:\ALEX-05-01\gis\mxd\UKHM\Overview_Maps\SpecifcTopics\WeatherStations_20131114.mxd
(14/11/2013/10:51 AM)

2. CALUMET WEATHER STATION

An automated Onset HOBO meteorological station (Calumet Weather Station) was installed on Galena Hill above the Hector adit at 1,380 masl in June 2007. See Appendix I for the list of components.

2.1. OBSERVATIONS AND EQUIPMENT CONDITION 2013

- The station was commissioned on June 15, 2007, and logs air temperature, relative humidity, barometric pressure, rainfall, wind speed and direction at a height of 3 meters, solar radiation, and soil temperature at a 15-minute interval.
- The station was down between April 15 and June 3, 2013.
- The wind sensor experienced occasional icing during the winter months and extended periods of zero wind speed were invalidated. Also note that winter wind speeds may occasionally be underestimated due to the presence of ice on the sensor, but these occurrences cannot be detected in the data record.
- No total precipitation gauge or snowfall conversion adaptor is installed at this time, therefore only rainfall was measured. Note that instances of rainfall recorded at temperatures below zero are likely due to snowmelt.

2.2. METHODS AND RESULTS

Monthly averages were calculated from 15-minute values recorded by the data logger. Average temperature and total rainfall are presented in Table 1 below.

Table 1 Monthly statistics for average temperature and total rainfall collected at Calumet Station

	Average Temperature (°C)							Total Rainfall (mm)						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
January	-	-17.18	-18.84	-14.08	-16.78[3]	-18.71[4]	-16.90	-	-	-	-	-	-	-
February	-	-16.99	-16.95	-9.09	-15.88[3]	-9.94[4]	-10.81	-	-	-	-	1.8[3]	[9]	-
March	-	-11.04	-16.39	-9.21	-12.92[3]	-12.92[4]	-14.45	-	-	-	-	0.5[3]	[9]	0.6
April	-	-4.93	-4.75	-2.01	-3.77[3]	-1.88[4]	-12.32	-	1	-	1.3[3]	2.8[3]	[9]	0.2
May	-	3.31	3.66	5.35	4.41[3]	1.61[4]	n/a	-	25.4	21.8	32.3[3]	15.5[3]	[9]	n/a
June	*11.25*[1]	8.70	9.58	8.68	8.82[3]	7.76[4]	11.59	*55.2*[1]	44.6	*11.8*[7]	56.7[3]	121.8[3]	[9]	45.2
July	11.80	8.17	12.45	10.50	3.80[3]	7.84[4]	11.11	108.8	108.4	*22.8*[8]	137.7[3]	135.9[3]	*27.8*[10]	39.2
August	9.63	5.54	7.47	9.61	[2]	8.33[5]	10.58	54.8	110.2	89.4	140.0[3]	[9]	45.0	35.6
September	1.12	2.27	3.58	2.40	[2]	3.39	3.33	57.6	61.4	50.4	78.0[3]	[9]	17.4	64.6
October	-6.53	-7.20	-4.73	-4.86	[2]	-8.16	-2.52	-	12.6	-	16.0[3]	[9]	1.6	14.6
November	-9.41	-10.17	-11.94	-11.19	-17.39[4]	-18.44	[6]	-	-	-	-	-	0.2	[6]
December	-16.19	-18.34	-11.16	-17.72	-11.78[4]	-18.83		-	-	-	-	-	0	

Notes:

Values in grey italics indicate a partial month

[1] *Station commissioned June 15, 2007*

[2] *Temperature probe malfunction – no proxy data available*

[3] *Calculated from MAYO A data*

[4] *Sensor occasionally offline but most data complete*

[5] *Sensor replaced August 7th*

Notes:

[6] *Last download on November 2, 2013.*

[7] *Rainfall gauge malfunction on June 11; total rainfall provided for June 1-11*

[8] *Rainfall gauge back online; total rainfall provided for July 7-31*

[9] *Tipping bucket malfunction – no proxy data available*

[10] *Tipping bucket repaired July 4th; total rainfall provided for July 4-31*

3. DISTRICT MILL WEATHER STATION

The District Mill Campbell Scientific automated meteorological station is located above the dry stack tailings facility and below the old Keno City dump near Keno, YT (UTM coordinates: 08 V 048409 7086872, elevation: 936m).

3.1. OBSERVATIONS AND EQUIPMENT CONDITION 2013

- The Campbell Scientific Meteorological Station was commissioned on June 2, 2011 and includes sensors for the measurement of temperature, relative humidity, rainfall, wind speed and wind direction at a height of 10 meters (a list of components and a photo are shown in Appendix I).

- Relative humidity readings were found to be invalid from time of commissioning until May 7, 2012, at which time the problem was corrected by sending a revised program to the datalogger.

- A pyranometer (model SP Lite2) was installed on December 13, 2012, and the datalogger program was revised to incorporate hourly solar radiation readings and an evapotranspiration (ET) instruction. The ET instruction uses temperature, relative humidity, wind speed, solar radiation, latitude, longitude and altitude to calculate an evaporation rate for a short grass crop. This is only an approximation of actual evaporation at site, which varies locally depending on surface type and micro topography. Note that if one of the parameters listed above is invalid, the ET calculation also has to be invalidated.

- The wind sensor experienced occasional icing during the winter months and extended periods of zero wind speed were invalidated. Also note that winter wind speeds may occasionally be underestimated due to the presence of ice on the sensor, but these occurrences cannot be detected in the data record.

- No total precipitation gauge or snowfall conversion adaptor was installed in 2011 or 2012, therefore only rainfall was measured. Note that instances of rainfall recorded at temperatures below zero are likely due to snowmelt. A snowfall converter was installed on October 15, 2013 and will record total precipitation going forward.

3.2. METHODS AND RESULTS

Monthly averages were calculated from hourly values recorded by the data logger for the following parameters: temperature, daily maximum temperature, daily minimum temperature, relative humidity, wind speed, maximum wind speed and solar radiation. Monthly extreme maximum temperature, extreme minimum temperature, maximum wind speed, total rainfall and total evapotranspiration are also shown in Table 2 below.

Since the pyranometer was only installed in December 2012, no evapotranspiration data was calculated for 2011 or 2012 and estimates for evapotranspiration were developed from the 1996 data set using a computer program known as WREVAP which was developed by Environment Canada's National Hydrology Research Institute. As of 2013, evapotranspiration is calculated in the datalogger program from local meteorological parameters. Table 3 presents the comparison between the 2013 and the 1996 evapotranspiration data sets. It shows that the 1996 WREVAP evapotranspiration values may overestimate the local evapotranspiration, although more years of local evapotranspiration data will allow a more reliable comparison.

Table 2 Monthly statistics for meteorological parameters collected at District Mill Station

Month	Extreme Maximum Temperature (°C)	Average Maximum Temperature (°C)	Average Temperature (°C)	Average Minimum Temperature (°C)	Extreme Minimum Temperature (°C)	Average Relative Humidity (%)	Total Rain (mm)	Average Wind Speed (m/s) [1]	Extreme Maximum Wind Speed (m/s) [1]	Average Solar Radiation (W/m²)	Total Evapo-transpiration (mm)
Jun -11 [2]	24.72	18.59	11.96	6.30	-2.56	n/a	n/a	1.35	9.14	n/a	n/a
Jul-11	25.67	18.50	12.91	8.00	5.09	n/a	n/a	1.15	8.02	n/a	n/a
Aug-11	22.32	15.58	9.78	5.37	1.93	n/a	n/a	1.18	9.15	n/a	n/a
Sep-11	17.97	11.29	6.07	1.85	-2.47	n/a	n/a	1.43	11.36	n/a	n/a
Oct-11	7.20	0.20	-2.74	-5.41	-9.84	n/a	*2.60* [3]	0.94	13.12	n/a	n/a
Nov-11	-4.23	-16.79	-19.54	-22.47	-34.99	n/a	0.00	0.58	12.05	n/a	n/a
Jan-12	-0.96	-19.10	-23.13	-26.79	-37.32	n/a	0.00	*0.59*	*9.51*	n/a	n/a
Feb-12	2.77	-6.77	-10.00	-13.07	-26.78	n/a	0.10 [4]	*1.38*	*15.62*	n/a	n/a
Mar-12	5.33	-7.69	-13.37	-18.00	-27.80	n/a	0.00	*0.97*	*9.24*	n/a	n/a
Apr-12	9.69	6.13	0.96	-3.87	-15.92	n/a	0.60 [4]	1.37	10.27	n/a	n/a
May-12	17.78	10.73	6.31	1.91	-3.47	*51.81* [5]	18.30	1.78	10.60	n/a	n/a
Jun-12	27.62	18.41	13.46	8.29	4.42	56.35	21.70	1.44	10.26	n/a	n/a
Jul-12	25.14	18.07	12.75	7.73	1.64	69.26	85.80	1.36	12.99	n/a	n/a
Aug-12	21.72	16.31	11.25	6.56	-0.89	67.79	47.00	1.62	9.41	n/a	n/a
Sep-12	20.24	10.33	5.90	2.08	-5.22	69.51	36.40	1.84	14.27	n/a	n/a
Oct-12	7.60	-3.95	-7.35	-10.32	-20.62	79.54	7.60	1.13	10.37	n/a	n/a
Nov-12	-8.98	-19.55	-21.90	-24.32	-33.36	81.43	0.00	0.94	9.36	n/a	n/a
Dec-12	-3.36	-21.30	-23.44	-25.58	-36.32	81.34	0.00	*0.26*	*5.93*	*1.01* [6]	*0.05* [7]
Jan-13	-1.59	-17.06	-20.01	-23.08	-41.48	82.92	0.00	*0.76*	*14.48*	1.06	0.81
Feb-13	1.54	-9.10	-12.52	-15.46	-23.74	88.36	0.30 [4]	*0.85*	*12.25*	10.26	1.27
Mar-13	3.26	-7.52	-13.16	-17.99	-29.96	64.08	3.90	*1.59*	*12.47*	95.82	6.33

Month	Extreme Maximum Temperature (°C)	Average Maximum Temperature (°C)	Average Temperature (°C)	Average Minimum Temperature (°C)	Extreme Minimum Temperature (°C)	Average Relative Humidity (%)	Total Rain (mm)	Average Wind Speed (m/s) [1]	Extreme Maximum Wind Speed (m/s) [1]	Average Solar Radiation (W/m^2)	Total Evapo-transpiration (mm)
Apr-13	6.07	-2.76	-7.94	-13.69	-25.07	54.50	8.20	2.44	12.93	190.02	14.48
May-13	23.31	10.20	5.27	0.23	-9.46	61.83	39.60	1.77	11.76	215.44	21.70
Jun-13	30.51	19.97	14.27	8.30	1.84	58.72	57.30	1.82	12.87	234.69	29.79
Jul-13	24.93	19.40	14.01	8.60	2.25	62.67	46.90	1.75	16.14	211.00	27.10
Aug-13	27.34	18.54	12.98	8.01	-0.38	66.30	51.90	1.49	11.05	156.25	21.38
Sep-13	16.11	9.69	5.81	2.26	-3.74	77.52	59.70	1.54	10.99	79.69	10.88
Oct-13	8.25	1.61	-1.32	-4.21	-10.10	86.75	44.60	1.11	11.62	35.75	4.26

Notes: *Values in grey italics indicate a partial month*

[1] January 2012 has 25 days of complete wind data
February 2012 has 28 days of complete wind data
March 2012 has 30 days of complete wind data
December 2012 has 15 days of complete wind data

[2] June 2011 has 29 days of complete data (station commissioned on June 2)
[3] 16 days of complete rain data
[4] Rainfall recorded at temperatures below zero may be due to snowmelt
[5] 25 days of complete RH data
[6] 18 days of complete solar radiation data
[7] 7 days of complete evapotranspiration data

Table 3 Evapotranspiration Data Sets Comparison

Month	2013	1996 WREVAP
January	0.81	0
February	1.27	0
March	6.33	0
April	14.48	10
May	21.70	42
June	29.79	43
July	27.10	44
August	21.38	20
September	10.88	20
October	4.26	0
November	n/a	0
December	n/a	0
Annual Total	138.00*	179

**Partial total*

4. VALLEY TAILINGS WEATHER STATION

The Valley Tailings Onset HOBO automated meteorological station is located near the valley tailings at UTM coordinates: 08 V 0475799 7088130 and at an elevation of 718m. See Appendix I for the list of components and a photo.

4.1. OBSERVATIONS AND EQUIPMENT CONDITION 2013

- The HOBO meteorological station was commissioned on October 19, 2012 and includes sensors for the measurement of temperature, relative humidity, rainfall, barometric pressure, soil water content, wind speed and wind direction at a height of 3 meters.

- The tipping bucket can only record rainfall (not total precipitation), so little or no data can be collected during the winter months. As the air temperature started to rise above 0°C in May 2013, it was noted that still no rain was being recorded. This observation triggered an inspection of the tipping bucket and the tipping mechanism was found to be obstructed. The obstruction was removed on May 16, 2013, and the tipping bucket is now functioning properly.

- The wind sensor experienced frequent icing during the winter months and extended periods of zero wind speed in combination with wind gusts of less than 1 m/s were invalidated. Similarly, extended periods with identical wind directions were also invalidated. Also, note that winter

wind speeds may be underestimated due to the presence of ice on the sensor, but these occurrences cannot be detected in the data record.

- The logging interval was changed to 15 minutes on May 16, 2013, as this interval is sufficient for the purposes of this meteorological station and requires less datalogger memory.

4.2. METHODS AND RESULTS

Monthly averages from installation to October 2013 inclusively were calculated from 10-minute or 15-minute values recorded by the datalogger for the following parameters: temperature, daily maximum temperature, daily minimum temperature, relative humidity, wind speed, gust speed, barometric pressure and solar radiation. Monthly extreme maximum temperature, extreme minimum temperature, maximum and minimum relative humidity, maximum gust speed and total rainfall are also shown in Table 4 below. Note that the barometric pressure has not been corrected for elevation and therefore represents the absolute pressure.

Table 4 Monthly Statistics for Meteorological Parameters Collected at the Valley Tailings Meteorological Station

Month	Extreme Minimum Temp.(°C)	Average Minimum Temp. (°C)	Average Temp. (°C)	Average Maximum Temp. (°C)	Extreme Maximum Temp. (°C)	Average Relative Humidity (%)	Maximum Relative Humidity (%)	Minimum Relative Humidity (%)	Total Rain (mm)[2]	Average Wind Speed (m/s)[3]	Average Maximum Wind Speed (m/s)[3]	Extreme Maximum Wind Speed (m/s)[3]	Average Barometric Pressure (mbar)	Average Solar Radiation (W/m²)	Soil Average Water Content (%)[4]
Oct-2012[1]	*-23.84*	*-20.12*	*-15.71*	*-9.71*	*-4.05*	*81.92*	*89.16*	*70.76*	n/a	*0.51*	*1.39*	*7.81*	*939.06*	*34.14*	n/a
Nov-2012	-40.71	-27.24	-23.77	-20.42	-8.07	82.04	90.97	69.24	n/a	*0.59*	*1.66*	*7.81*	932.15	7.72	n/a
Dec-2012	-44.20	-29.97	-26.29	-22.98	-3.99	82.75	97.20	71.67	n/a	*0.52*	*1.75*	*6.04*	926.06	1.48	n/a
Jan-2013	-45.56	-25.98	-21.58	-17.72	0.74	84.73	94.43	72.60	n/a	*0.94*	*2.10*	*14.61*	929.62	4.78	n/a
Feb-2013	-24.88	-16.72	-12.96	-8.80	2.40	90.08	96.67	81.42	n/a	*0.90*	*2.09*	*10.83*	919.93	23.70	n/a
Mar-2013	-33.45	-21.40	-13.93	-5.74	5.57	68.05	92.35	53.08	n/a	*0.84*	*2.00*	*13.85*	931.80	93.31	n/a
Apr-2013	-25.05	-14.66	-7.17	-0.87	8.37	53.23	81.57	39.58	n/a	*2.01*	*4.10*	*16.62*	930.07	171.18	n/a
May-2013	-8.36	0.10	6.08	11.66	23.35	62.90	95.00	40.13	*4.80*	*1.42*	*3.26*	*11.84*	928.76	186.87	12.3
Jun-2013	1.64	8.20	15.63	22.00	32.82	58.66	84.24	42.04	46.20	1.50	3.45	22.66	930.76	215.51	8.0
Jul-2013	1.59	8.95	15.68	21.90	29.32	60.65	87.50	38.38	25.40	1.39	3.22	16.12	931.69	194.18	6.9
Aug-2013	-1.90	6.94	13.85	20.49	29.49	68.65	95.18	44.98	43.00	*0.93*	*2.45*	*13.60*	926.92	144.34	9.6
Sep-2013	-2.45	2.00	6.39	10.85	18.06	80.70	98.19	60.89	64.80	*1.19*	*2.83*	*17.38*	921.41	71.21	14.4
Oct-2013	-11.22	-5.32	-1.54	2.56	9.11	91.89	99.04	68.02	49.40	*0.61*	*1.86*	*11.58*	927.19	32.16	12.2

Notes: *Values in grey italics indicate a partial month*

[1] Station was commissioned on October 19 so October 2012 has 12 days of complete data

[2] May2013 has 14 days of compete rain data

[3] October 2012 has 2 days of complete and 11 days of partial wind data
November 2012 has 5 days of complete and 24 days of partial wind data
December 2012 has 2 days of complete and 16 days of partial wind data and
January 2013 has 5 days of complete and 16 days of partial wind data
February 2013 has 2 days of complete and 26 days of partial wind data
March 2013 has 4 days of complete and 27 days of partial wind data
April 2013 has 14 days of complete and 16 days of partial wind data
May 2013 has 15 days of complete and 16 days of partial wind data
June 2013 has 29 days of complete and 1 day of partial wind data
August 2013 has 29 days of complete and 2 days of partial wind data
September 2013 has 15 days of complete and 15 days of partial wind data
October 2013 has 6 days of complete and 25 days of partial wind data

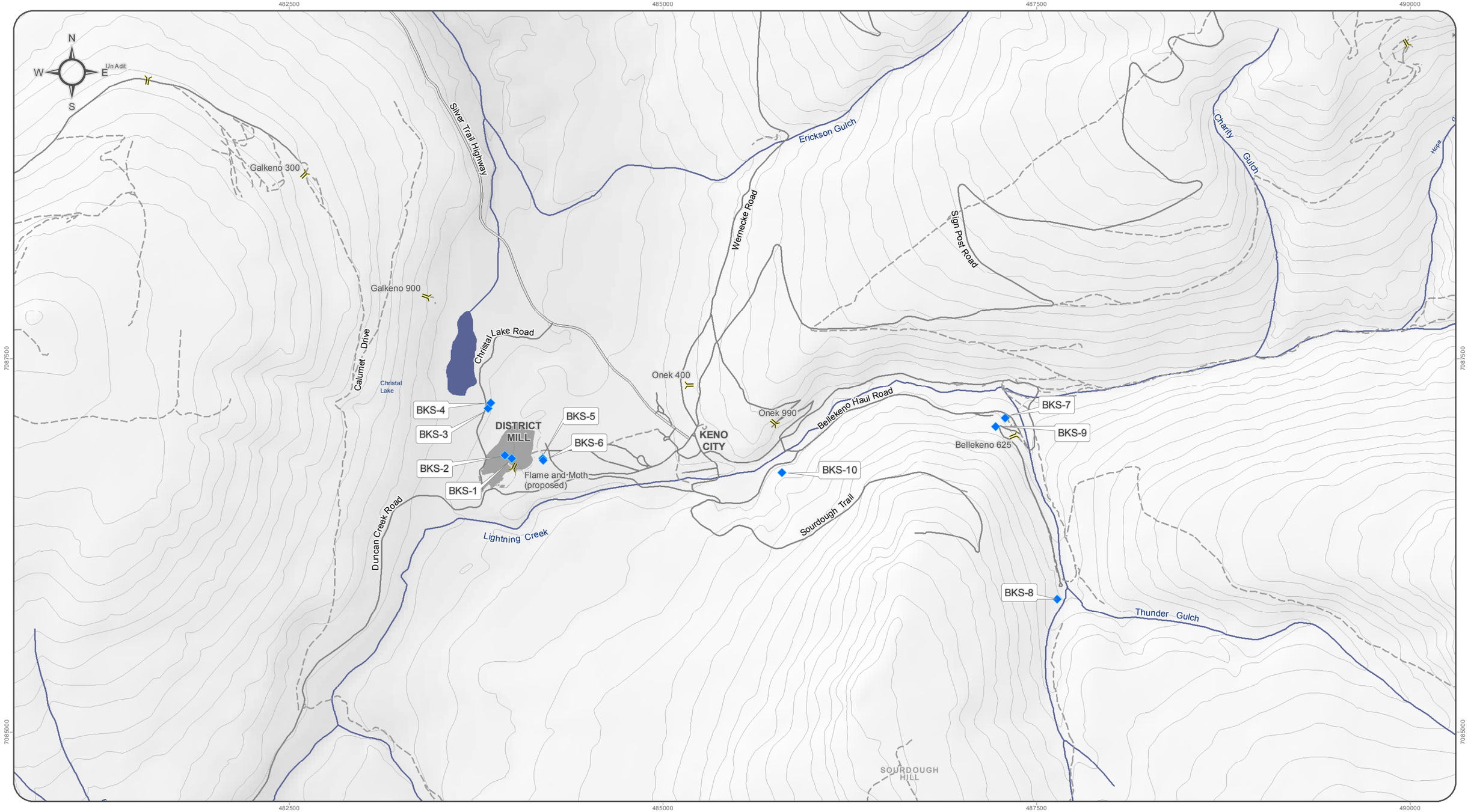
[4] Negative values were reported from Oct to April and were invalidated – soil assumed to be frozen

5. SNOW SURVEYS

Alexco also conducted manual snow surveys in 2011, 2012 and 2013 at ten monitoring stations in order to adequately represent the varying snow conditions as a function of aspect, elevation, etc. Snow water equivalent (SWE) results are presented in Table 5 below and the station locations are shown of Figure 2.

Table 5 Snow Survey SWE Results

Station	Description	Jan 2011 SWE (cm)	Feb 2011 SWE (cm)	Mar 2011 SWE (cm)	Jan 2012 SWE (cm)	Feb 2012 SWE (cm)	Mar 2012 SWE (cm)	April 2012 SWE (cm)	Jan 2013 SWE (cm)	Feb 2013 SWE (cm)	Mar 2013 SWE (cm)	April 2013 SWE (cm)
BKS-1	tall spruce up hill near dry stack	7.6	7.6	5.1	6.	16.1	18.7	8.7	7.3	11.3	13.0	15.0
BKS-2	log pile near dry stack	7.6	7.6	7.6	12.2	13.6	9.3	20.8	9.3	10.7	11.7	13.8
BKS-3	Between 1 and 2 marker on CLR road	7.6	10.2	7.6	9.6	12.5	4.4	7.7	7.3	10.0	14.3	14.7
BKS-4	down road from BKS 3, closer to #2 CLR marker	7.6	7.6	7.6	8.5	17.6	12.3	8.8	9.3	11.7	18.3	14.3
BKS-5.0	Keno dump area. Near scrub trees	5.1	7.6	5.1	13.7							
BKS-5.1	Keno dump area. Near scrub trees	-	-	-		11.3	12.2	9.6	6.7	9.7	13.3	13.0
BKS-6	Keno dump area. On sloping hillside	2.5	2.5	0	11.2	12.6	14.8	19.8	6.7	9.2	12.0	11.3
BKS-7	Up hill from Bellekeno treatment pond	7.6	10.2	7.6	12.5	13.6	4.8	8.5	6.7	11.0	10.3	13.7
BKS-8	Far end of Bellekeno East. Nr explosive storage shed	7.6	7.6	5.1	9.9	13.8	17.6	19.5	8.0	10.0	18.5	19.7
BKS-9	At BKR 16 marker. Slightly up on hillside	7.6	10.2	10.2	12.4	13.3	17.1	0.00	7.3	10.0	15.0	14.0
BKS-10	Near BKR 8 pull out. Up on hillside	10.1	7.6	5.1	13.3	16.5	27.7	10.7	9.3	10.0	12.3	14.3
Mean	-	7.112	7.874	6.096	10.93	14.09	13.87	11.43	7.79	10.36	13.87	14.38



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Datum: NAD 83; Map Projection: UTM Zone 8N

1:24,000 (when printed on 11 x17 inch paper)

0 500 1,000 1,500 2,000 Meters

- Snow Monitoring Station
- Adit
- Highway
- Secondary Road
- Track
- Contours (100 ft)
- Watercourse
- Waterbody

ALEXCO ACCESS

FIGURE 2
KENO SNOW SURVEY STATIONS

NOVEMBER 2013

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(14/11/2013/10:52 AM)

APPENDIX I: METEOROLOGICAL STATIONS COMPONENTS

Galena Hill HOBO Meteorological Station

Component	Model	Serial Number
Datalogger	HOBO Weather Logger	1153440
Temp & RH Sensor	S-THB-XXXX	10064003
Soil Temp Sensor	S-TMB-XXXX	985390
Pyranometer	S-LIB-XXXX	1048627
Rain Gauge	S-RGB-M002	1017667
Wind Speed & Direction Sensor	S-WCA-XXXX	1254995
BP Sensor	S-BPA-XXXX	1037089

District Mill Campbell Scientific Meteorological Station

Component	Model	Serial Number
Air Temperature and Relative Humidity Sensor	HMP45C212	n/a
Tipping Bucket Rain Gauge	TE525M	45303-910
Wind Speed and Direction Sensor	05103AP-10-L	WM105907
Solar Panel	SX320J	T21008289B30EC8
Datalogger	CR800	16119
Battery	PS-12120 F2	06299-HC
Pyranometer	SP Lite2	125766

Valley Tailings HOBO Meteorological Station

Component	Model	Serial Number
Datalogger	U30 NRC	10231016
Input Expander kit		
Solar Panel	6W	
AC Power Adaptor	120V - 60Hz	
HOBOware	Pro	2580 2976 6309 4793
Temp & RH Sensor	THB-M002	10220040
Solar Radiation Shield	RS3	
Pyranometer	LIB-M003	10191222
Rain Gauge	RGB-M002	10222664
Light Sensor Bracket	LBB	
Light Sensor Level	LLA	
Wind Speed & Direction Sensor	WSET-A	10233230
Full Cross Arm	CAA	
BP Sensor	BPB-CM50	10212093
Soil Moisture Sensor	SMC-M005	10225679
Tripod	TPA-KIT 3m	

District Mill Campbell Scientific Meteorological Station

Valley Tailings HOBO Meteorological Station

ACCESS

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Whitehorse, Yukon Y1A 2V3
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www.accessconsulting.ca

Memorandum

To: Kai Woloshyn, Alexco Resource Corp.

From: Anthony Bier, Access Consulting Group

Date: November 12, 2013

Re: Keno Hill Silver District Continuous Discharge Monitoring

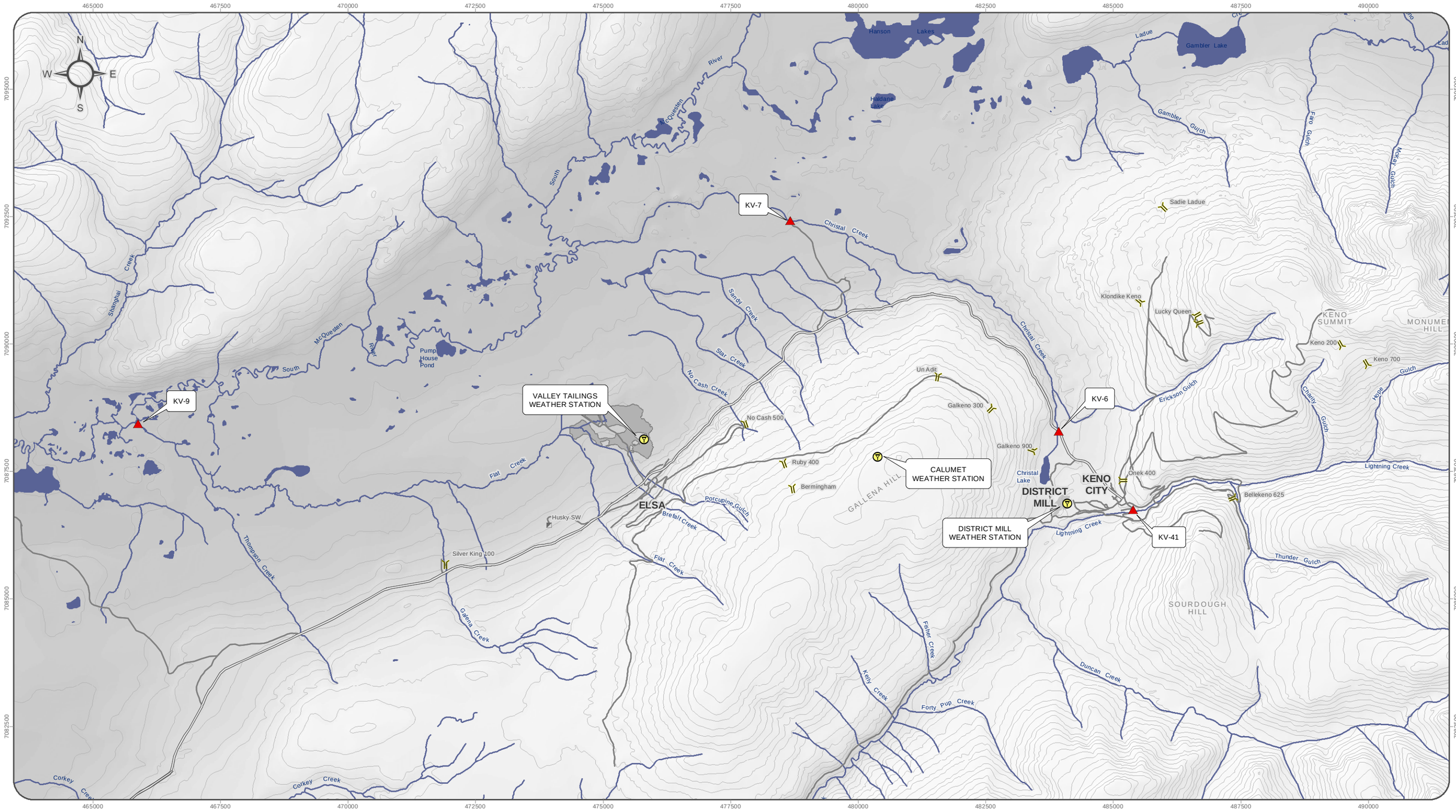
1 INTRODUCTION

This memo describes the discharge data for water monitoring locations KV-6(Christal Creek at Silver Trail Highway) and KV-7 (Christal Creek at Hanson Road), and KV-41 (Lighting Creek upstream of the Keno City Bridge shown on Figure 1. Water level has been monitored at KV-7 and KV-41 since 2004 with data processing performed by Clearwater Consultants Ltd. (Clearwater) into 2009 (Memorandum CCL-UKHM-1 and CCL-UKHM-2). A new station was set-up at KV-6 in the summer of 2011 including the installation of a stilling well with Solinst water level recorder on July 20th 2011.

2 METHODS

Continuous water levels are recorded during the open water season at fifteen or thirty minute intervals using Solinst water level recorders. Discharge measurements and staff gauge observations are taken at regular intervals during the open water season, approximately once per month. Occasionally, salt slugs are used to determine flow when conditions do not permit regular velocity-area discharge measurements. These data have been used together to develop rating curves which facilitate the translation of continuous water level data into continuous discharge. Discharge measurements are taken in winter when conditions permit using the salt dilution gauging method.

For the period 2004 – 2009, Clearwater Consultants Ltd. (Clearwater) processed the water level data to produce a flow record on behalf of Access Consulting Group (ACG). Clearwater have patched the data record over the winter months when gauging data were not collected, and have shown through regional analysis that this practice gives realistic values for the purpose of calculating mean and annual and monthly runoff (CCL, 2008) These data are summarized in memorandums CCL-UKHM-1 and CCL-UKHM-2.



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Quartz claim boundaries current as of February 24th, 2011. Ownership data current as of December 20th, 2010. Data source: http://geomaticsyukon.ca.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:70,000 (when printed on 11 x17 inch paper)

0 1 2 3 Kilometers

- Water Quality Monitoring Station
- Weather Station
- Adit
- Shaft
- Highway
- Secondary Road
- Contours (100 ft)
- Watercourse
- Waterbody

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FIGURE 1

KENO HILL SILVER DISTRICT CONTINUOUS DISCHARGE LOCATIONS

NOVEMBER 2013

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Data at these sites have been collected by ACG and more recently by Alexco with assistance from ACG. ACG has compiled the data since 2010.

3 RESULTS

Below the mean monthly discharge records are presented for KV-6, KV-7, and KV-41. Typically, continuous data is available from May to October. In some years Clearwater Consultants Ltd. were able to fill the winter months. From 2010-2013, winter months are not computed. Appendix A includes hydrographs For KV-6, KV-7, and KV-41 as well as the continuous stage records with spot measurements included for reference. 2012 and 2013 data were processed using Aquatic Informatics Aquarius Time-Series software.

3.1 KV-6 CHRISTAL CREEK ABOVE SILVER TRAIL HIGHWAY

The hydrometric station on Christal Creek at KV-6 is above the Silver Trail highway and several hundred meters downstream of Christal Lake. That catchment area is 6.1 km^2 with a median elevation of 1002 m. ACG revised these numbers using GIS software in 2012. Based on the methods used in Clearwater report CCL-UHKM-1 (2008) the mean annual runoff estimate (MAR) was revised to 243mm or 1,482,300 m^3/yr.

A Solinst water level recorder was deployed at KV-6 in a stilling well on July 20th 2011 and retrieved on October 23rd 2011. Instantaneous discharge measurements have been collected since June 2008 on a monthly basis as often as possible. There was one discharge measurement taken during the continuous water level record but not staff gauge was installed.

The 2012 Solinst Level Logger record begins May 1st and extends till mid-October. Ice begins to affect the pressure readings on October 10th making water levels following that unreliable (Figure 2, Appendix A). A staff gauge was installed along with the Level Logger on May 1st with a corresponding BaroLogger (barometric pressure data logger). After mid-July the record becomes unreliable due to a ponding effect (Figure 2, Appendix A).

In 2013 the KV-6 station was moved upstream due to the ponding encountered in 2012, but due to infrequent measurements a continuous record could not be produced. Furthermore, the station was moved again in September 2013 to a more stable reach. The reach of the stream between Christal Lake and the Silver Trail Highway is not ideal for rating curve development, but with continued efforts a continuous record should be available for 2014.

Table 1 shows instantaneous discharge measurements taken since 2008 at KV-6. Figure 2 (Appendix A) shows the discharge time series for 2012.

Table 1 - Instantaneous discharge measurements at KV-6, Christal Creek below Christal Lake (m^3/s)

	Month											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2008						0.064	0.13	0.119	0.08	0.161		
2009						0.124	0.101	0.114	0.103	0.033		
2010					0.071		0.094	0.061	0.141	0.094		
2011					0.136	0.08	0.091		0.127	0.088	0.075	0.107
2012		0.077		0.062	0.126	0.089	0.095	0.091	0.089	0.076		
2013						0.123	0.082	0.079	0.091	0.093		
Mean[1]	0.092	0.077	0.07	0.062	0.111	0.096	0.099	0.093	0.105	0.091	0.075	0.107

1 - Grey numbers are estimates.

3.2 KV-7 CHRISTAL CREEK AT HANSON-MCQUESTEN LAKES ROAD BRIDGE

Christal Creek at KV-7 drains an area 35.8 km^2 with a median elevation of 970 m and includes KV-6 and Christal Lake. There are quite a number of old workings within the watershed including Galkeno 300, Galkeno 900, Brewis Red Lake, Lucky Queen, Klondike Keno and, arguably Onek 400.

The 2011 updated MAR for Christal Creek at KV-7 is 205 mm or 0.283 m^3/s, somewhat lower than calculated in 2008; 221 mm and 0.304 m^3/s (CCL-UKHM-1). This result is also somewhat lower than the MAR estimates based on the initial hydrology study found in UKM/96/01 of 230mm.

Cleawater has summarized the data for 2004 - 2009 (CCL 2008; 2009). Data for 2010 and 2011 have been processed by ACG following the same methodology as Clearwater. ACG has processed data at this site using Aquarius time series software in 2012 and 2013. Mean monthly discharge is shown since 2003 at KV-7 in

Table 2. Figure 3, Figure 4, Figure 5, and Figure 6 show the discharge time series for 2010, 2011, 2012 and 2013, respectively (Appendix A).

Table 2 – Mean Monthly Discharge at KV-7, Christal Creek at Hanson-McQuesten Road Bridge (m^3/s)

	Month											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2003								0.42	0.51			
2004			0.15	0.166	1.153	0.314	0.119	0.112	0.163	0.135	0.103	0.101
2005		0.122	0.112	0.391	1.54	0.264	0.294	0.398	0.335	0.259	0.189	0.15
2006	0.166	0.138	0.12	0.124	1.089	0.519	0.397	0.278	0.415	0.368	0.203	0.142
2007	0.151	0.12			0.757	0.327	0.54	0.218	0.335	0.154		
2008								0.43	0.333	0.352		0.134
2009	0.079	0.068	0.048	0.074	1.123	0.338	0.102	0.183	0.368			
2010					0.309	0.24	0.359	0.23	0.232	0.186		
2011					1.260	0.142	0.503	0.419	0.268		0.173	0.126
2012	0.154	0.078		0.014	0.730	0.258	0.400	0.217	0.267	0.200		
2013	0.075	0.063	0.086	0.118		0.285	0.126	0.080	0.177	0.266		
Mean	0.125	0.098	0.103	0.148	0.995	0.299	0.316	0.271	0.309	0.240	0.167	0.131

Note: Grey numbers are discrete discharge measurements.

3.3 KV-41 LIGHTNING CREEK AT KENO CITY BRIDGE

Lightning Creek at KV-41 has a catchment area of 58.98 km^2 and a median catchment elevation of approximately 1400 m. Lightning Creek originates to the east of Keno City and drains the southern flank of Keno Hill and the Northern flank of Mount Hinton. Lightning Creek flows to the south of Galena hill into Duncan Creek. Within the Lightening Creek watershed are multiple adits including Keno 200 and 700, multiple old surface workings, active mining at Bellekeno East and placer mining on Thunder Gulch.

Hydrometric station KV-41 is located on Lightning Creek above the Keno City Bridge and downstream of the Bellekeno mine and local placer mining activity. Ice-free continuous water level data extends from late May to early October after which ice begins to affect water level readings and the stage-discharge relationship.

Table 33 shows the update mean monthly discharge record with winter months filled in with spot measurements. Figure 9, Figure 0 and Figure 1 show the discharge time series for 2010, 2011 and 2012, respectively (Appendix A). Due to a logger problem in 2013 the continuous record only extends to June 16th and these data have not been processed at this time.

Table 3 – Mean Monthly Discharge at KV-41, Lightening Creek above Keno City Bridge (m^3/s)

	Month											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2004								0.433	0.315	0.240	0.153	0.125
2005	0.098	0.067	0.056	0.130	1.802	1.418	0.989	1.111	0.958	0.637	0.452	0.299
2006	0.219	0.192	0.194	0.272	0.793	1.994	1.326	0.921	1.083	0.889	0.554	0.447
2007					1.231	1.926	1.193					
2008								1.136	0.770	1.030		
2009		0.110	0.128	0.069	1.595	1.628						
2010					1.172	1.383	1.007	0.760	0.570	0.457		
2011						1.206	1.826	1.542	0.926			0.268
2012	0.251	0.159	0.182			2.096	1.404	0.707	0.869	0.566		
Mean	0.189	0.132	0.140	0.157	1.319	1.664	1.291	0.944	0.784	0.637	0.386	0.285

Note: Grey numbers are discrete discharge measurements.

APPENDIX A

HYDROGRAPHS

Figure 2 – Discharge at KV-6, Christal Creek below Christal Lake, 2012 open water season

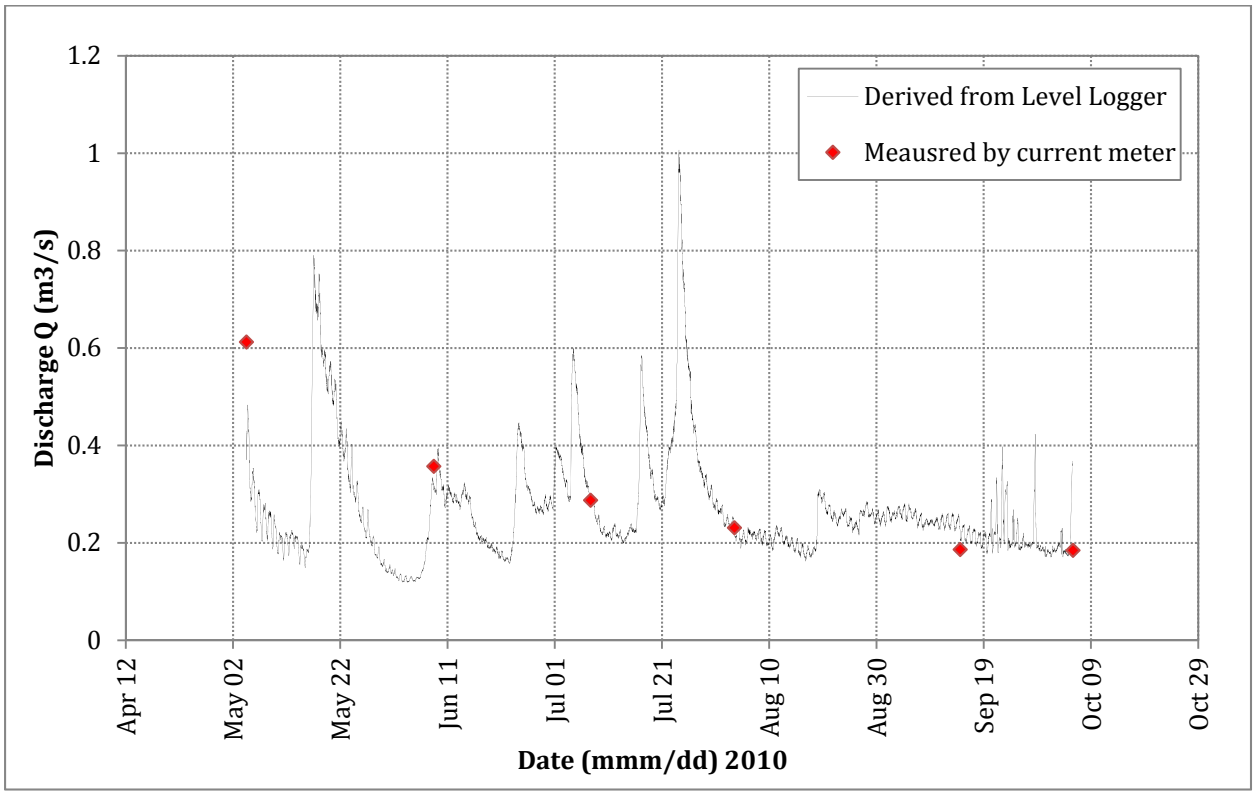


Figure 3 - Discharge at KV-7, Christal Creek at Hansen Road 2010

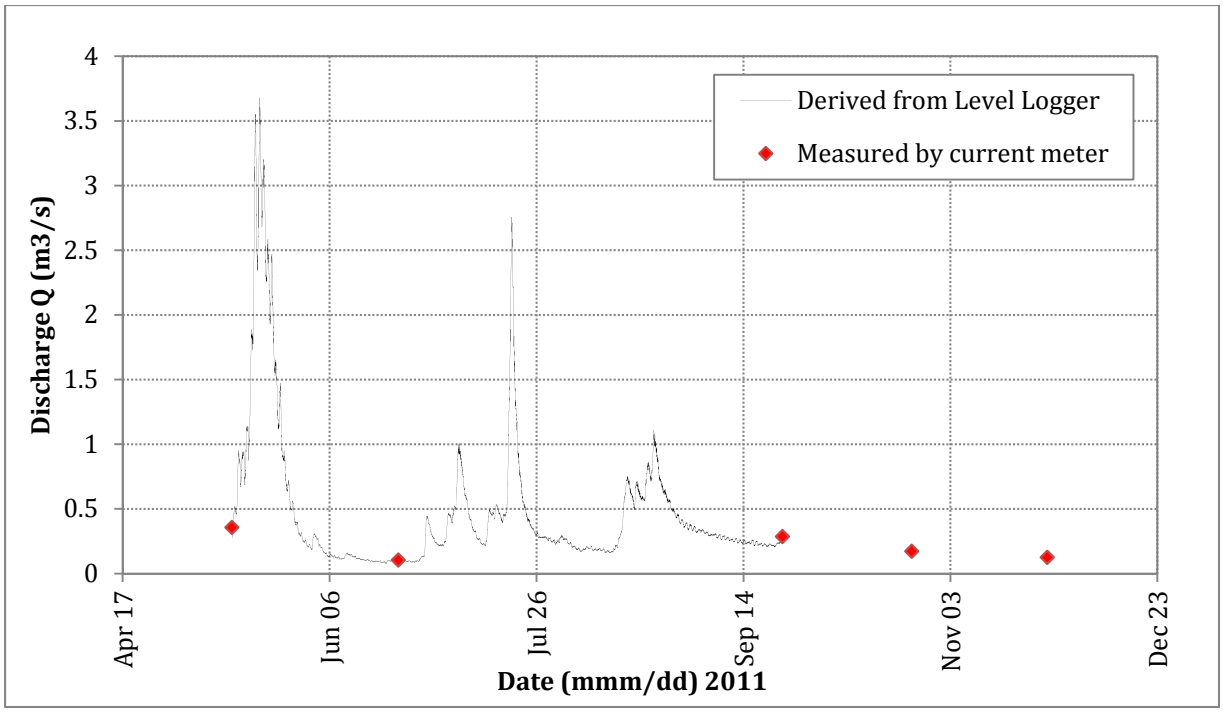


Figure 4 - Discharge at KV-7, Christal Creek at Hansen Road 2011

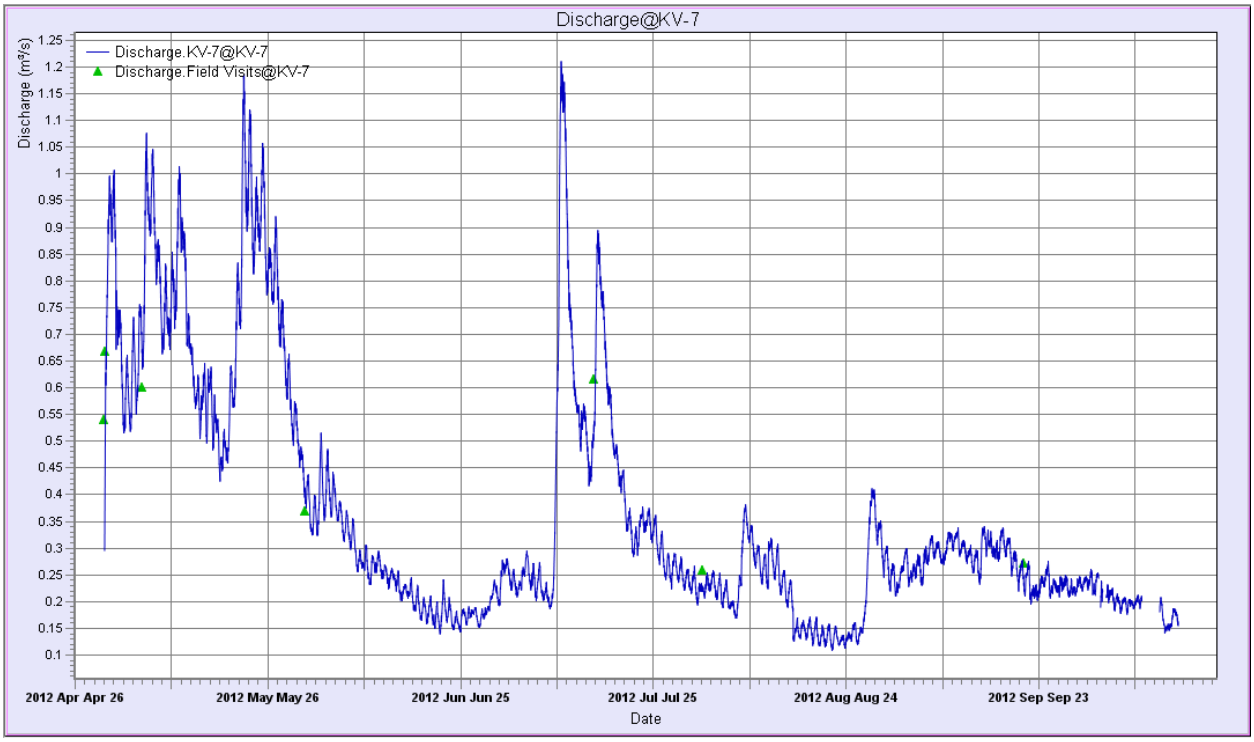


Figure 5 – Discharge at KV-7, Christal Creek at Hanson-McQuesten Lakes Road Bridge, 2012 open water season

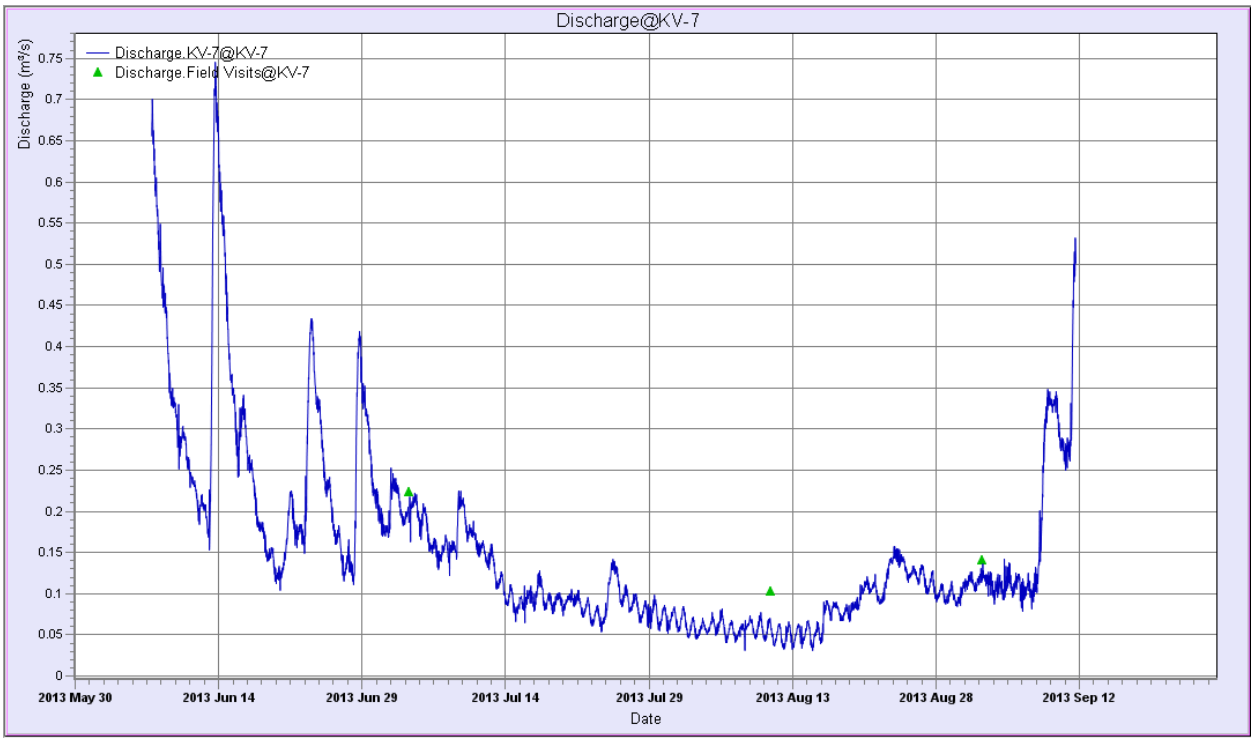


Figure 6 - Discharge at KV-7, Christal Creek at Hanson-McQuesten Lakes Road Bridge, 2013 open water season

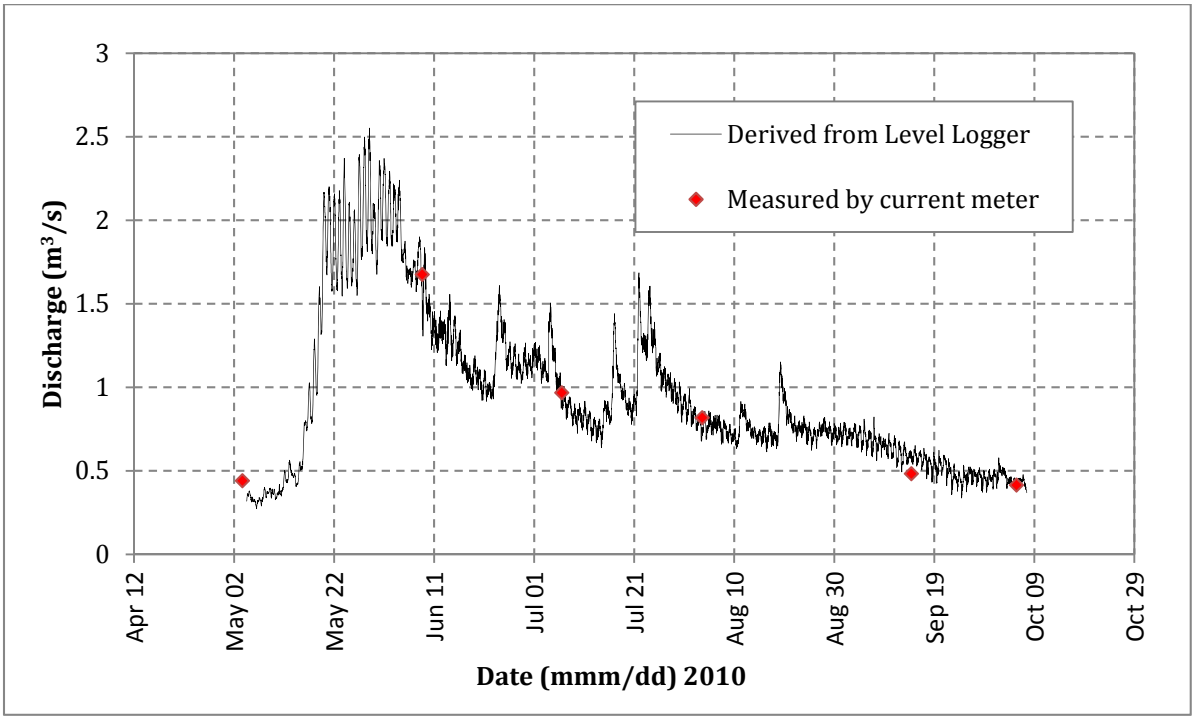


Figure 7 - Discharge at KV-41, Lightening Creek 2010

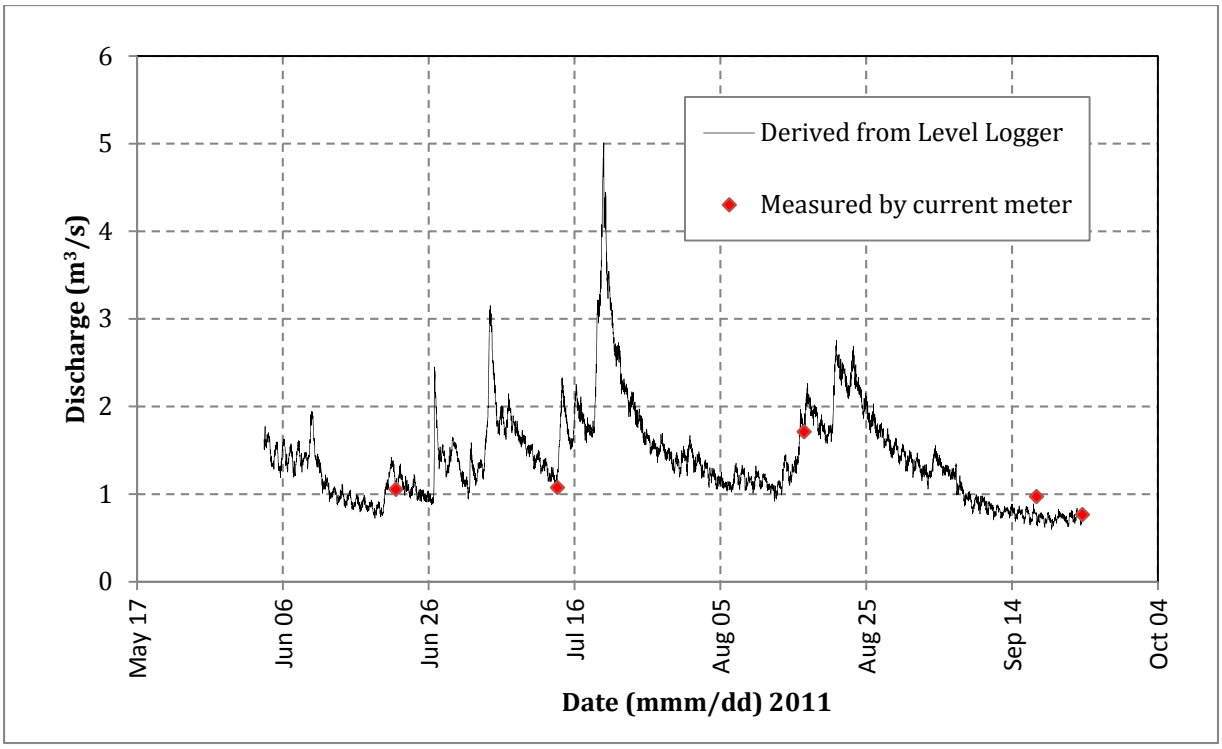


Figure 8 - Discharge at KV-41, Lightening Creek 2011

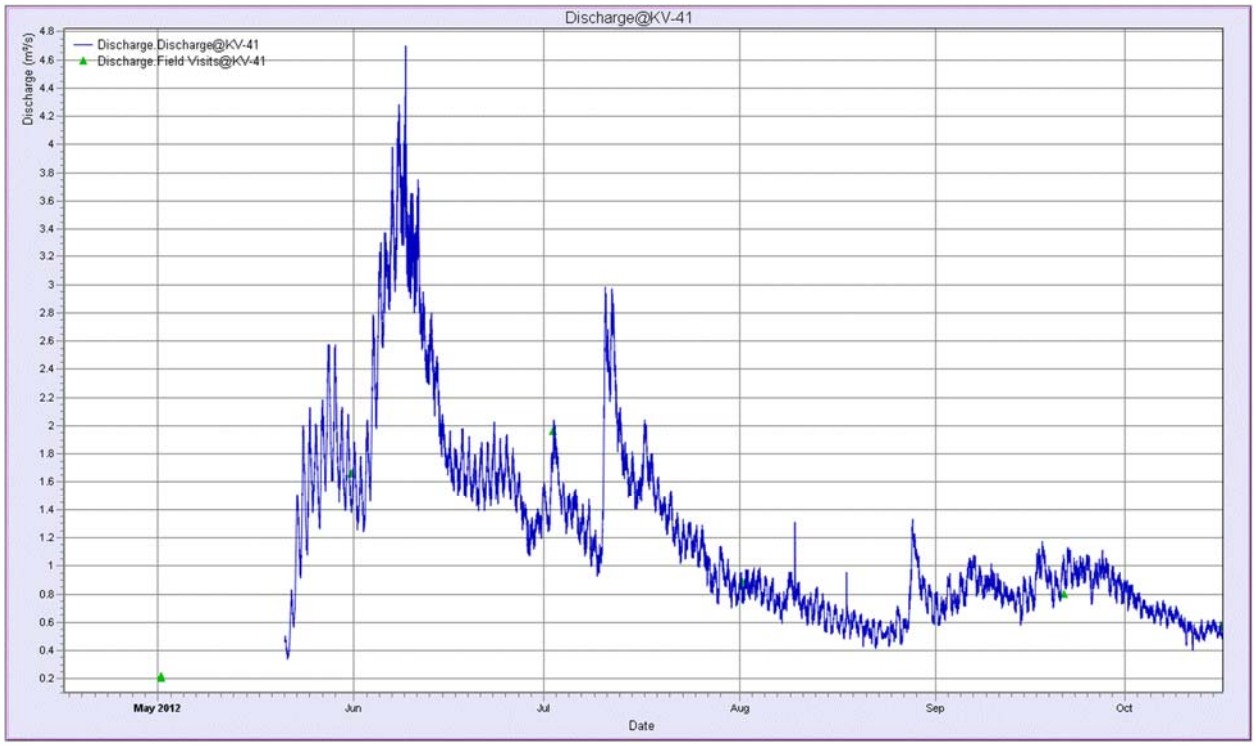


Figure 9 – Discharge at KV-41, Lightening Creek above Keno City Bridge, 2012 open water season

3 Calcite Business Centre, 151 Industrial Road
Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 Fax (867) 667-6680
www.accessconsulting.ca

Memorandum

To: Kai Woloshyn, Alexco Resource Corp.

From: Nichole Speiss, Access Consulting Group

Date: November 27, 2013

Re: 2013 Water Quality Review for the Keno Hill Silver District

INTRODUCTION

In 2008 Minnow Environmental Inc. prepared the Water Quality Assessment Report for United Keno Hill Mines (Minnow, 2008) that provided a data quality assessment, identified contaminants of concern (COCs), potential contaminants of concern (PCOCs), and reviewed/characterized water quality for a number of stations in the Keno Hill Silver District (KHSD). The Minnow Report was prepared as part of district closure studies and included a water quality assessment (up to July 2007) for background stations (KV-1, KV-37), Lightning Creek (KV-39, KV-40, KV-38, KV-41), Christal Creek (KV-6, KV-16, KV-29, KV-30, KV-7, KV-8), No Cash Creek (KV-21), Flat Creek (KV-9, KV-47) and the South McQuesten River (KV-2, KV-3, KV-4, KV-5, KV-15).

Subsequently a memo was produced by Access Consulting Group (November 2012) which presents a review of the water quality data up to October 2012 for the COCs in the KHSD for the watersheds and stations relative to the Bellekeno Mine which includes: Lightning Creek (KV-37, KV-39, KV-40, KV-38, KV-41 KV-65, KV-76, KV-77, KV-81), Christal Creek (KV-6, KV-7, KV-8 KV-48, KV-49, KV-50, KV-51) and the South McQuesten River (KV-1 and KV-2).

This October 2013 memo provides an update to the November 2012 version with water quality results to August 2013 inclusive. The memo does not discuss stations in No Cash Creek, Flat Creek and the South McQuesten River that are monitored as part of Care and Maintenance or district closure studies. Specifically, the memo will identify changes or trends in water quality for the period prior to mining or milling Bellekeno ore (2004 to 2008) and the period where advanced exploration, mining the Bellekeno Mine and milling of Bellekeno ore (2009 to September 2013) has occurred. The advanced exploration began in 2009, whereas the District Mill and Dry Stack Tailings Facility did not begin commercial operation until January 2011. Advanced exploration at Onek 990 and Lucky Queen were initiated in 2013, but did result into production. The Keno Hill Silver District mining operations went into temporary suspension on September 3, 2013 due to metal prices.

1 DATA SOURCES

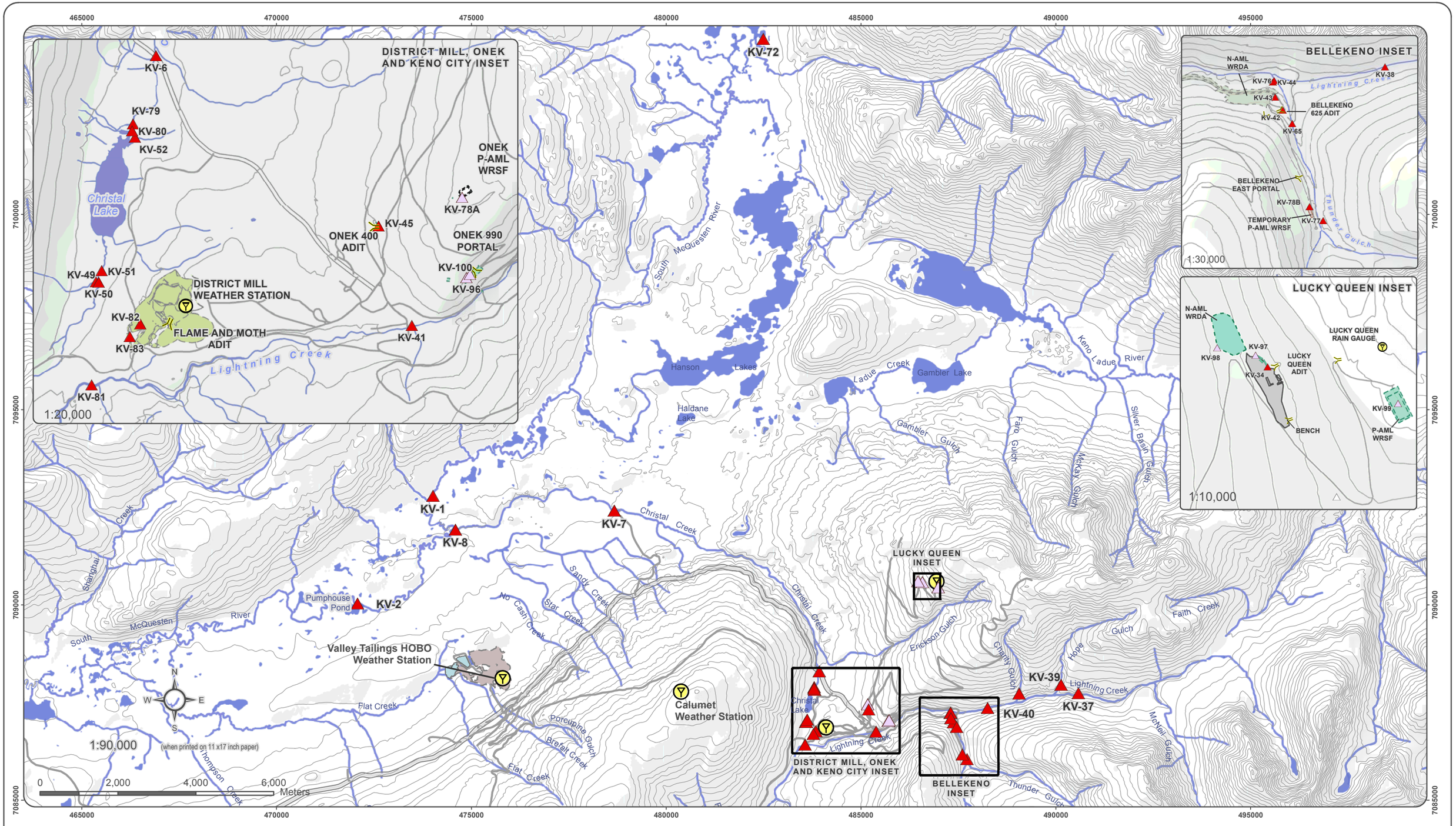
Table 1 presents a number of background and receiving environment stations that are monitored in the KHSD and discussed in this memo. Sample station locations are presented on Figure 1. Appendix A presents the water quality data presented within this memo from 2004 to August 2013. PCOCs identified by the 2008 Minnow report were aluminum, arsenic, cadmium, chromium, copper, manganese, nitrite, phosphorous, selenium, silver and zinc. In September 2013 Minnow evaluated COCs for the Long Term Monitoring Program in the KHSD and concluded that cadmium and zinc should remain as COCs for the program, with no other COCs warranted. The following discussion will focus on these two parameters, as well as provide summary data for arsenic.

For the calculation of statistics and the graphical representation in figures, concentrations below the detection limit were set to half the detection limit. The data in the tables, figures and appendix have been compared to the Canadian Water Quality guidelines for the Protection of Aquatic Life (CCME, 2013). Table 2 summarizes the parameters exceeding the CCME PAL guideline for the periods of 2004 to 2008 and 2009 to August 2013 for the all the stations listed in Table 1. Aside from total metals, not all parameters with CCME PAL guidelines are analyzed for on a regular basis (i.e. ammonia, nitrite, nitrate, fluoride, chloride, mercury). CCME PAL guidelines that are dependent on hardness (cadmium, copper, lead, nickel) used total hardness in the guideline calculation where available (mainly 2009 forward). Where total hardness is not available, dissolved hardness was used to calculate the guideline, and where no hardness result was provided, the mean dissolved hardness (2004 to 2008 datasets) was used to calculate the guideline. Where results were below the detection limit, half the detection limit was compared against the guideline. When a poor detection limit was used (mainly limited to 2004 data) and half the detection limit was above the guideline, those results were removed from the summary statistics and exceedances. Please refer to Appendix A which provides results reviewed and highlights the few data points removed from the summary of water quality. Data presented in Appendix A is being used to evaluate changes or trends in water quality over time and have also been used in the development of the mass load models for Christal and Lightning Creeks.

Table 1. Water Quality stations in the KHSD

Stations	Watershed	Description
KV-37	Lightning Creek	Lightning Creek upstream Hope Gulch
KV-38	Lightning Creek	Lightning Creek upstream Thunder Gulch
KV-39	Lightning Creek	Hope Gulch upstream Lightning Creek
KV-40	Lightning Creek	Charity Gulch upstream Lightning Creek
KV-41	Lightning Creek	Lightning Creek upstream bridge at Keno City
KV-65	Lightning Creek	Thunder Gulch upstream of Bellekeno
KV-76	Lightning Creek	Thunder Gulch downstream Bellekeno 625 Adit
KV-77	Lightning Creek	Thunder Gulch upstream Bellekeno East
KV-81	Lightning Creek	Lightning Creek southwest of Mill Site
KV-6	Christal Creek	Christal Creek at Silver Trail Highway
KV-7	Christal Creek	Christal Creek at Hanson Road

Stations	Watershed	Description
KV-8	Christal Creek	Christal Creek at mouth
KV-48	Christal Creek	Hinton Creek upstream Calumet Drive
KV-49	Christal Creek	Hinton Creek upstream Christal Creek
KV-50	Christal Creek	Christal Creek upstream Hinton Creek
KV-51	Christal Creek	Christal Creek downstream Hinton Creek
KV-1	South McQuesten	South McQuesten River upstream Christal Creek
KV-2	South McQuesten	South McQuesten River at pump house d/s Christal Creek



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 8N

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- Weather Station
- Monitored
- Pending
- Discontinued
- Valley Tailings Pond
- Valley Tailings
- Keno District Mill Site
- Waterbody
- Highway
- Secondary Road
- Watercourse
- Contour (100 feet)

AKHM
ACCESS

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 1

KENO HILL SURFACE WATER QUALITY STATION LOCATIONS LICENCE QZ09-092

NOVEMBER 2013

I:\ALEX-05-01\gis\mxd\UKHM\Overview_Maps\WQ\02-SURFACEWATER\SWMonitoring_KenoHill_Qz09-092_20131115.mxd
(11/14/2013/17:00 PM)

Table 2 Parameters Exceeding the CCME PAL guideline for 2004 - 2008 period and 2009 - 2012 period

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-37	Lightning Creek	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 2 or 13% May 2006 & 2008 As: n = 2 or 13% Mar & May 2008 Cd: n = 5 or 33% Proposed Cd: n = 2 or 13% Mar & May 2008 Cr: n = 1 or 7% May 2008 Cu: n = 2 or 13% May 2006 & 2008 Fe: n = 3 or 20% 2 May 2006 & 2008 Pb: n = 1 or 7% May 2008 Se: n = 1 or 7% Mar 2008 Ag: n = 1 or 7% July 2004 Zn: n = 1 or 7% Mar 2008	NO2-, Al, As, Cd, Cu, Fe, Pb	NO2-: n = 1 or 4% Nov 2012 Al: n = 1 or 3% June 2013 As: n = 1 or 3% June 2013 Cd: n = 11 or 28% Proposed Cd: n = 3 or 8% May 2011, June 2012 & 2013 Cu: n = 1 or 3% June 2013 Fe: n = 1 or 3% June 2013 Pb: n = 2 or 5% May 2011 & June 2013	Cr, Se, Ag, Zn	NO2-
KV-38	Lightning Creek	Al, Cd, Cu, Pb, Ag, Zn	Al: n = 1 or 7% May 2008 Cd: n = 15 or 100% Proposed Cd: n = 11 or 73% Cu: n = 1 or 7% May 2008 Pb: n = 3 or 20% July 2004, May 2006 & 2008 Ag: n = 1 or 7% July 2004 Zn: n = 4 or 27% July 2004, May 2006 & 2008, Oct 2008	Al, As, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Al: n = 1 or 3% June 2013 As: n = 2 or 6% Oct 2012 & June 2013 Cd: n = 33 or 100% Proposed Cd: n = 14 or 42% Cr: n = 1 or 3% July 2013 Cu: n = 2 or 6% Jan 2013 & June 2013 Fe: n = 2 or 6% Oct 2012 & June 2013 Pb: n = 9 or 27% Ag: n = 1 or 3% June 2013 Zn: n = 4 or 12% May 2009 & 2011, June 2012 & 2013	-	As, Cr, Fe
KV-39	Lightning Creek	NO2-, Al, As, Cd, Cu, Fe, Pb, Se, Ag, Zn	NO2-: n =1 or 50% May 2006 Al: n = 1 or 13% May 2008 As: n = 8 or 100% Cd: n = 8 or 100% Proposed Cd: n = 8 or 100% Cu: n = 1 or 13% May 2008 Fe: n = 1 or 13% May 2008 Pb: n = 2 or 25% May 2006 & 2008 Se: n = 3 or 38% Sep 2007, Mar & Oct 2008 Ag: n = 1 or 13% May 2008 Zn: n = 8 or 100%	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 2 or 13% Oct 2009 & May 2012 As: n = 15 or 94% Cd: n = 16 or 100% Proposed Cd: n = 16 or 100% Cr: n = 1 or 6% Oct 2009 Cu: n = 4 or 25% May & Oct 2009, May 2010 & May 2011 Fe: n = 1 or 6% Oct 2009 Pb: n = 4 or 25% May & Oct 2009, May 2010 & May 2011 Se: n = 8 or 50% Ag: n = 2 or 13% Oct 2009 & May 2011 Zn: n = 16 or 100%	NO2- (suspicious result of 0.226 mg/L, not typically analysed for at this station: 3X total since 2004, once since 2009)	Cr

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-40	Lightning Creek	NO2-, Al, Cd, Se	NO2-: n =1 or 100% July 2005 Al: n = 1 or 14% Oct 2008 Cd: n = 4 or 57% Sep 2007 & Mar, May & Oct 2008 Proposed Cd: n = 0 or 0% Se: n = 5 or 71%	Al, Cd, Cu, Se	Al: n = 2 or 17% May 2009 & May 2011 Cd: n = 5 or 42% Proposed Cd: n = 1 or 8% May 2012 Cu: n = 1 or 8% May 2012 Se: n = 8 or 67%	NO2- (only 2 samples analysed since 2004)	Cu
KV-41	Lightning Creek	NO2-, Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	NO2-: n = 1 or 25% May 2006 Al: n = 12 or 57% As: n = 8 or 40% Cd: n = 20 or 100% Proposed Cd: n = 13 or 68% Cr: n = 10 or 48% Cu: n = 11 or 52% Fe: n = 12 or 57% Pb: n = 13 or 62% Se: n = 1 or 5% Oct 2008 Ag: n = 9 or 45% Zn: n = 9 or 43%	NO2-. Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Se, Ag, Zn	NO2-: n = 2 or 5% Aug 2011 & Nov 2012 Al: n = 23 or 38% As: n = 8 or 13% Cd: n = 59 or 98% Proposed Cd: n = 20 or 33% Cr: n = 13 or 22% Cu: n = 19 or 32% Fe: n = 20 or 33% Pb: n = 23 or 38% Hg: n = 1 or 2% July 2011 Se: n = 16 or 27% Ag: n = 11 or 18% Zn: n = 9 or 15%	-	Hg
KV-65	Lightning Creek	Al, Cd, Cr, Cu, Fe, Pb	Al: n = 1 or 20% May 2008Cd: n = 3 or 60% July & Sep 2007 & May 2008Proposed Cd: n = 2 or 40% Sep 2007 & May 2008Cr: n = 1 or 20% May 2008Cu: n = 1 or 20% May 2008Fe: n = 1 or 20% May 2008Pb: n = 1 or 20% May 2008	NO2-, Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	NO2-: n = 2 or 7% Aug 2011 & Nov 2012Al: n = 9 or 18%As: n = 1 or 2% May 2009Cd: n = 29 or 59%Proposed Cd: n = 4 or 8% May 2009, July & Aug 2011, May 2012Cr: n = 5 or 10%Cu: n = 4 or 8% May 2009, July 2011, May 2012, June 2013Fe: n = 3 or 6% May 2009, July 2011, May 2012Pb: n = 16 or 33%Se: n = 2 or 4% Dec 2012 & Feb 2013Ag: n = 3 or 6% May 2009, July 2011, May 2012Zn: n = 3 or 6% May 2009, July 2011, May 2012	-	NO2-, As, Se, Ag, Zn

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-76	Lightning Creek	Al, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Al, Cd (including proposed), Cr, Cu Fe, Pb, Ag, Zn: n = 1 or 100% May 2008	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 9 or 39% As: n = 3 or 13% May 2009, May 2012, July 2012 Cd: n = 20 or 87% Proposed Cd: n = 9 or 39% Cr: n = 5 or 22% Cu: n = 5 or 22% Fe: n = 5 or 22% Pb: n = 10 or 44% Se: n = 2 or 9% May 2012 & Feb 2013 Ag: n = 5 or 22% Zn: n = 4 or 17% May & Sep 2009, May & July 2012	-	As, Se
KV-77	Lightning Creek	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al, As, Cr, Cu, Fe, Pb, Se, Ag: n = 1 or 33% Mar 2008 Cd (including proposed) & Zn: n = 3 or 100% Mar, May & Oct 2008	Al, As, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Al: n = 4 or 25% May 2009, 2011 & 2013, July 2011 As: n = 2 or 13% May 2009 & Oct 2010 Cd: n = 5 or 31% Proposed Cd: n = 2 or 13% May 2009 & Oct 2010 Cr: n = 1 or 6% May 2009 Cu: n = 2 or 13% May 2009 & Oct 2010 Fe: n = 3 or 19% May 2009 & 2013, Oct 2010 Pb: n = 3 or 10% May 2009 & 2011, July 2011 Ag: n = 2 or 13% May 2009 & Oct 2010 Zn: n = 2 or 13% May 2009 & Oct 2010	Se	-
KV-81	Lightning Creek	Not Monitored Until Oct 2010	Not Monitored Until Oct 2010	Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Se, Ag, Zn	Al: n = 8 or 57% As: n = 3 or 21% July 2011, 2012 & 2013 Cd: n = 14 or 100% Proposed Cd: n = 6 or 43% Cr: n = 3 or 21% July 2011, 2012 & 2013 Cu: n = 6 or 43% Fe: n = 6 or 43% Pb: n = 7 or 50% Hg: n = 1 or 7% Se: n = 4 or 29% Ag: n = 5 or 36% Zn: n = 4 or 29%	-	-

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-6	Christal Creek	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 12 or 23%As: n = 19 or 40%Cd: n = 51 or 98%Proposed Cd: n = 51 or 98%Cr: n = 7 or 13%Cu: n = 6 or 11%Fe: n = 15 or 28%Pb: n = 27 or 51%Se: n = 12 or 25%Ag: n = 18 or 38%Zn: n = 52 or 98%	Fluoride, Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Fluoride: n =1 or 25% Aug 2013Al: n = 3 or 6% July 2010, May & June 2013As: n = 28 or 54%Cd: n = 52 or 100%Proposed Cd: n = 50 or 96%Cr: n = 1 or 2% Apr 2009Cu: n = 2 or 4% July 2010 & May 2013Fe: n = 26 or 50%Pb: n = 22 or 42%Se: n = 3 or 6% Jan 2009 & 2012 & Nov 2012Ag: n = 3 or 6% Sep 2009, July 2010, May 2013Zn: n = 50 or 96%	-	Fluoride (monitored since May 2013)
KV-7	Christal Creek	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 18 or 33% As: n = 8 or 16% Cd: n = 55 or 100% Proposed Cd: n = 54 or 98% Cr: n = 12 or 22% Cu: n = 9 or 16% Fe: n = 18 or 33% Pb: n = 13 or 23% Se: n = 6 or 12% Ag: n = 10 or 20% Zn: n = 56 or 100%	Fluoride, NO2-, Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Fluoride: n = 3 or 60% NO2-: n = 1 or 3% Al: n = 6 or 11% As: n = 3 or 5% July 2011, May 2012 & 2013 Cd: n = 57 or 100% Proposed Cd: n = 49 or 86% Cr: n = 2 or 4% Cu: n = 5 or 9% Fe: n = 8 or 14% Pb: n = 9 or 16% Se: n = 4 or 7% Jan 2009, Nov 2012, Feb & Mar 2013 Ag: n = 4 or 7% July 2011, June 2012, May & June 2013 Zn: n = 57 or 100%	-	Fluoride (monitored since April 2013), NO2-

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-8	Christal Creek	Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	Al: n = 14 or 30% As: n = 3 or 7% June 2006, May & July 2007 Cd: n = 48 or 100% Proposed Cd: n = 48 or 100% Cr: n = 8 or 17% Cu: n = 6 or 13% Fe: n = 13 or 28% Pb: n = 8 or 17% Se: n = 4 or 9% Oct 2005, Mar 2006, Nov 2007, Feb 2008 Ag: n = 8 or 19% Zn: n = 48 or 100%	pH, Al, As, Cd, Cr, Cu, Fe, Pb, Se, Ag, Zn	pH: n = 1 or 2% Mar 2012 Al: n = 5 or 11% As: n = 4 or 9% Oct 2009, Feb 2011, June 2011 & 2013 Cd: n = 47 or 100% Proposed Cd: n= 45 or 96% Cr: n = 3 or 6% Apr 2009, Nov 2011, May 2013 Cu: n = 6 or 13% Fe: n = 8 or 17% Pb: n = 11 or 23% Se: n = 6 or 13% Ag: n = 5 or 11% Zn: n = 47 or 100%	-	pH
KV-48	Christal Creek	Al, Cd, Cu, Pb	Al, Cd, Cu: n = 3 or 100% July & Sep 2007, May 2008 Pb: n = 2 or 67% Sep 2007 & May 2008	pH, Al, Cd, Cu, Fe, Pb, Ag, Zn	pH: n = 1 or 9% Oct 2011 Al: n = 2 or 18% May 2009 & 2010 Cd: n = 11 or 100% Proposed Cd: n = 11 or 100% Cu: n = 2 or 18% May 2009 & July 2011 Fe: n = 2 or 18% May 2009 & 2010 Pb: n = 1 or 9% May 2009 Ag: n = 1 or 9% May 2009 Zn: n = 10 or 91%	-	pH, Fe, Ag, Zn
KV-49	Christal Creek	Al, Cd	Al: n = 1 or 25% May 2008 Cd: n = 4 or 100% July & Sep 2007, May & Oct 2008 Proposed Cd: n = 4 or 100% July & Sep 2007, May & Oct 2008	pH, DO, Al, Cd, Fe, Pb, Zn	pH: n = 2 or 17% July 2012 & 2013 DO: n = 1 or 17% July 2013 Al: n = 3 or 23% May 2009, July 2012 & 2013 Cd: n = 13 or 100% Proposed Cd: n = 7 or 54% Fe: n = 2 or 15% Sep 2011 & Oct 2012 Pb: n = 3 or 23% July 2010, July & Oct 2012 Zn: n = 8 or 62%	-	pH, DO, Fe, Pb, Zn

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-50	Christal Creek	Al, As, Cd, Cr, Cu, Fe, Zn	Al & As: n = 4 or 80% July & Sep 2007, May & Oct 2008Cd: n = 5 or 100%Proposed Cd: n = 3 or 60%Cr: n = 3 or 60%Cu: n = 1 or 20% May 2008Fe: n = 5 or 100%Zn: n = 5 or 100%	DO, Fluoride, Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ag, Zn	DO: n = 1 or 6% Nov 2012Fluoride: n = 2 or 67% May & Aug 2013Al: n = 14 or 50%As: n = 28 or 100%Cd: n = 28 or 100%Proposed Cd: n = 8 or 29%Cr: n = 4 or 14% Oct 2009 & Aug, Sep & Oct 2011Cu: n = 5 or 18%Fe: n = 28 or 100%Pb: n = 4 or 14% Oct 2009, Sep & Oct 2011, May 2013Hg: n = 1 or 4% Sep 2011Ag: n = 1 or 4% Sep 2011Zn: n = 28 or 100%	-	DO, Fluoride, Pb, Hg, Ag
KV-51	Christal Creek	Al, As, Cd, Cr, Cu, Fe, Zn	Al & As: n = 4 or 80% July & Sep 2007, May & Oct 2008 Cd: n = 5 or 100% Proposed Cd: n = 3 or 60% Cr: n = 3 or 60% Cu: n = 1 or 20% May 2008 Fe: n = 5 or 100% Zn: n = 5 or 100%	Fluoride, Al, As, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Fluoride: n = 2 or 100% May & July 2013 Al: n = 8 or 57% As: n = 14 or 100% Cd: n = 14 or 100% Proposed Cd: n = 5 or 36% Cr: n = 3 or 21% Oct 2009 & 2011, May 2013 Cu: n = 3 or 21% Oct 2009, 2010 & 2011 Fe: n = 14 or 100% Pb: n = 2 or 14% Oct 2009 & May 2013 Ag: n = 1 or 7% Oct 2009 Zn: n = 14 or 100%	-	Fluoride, Pb, Ag

Stations	Watershed	2004-2008 CCME Parameter Exceedance*	2004 - 2008 CCME Exceedance Frequency	2009 - August 2013 CCME Parameter Exceedance	2009 - August 2013 CCME Exceedance Frequency	CCME Parameter Exceeded from 2004 to 2008, but not from 2009 - August 2013	CCME Parameter Exceeded from 2009 to August 2013, but not from 2004-2008
KV-1	South McQuesten	Al, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Al: n = 35 or 67% Cd: n = 46 or 92% Proposed Cd: n = 28 or 56% Cr: n = 4 or 8% Apr & May 2007, Nov & Dec 2008 Cu: n = 28 or 53% Fe: n = 17 or 33% Pb: n = 4 or 8% Feb, Mar & June 2004, May 2006 Ag: n = 6 or 13% Zn: n = 37 or 70%	DO, Fluoride, NO2-, Al, As, Cd, Cr, Cu, Fe, Pb, Zn	DO: n = 1 or 6% Nov 2012 Fluoride: n = 2 or 50% May & Aug 2013 NO2-: n = 1 or 5% Nov 2012 Al: n = 43 or 92% As: n = 4 or 9% Cd: n = 46 or 98% Proposed Cd: n = 45 or 96% Cr: n = 3 or 6% Feb & July 2011, June 2013 Cu: n = 27 or 57% Fe: n = 23 or 49% Pb: n = 3 or 6% May 2009, Feb 2011, June 2013 Zn: n = 46 or 98%	Ag	DO, Fluoride, NO2- , As
KV-2	South McQuesten	Al, Cd, Cr, Cu, Fe, Pb, Ag, Tl, Zn	Al: n = 14 or 44% Cd: n = 29 or 100% Proposed Cd: n = 10 or 34% Cr: n = 4 or 12% Mar 2004 & 2005, May & Oct 2008 Cu: n = 8 or 24% Fe: n = 7 or 22% Pb: n = 6 or 18% Ag: n = 4 or 12% July 20 & 30, 2004, Nov 2004, May 2005 Tl: n = 1 or 4% June 2004 Zn: n = 28 or 85%	Fluoride, Al, As, Cd, Cr, Cu, Fe, Pb, Ag, Zn	Fluoride: n = 1 or 20% Aug 2013 Al: n = 25 or 74% As: n = 3 or 9% May & July 2011, June 2013 Cd: n = 33 or 97% Proposed Cd: n = 30 or 88% Cr: n = 3 or 9% May 2010, Feb & June 2013 Cu: n = 10 or 29% Fe: n = 11 or 32% Pb: n = 7 or 21% Ag: n = 1 or 3% June 2013 Zn: n = 32 or 94%	Tl	Fluoride, As

2 LIGHTNING CREEK

Lightning Creek is characterized as being a mountainous alpine stream with high gradient that flows into Duncan Creek. Historically a number of mines have been in operation in the Lightning Creek watershed including: Keno 700, Bellekeno, Homestake, Demon, Bema, Divide, Comstock, Apex, Charity, Vanguard, Runner, Ironclad, Hogan and Gold Hill number 2. Placer mining in Lightning Creek and Thunder Gulch predate the Alexco Keno Hill Mining Corp. operations of the Bellekeno mine. The water treatment plant at Bellekeno was operated by Elsa Reclamation and Development Co. Ltd (ERDC) prior to AKHM commencing advanced exploration activities at Bellekeno. The water treatment facility treats Bellekeno 625 adit discharge and discharges the water to ground up hill from the placer ponds which eventually reports to Lightning Creek. The Bellekeno N-AML waste rock disposal area planned in the Lightning Creek watershed has not been constructed. To date, all N-AML waste rock has been used to construct the haul road or stored underground.

The Lightning Creek watershed water quality data for 2004 to August 2013 is presented in Appendix A. The total arsenic, cadmium and zinc summary statistics for the Lightning Creek stations are presented in Tables 3, 4 and 5 respectively for the periods of 2004 to 2008 and 2009 to August 2013.

2.1 UPPER LIGHTNING CREEK WATERSHED

Monitoring of upper Lightning Creek watershed includes two stations on Lightning Creek (KV-37 and KV-38), as well as Hope Gulch (KV-39) and Charity Gulch (KV-40). The total and dissolved, arsenic, cadmium and zinc concentrations for upper Lightning Creek between 2004 and August 2013 are plotted on Figures 2, 4 and 6 respectively. The total arsenic, cadmium and zinc concentrations for Hope Gulch at KV-39, which has the highest contributions of COC's, show decreasing trends, with a median cadmium concentration from 2004 to 2008 of 0.00303 mg/L decreasing to a 2009 to August 2013 median of 0.00235 mg/L. Total arsenic concentrations for KV-37 (median for all results: 0.0027 mg/L) are nearly all below the CCME PAL guideline of 0.005 mg/L. Similarly, at KV-40 total arsenic concentrations are below the CCME PAL (median: 0.0008 mg/L) while all KV-39 results are above the guideline (with one May 2012 result just below). Total zinc concentrations for all KV-37 results (median: 0.002 mg/L) and all KV-40 results (median: 0.0045 mg/L) were below the CCME PAL guideline of 0.03 mg/L (with the exception of a March 13, 2008 sample at KV-37), while all the KV-39 results were above the guideline. Total arsenic at KV-38 is generally below the guideline (median: 0.0027 mg/L) as is zinc (median: 0.0141 mg/L) while cadmium exceeds the guideline 100% of the time but does show a slight decrease from 2004 to 2008.

Exceedance of the cadmium CCME PAL guideline at KV-37 was 33% in 2004 to 2008, and 28% from 2009 to August 2013. Hope Gulch (KV-39) exceeds the cadmium and zinc guidelines 100% of the time and nearly 100% for arsenic. Selenium exceedances are also seen at KV-39 and appear to have increased during 2009 to 2013 to 50%. Charity Gulch (KV-40) shows 57% exceedance of the cadmium CCME PAL guideline from 2004 to 2008, while during 2009 to August 2013 it was 42%. Selenium exceedances are also seen at KV-40 (67% during 2009 to August 2013). KV-38 on Lightning Creek shows 100% exceedance of the cadmium CCME PAL guideline; 27% exceedance for lead; and 12% exceedance for zinc (2009 to August 2013). Upper Lightning Creek watershed shows seasonal variation with peak concentrations during freshet and decreasing during open water season and increase throughout the fall/winter period. Periodic exceedances of other CCME PAL guidelines are observed during higher than usual TSS events (see Table 2).

2.2 THUNDER GULCH

Three stations are monitored on Thunder Gulch; KV-77 - upstream of Bellekeno East adit, KV-65 - upstream of the Bellekeno adit discharge and KV-76 - at the mouth of Thunder Gulch. It should be noted that Thunder Gulch has been actively placer mined and provides a load source to the watershed. The total arsenic, cadmium and zinc concentrations between 2007 and 2012 are plotted on Figures 8, 9 and 10, respectively. The spikes in total arsenic, cadmium and zinc concentrations shown in Figures 8 through 10 are a result of elevated TSS during freshet or as a result of placer activity on Thunder Gulch. For example, the KV-76 total zinc concentration of 0.658 mg/L on July 10, 2012 was sampled while placer mining activity was ongoing. The dissolved zinc concentration for this sampling event was 0.0206 mg/L, indicating that the zinc in the total metals sample was predominantly in the form of suspended particulate matter. Dissolved zinc concentrations for Thunder Gulch stations show little variability (Figure 10). Median total arsenic concentrations for KV-76 at the mouth of Thunder gulch is 0.0006 mg/L while total cadmium is 0.000108 mg/L and total zinc is 0.0078 mg/L.

Thunder Gulch station KV-65 has seen exceedances for nitrite, arsenic, selenium, silver and zinc for 2009 to August 2013 that were not observed in the 2004 to 2008 period. Other CCME PAL guidelines that show periodic exceedances in Thunder Gulch include aluminum, chromium, copper, iron and lead.

The 2004 to 2008 data for Thunder Gulch is limited to 1 sample for KV-76 and 3 samples for KV-77 in comparison to 23 samples for KV-76 and 16 samples for KV-77 during 2009 to August 2013.

2.3 LOWER LIGHTNING CREEK

Station KV-38 is located on Lightning Creek upstream of the confluence with Thunder Gulch. There are two stations in lower Lightning Creek downstream of the confluence with Thunder Gulch: station KV-41 is located adjacent to Keno City and station KV-81 is located about 2km downstream of KV-41. Station KV-81 was established in 2010 and has limited data set compared to KV-41 as it was established in October 2010; therefore, the discussion of Lightning Creek will be focused on comparing data for Lightning Creek upstream of the confluence with Thunder Gulch at station KV-38 with KV-41 which is over 2 km downstream of the confluence with Thunder Gulch. Generally the concentrations at KV-81 follow the same trends as KV-41, but are slightly lower in concentrations.

The total arsenic, cadmium and zinc concentrations for lower Lightning Creek between 2004 and 2012 are plotted on Figures 3, 5 and 7 respectively. The lower Lightning Creek stations generally show a pattern of elevated concentrations of total metals in the spring and summer months, with a decreasing trend in the fall to winter period. As outlined in the above section on Thunder Gulch, the Lightning Creek watershed is impacted by placer mining on Thunder Gulch. For example the July 2013 elevated concentrations for total arsenic, cadmium and zinc for KV-41 and KV-81 were associated with TSS concentrations of 203 mg/L and 75.4 mg/L, respectively. The associated dissolved concentrations were typically an order of magnitude lower than the total concentrations. The dissolved arsenic concentration for lower Lightning Creek (KV-41) shows a slight decrease between 2004 and August 2013 with a median arsenic concentration of 0.0018 mg/L for 2004 to 2008, and 0.0011 mg/L for 2009 to August 2013. The dissolved cadmium concentrations for KV-41 also shows a decreasing trend for the period of 2004 to 2008 (median: 0.000125 mg/L) and 2009 to August 2013 (median: 0.000065 mg/L). The dissolved zinc concentration for lower Lightning Creek (KV-41) shows a

decreasing trend between 2004 and August 2013 with a median zinc concentration of 0.018 mg/L for 2004 to 2008 period, and 0.008 mg/L for the 2009 to 2013 period. At KV-81 total arsenic meets the CCME PAL guideline except in July of each year, while total cadmium is 100% in exceedance and total zinc also experiences periodic exceedances during the spring and summer (May – July).

During the water licencing process in 2010 Alexco predicted zinc and cadmium concentrations through a mass load model at KV-41 ranging from 0.024 to 0.034 mg/L and 0.00021 to 0.00038 mg/L, respectively. In November 2012 the GoldSim model was used to calculate similar operations and post closure maximum concentrations with the additions for the Onek 990 mine at KV-41 for total zinc and cadmium at 0.041 mg/L and 0.00037 mg/L respectively.

A number of other parameters are seen to exceed the CCME PAL guidelines at KV-41 and KV-81 on a regular basis (i.e. greater than or equal to 15% of the time): aluminum, chromium, copper, iron, lead, selenium and silver.

Table 3 Lightning Creek Total Arsenic, Cadmium and Zinc Summary Statistics, 2004-2008

	KV-37	KV-39	KV-40	KV-38	KV-41	KV-81	KV-65	KV-76	KV-77
Arsenic, Total (mg/L)									
Average	0.0033	0.0099	0.0010	0.0028	0.0099		0.0006	0.0046	0.0529
Count	15	8	7	15	20	0	5	1	3
Minimum	0.0001	0.0074	0.0004	0.002	0.0017		0.0003	0.0046	0.002
Maximum	0.0079	0.0132	0.0028	0.00394	0.0748		0.0016	0.0046	0.154
Geometric Mean	0.0026	0.00974	0.0009	0.00276	0.00497		0.0005	0.0046	0.0095
Count <DL	1	0	0	0	0		0	0	0
Standard Deviation	0.00188	0.00184	0.00080	0.00053	0.01708		0.00060	0.00000	0.08750
1st Quartile	0.0023	0.00885	0.0008	0.0025	0.0022		0.0003	0.0046	0.0024
Median	0.0029	0.0098	0.0008	0.0027	0.0039		0.0004	0.0046	0.0028
3rd Quartile	0.0036	0.0107	0.0009	0.0031	0.0063		0.0006	0.0046	0.0784
Count Over Guideline	2	8	0	0	8		0	0	1
% Over Guideline	13	100	0	0	40		0	0	33
Cadmium, Total (mg/L)									
Average	0.000183	0.003130	0.000070	0.000226	0.000212		0.000050	0.000230	0.004120
Count	15	8	7	15	20	0	5	1	3
Minimum	0.000005	0.00236	0.00003	0.00008	0.00004		0.00001	0.00023	0.00113
Maximum	0.00255	0.00403	0.00016	0.000476	0.00052		0.00012	0.00023	0.00989
Geometric Mean	0.000013	0.00309	0.00006	0.000197	0.000177		0.00003	0.00023	0.00247
Count <DL	10	0	0	0	0		1	0	0
Standard Deviation	0.000655	0.00058	0.00005	0.000122	0.000124		0.00006	0	0.005
1st Quartile	0.000005	0.00276	0.00004	0.00014	0.0001175		0.00001	0.00023	0.00124
Median	0.000005	0.00303	0.00005	0.0002	0.00019		0.00002	0.00023	0.00135
3rd Quartile	0.00002	0.00356	0.00008	0.000295	0.0002865		0.00011	0.00023	0.00562
Count Over Guideline	5	8	4	15	20		3	1	3
% Over Guideline	33	100	57	100	100		60	100	100
Count Over Proposed Guideline	2	8	0	11	13		2	1	3
% Over Proposed Guideline	13	100	0	73	68		40	100	100
Zinc, Total (mg/L)									
Average	0.020	0.286	0.010	0.027	0.035		0.007	0.035	0.299
Count	15	8	7	15	21	0	5	1	3
Minimum	0.0005	0.229	0.003	0.014	0.016		0.003	0.035	0.132
Maximum	0.239	0.363	0.019	0.051	0.144		0.014	0.035	0.603
Geometric Mean	0.0039	0.282	0.009	0.0247	0.0306		0.006	0.035	0.234
Count <DL	2	0	0	0	0		0	0	0
Standard Deviation	0.0607	0.052	0.006	0.0111	0.0267		0.004	0	0.264
1st Quartile	0.002	0.246	0.006	0.018	0.026		0.004	0.035	0.147
Median	0.003	0.274	0.009	0.025	0.027		0.005	0.035	0.162
3rd Quartile	0.0075	0.318	0.015	0.0315	0.037		0.007	0.035	0.383
Count Over Guideline	1	8	0	4	9		0	1	3
% Over Guideline	7	100	0	27	43		0	100	100

Table 4 Lightning Creek Total Arsenic, Cadmium and Zinc Summary Statistics, 2009 – August 2013

	KV-37	KV-39	KV-40	KV-38	KV-41	KV-81	KV-65	KV-76	KV-77
Arsenic, Total (mg/L)									
Average	0.0028	0.0106	0.0007	0.0033	0.0028	0.0034	0.0008	0.0036	0.0016
Count	39	16	12	33	60	14	49	23	16
Minimum	0.00193	0.00467	0.00031	0.0023	0.00074	0.000905	0.00035	0.00036	0.00021
Maximum	0.00596	0.0472	0.00113	0.0127	0.0229	0.0119	0.011	0.0317	0.00996
Geometric Mean	0.00272	0.00892	0.000668	0.00304	0.001901	0.002322	0.000556	0.001002	0.000526
Count <DL	0	0	0	0	0	0	0	0	0
Standard Deviation	0.00066	0.00988	0.000256	0.00186	0.003565	0.003391	0.001616	0.007991	0.00325
1st Quartile	0.00241	0.00773	0.000447	0.0026	0.00098	0.001065	0.00043	0.00045	0.000275
Median	0.0026	0.0084	0.0007	0.0027	0.0014	0.0019	0.0005	0.0006	0.0003
3rd Quartile	0.00305	0.00939	0.000902	0.00305	0.002907	0.004257	0.00055	0.00087	0.000558
Count Over Guideline	1	15	0	2	8	3	1	3	2
% Over Guideline	3	94	0	6	13	21	2	13	13
Cadmium, Total (mg/L)									
Average	0.000023	0.002730	0.000060	0.000198	0.000180	0.000232	0.000087	0.000706	0.005781
Count	39	16	12	33	60	14	49	23	16
Minimum	0.000005	0.00135	0.000034	0.000033	0.000007	0.000075	0.000005	0.00002	0.000005
Maximum	0.000102	0.00606	0.000144	0.00119	0.00113	0.000757	0.0007	0.0109	0.0916
Geometric Mean	0.0000166	0.00252	0.0000533	0.000137	0.000111	0.000179	0.0000488	0.000147	0.0000369
Count <DL	1	0	0	0	0	0	1	0	1
Standard Deviation	0.0000234	0.00123	0.0000344	0.000232	0.00021	0.000192	0.0001482	0.002255	0.0228856
1st Quartile	0.000011	0.00198	0.000036	0.000076	0.000057	0.000102	0.000026	0.000064	0.000011
Median	0.000014	0.002350	0.000039	0.000110	0.000081	0.000142	0.000045	0.000100	0.000021
3rd Quartile	0.000022	0.00287	0.0000793	0.000174	0.000219	0.000336	0.00006	0.000241	0.0000383
Count Over Guideline	11	16	5	33	59	14	29	20	5
% Over Guideline	28	100	42	100	98	100	59	87	31
Count Over Proposed Guideline	3	16	1	14	20		4	9	2
% Over Proposed Guideline	8	100	8	42	33		8	39	13
Zinc, Total (mg/L)									
Average	0.002	0.207	0.005	0.018	0.018	0.023	0.008	0.049	0.595
Count	39	16	12	33	60	14	49	23	16
Minimum	0.0005	0.0952	0.0023	0.0037	0.0025	0.0073	0.0014	0.0015	0.0004
Maximum	0.0102	0.468	0.0093	0.101	0.0801	0.0621	0.065	0.658	9.42
Geometric Mean	0.0017	0.1884	0.00404	0.01287	0.01331	0.0192	0.0043	0.01205	0.00342
Count <DL	5	0	0	0	0	0	1	0	1
Standard Deviation	0.0020	0.1017	0.0025	0.0196	0.0155	0.0150	0.0130	0.1379	2.3535
1st Quartile	0.00111	0.1482	0.00276	0.00751	0.00753	0.0124	0.0026	0.006	0.0012
Median	0.002	0.164	0.003	0.011	0.012	0.018	0.004	0.007	0.002
3rd Quartile	0.00251	0.2538	0.006	0.02	0.01905	0.0301	0.005	0.01695	0.00308
Count Over Guideline	0	16	0	4	9	4	3	4	2
% Over Guideline	0	100	0	12	15	29	6	17	13

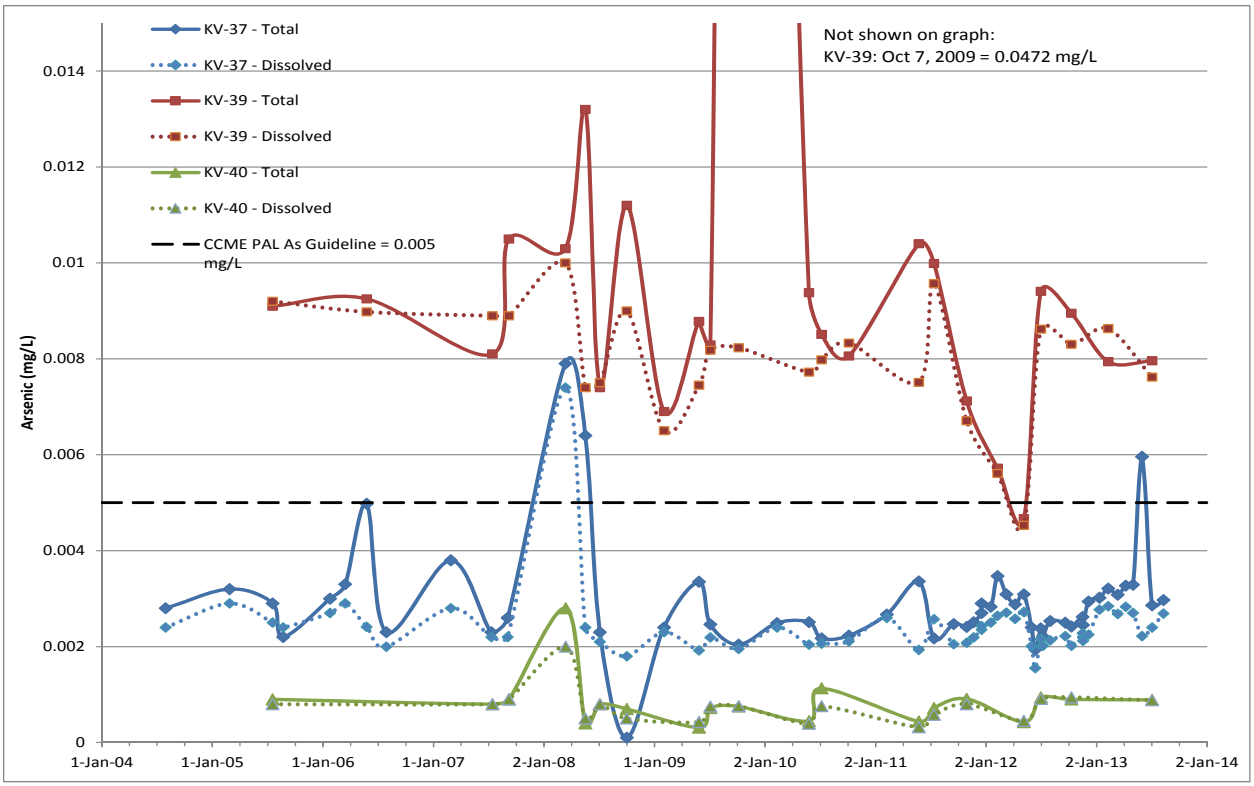

Figure 2 Upper Lightning Creek Watershed, Arsenic

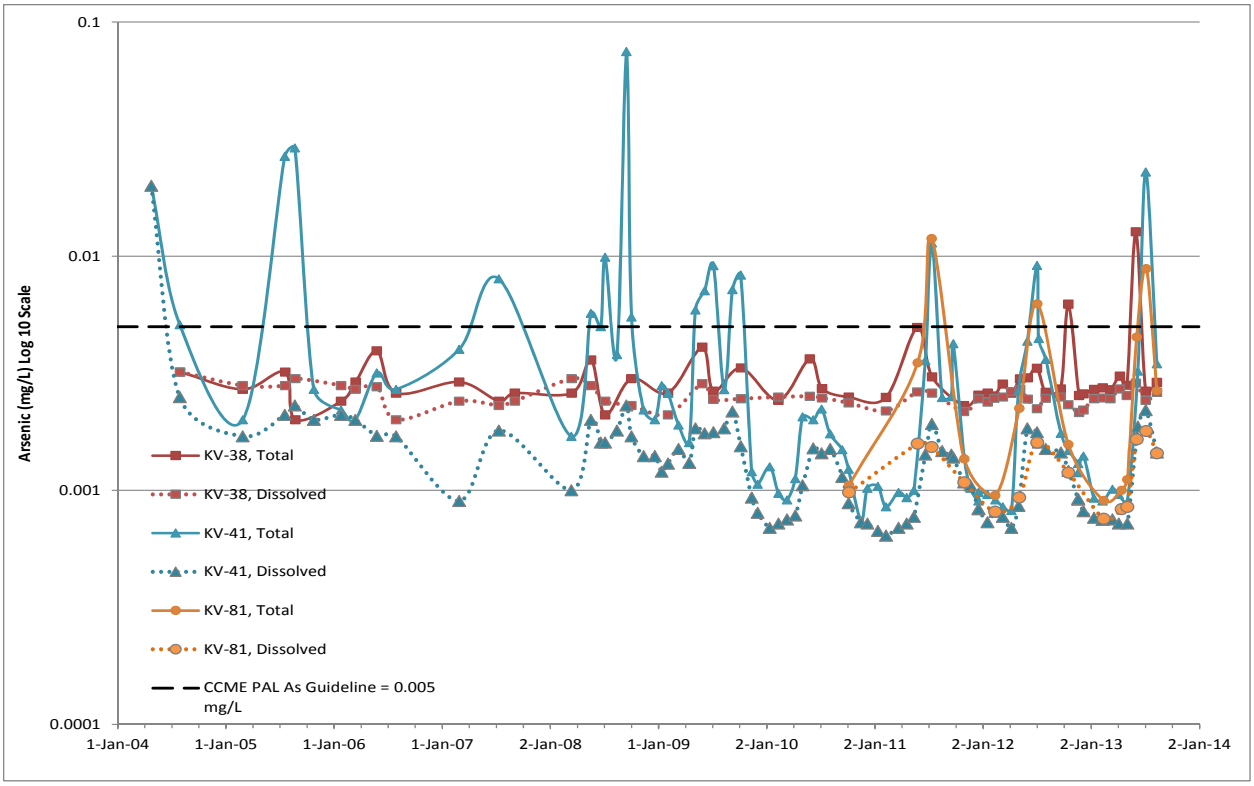

Figure 3 Lower Lightning Creek, Arsenic

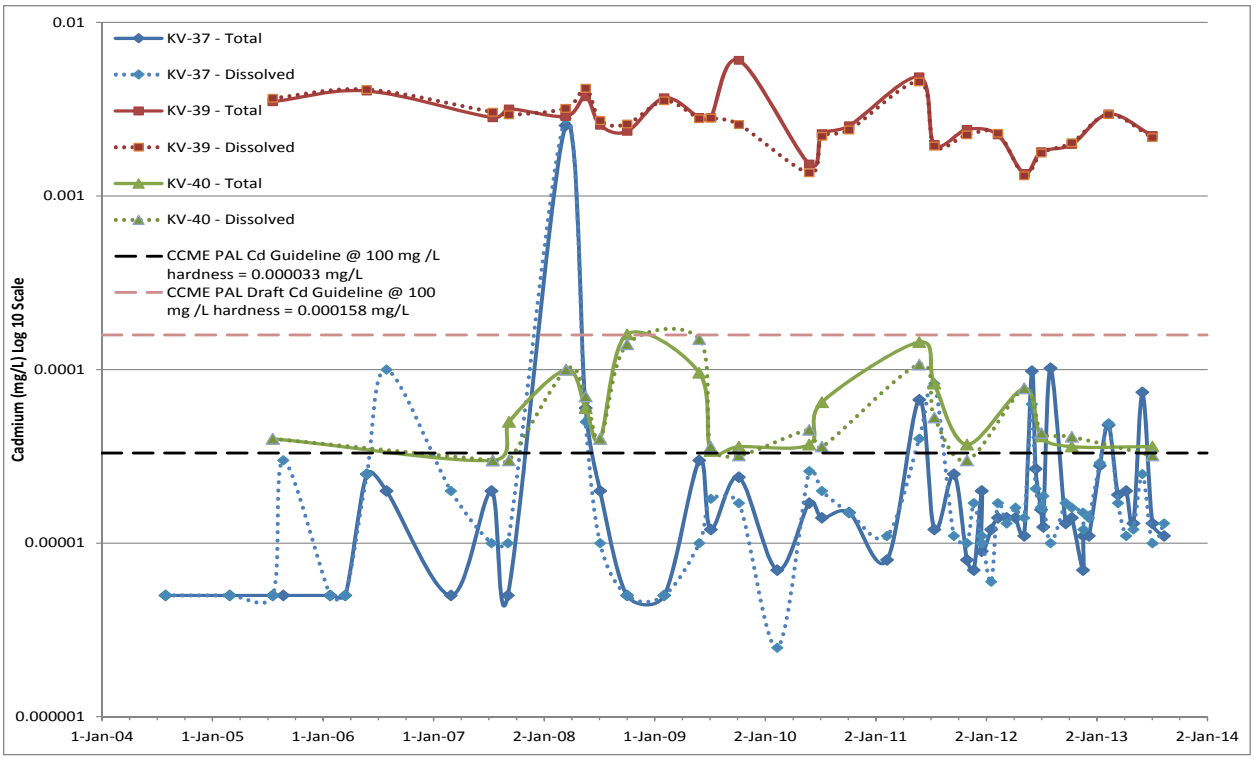

Figure 4: Upper Lightning Creek Watershed, Cadmium

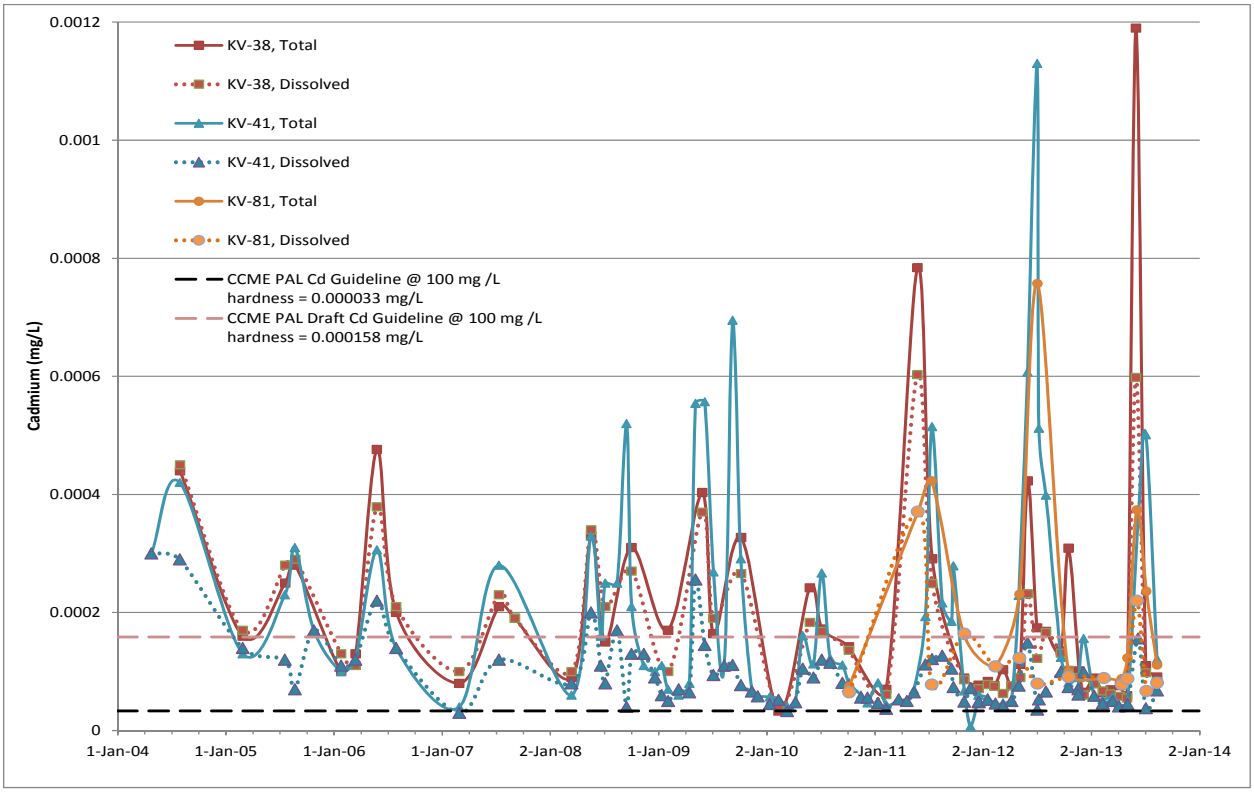

Figure 5: Lower Lightning Creek, Cadmium

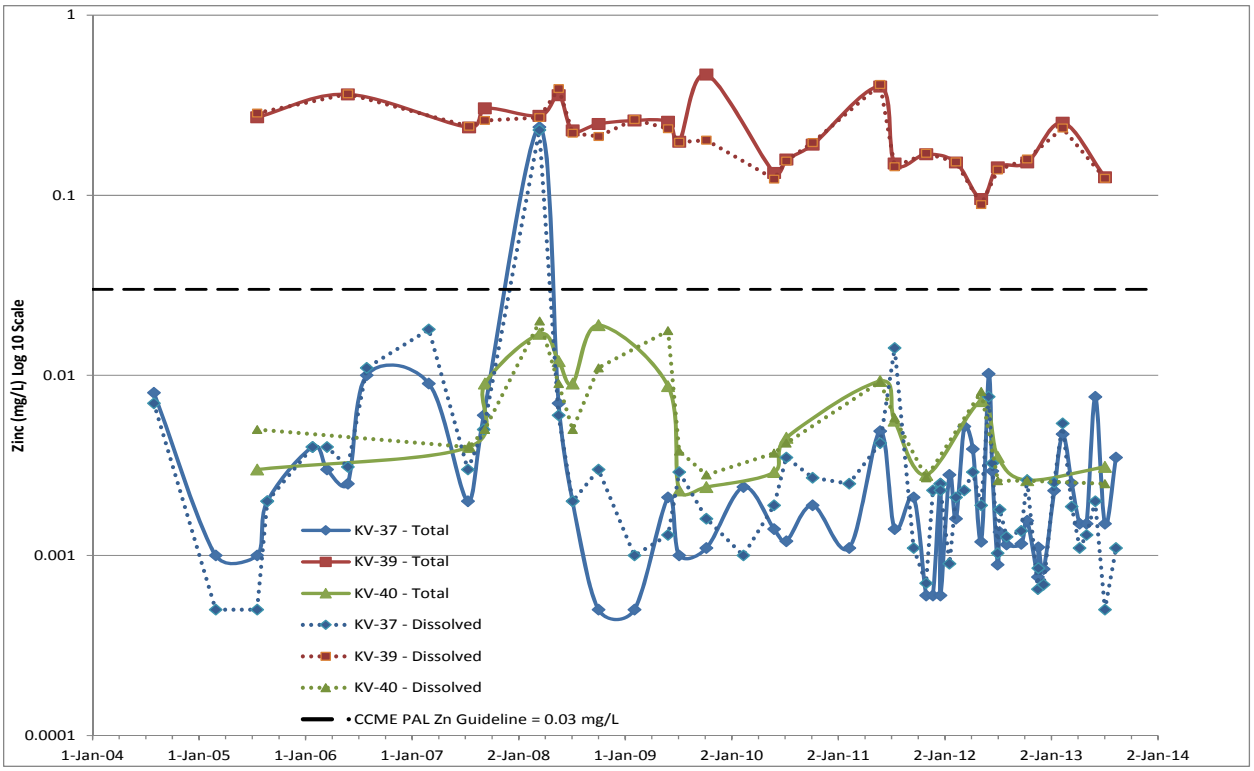

Figure 6: Upper Lightning Creek, Zinc

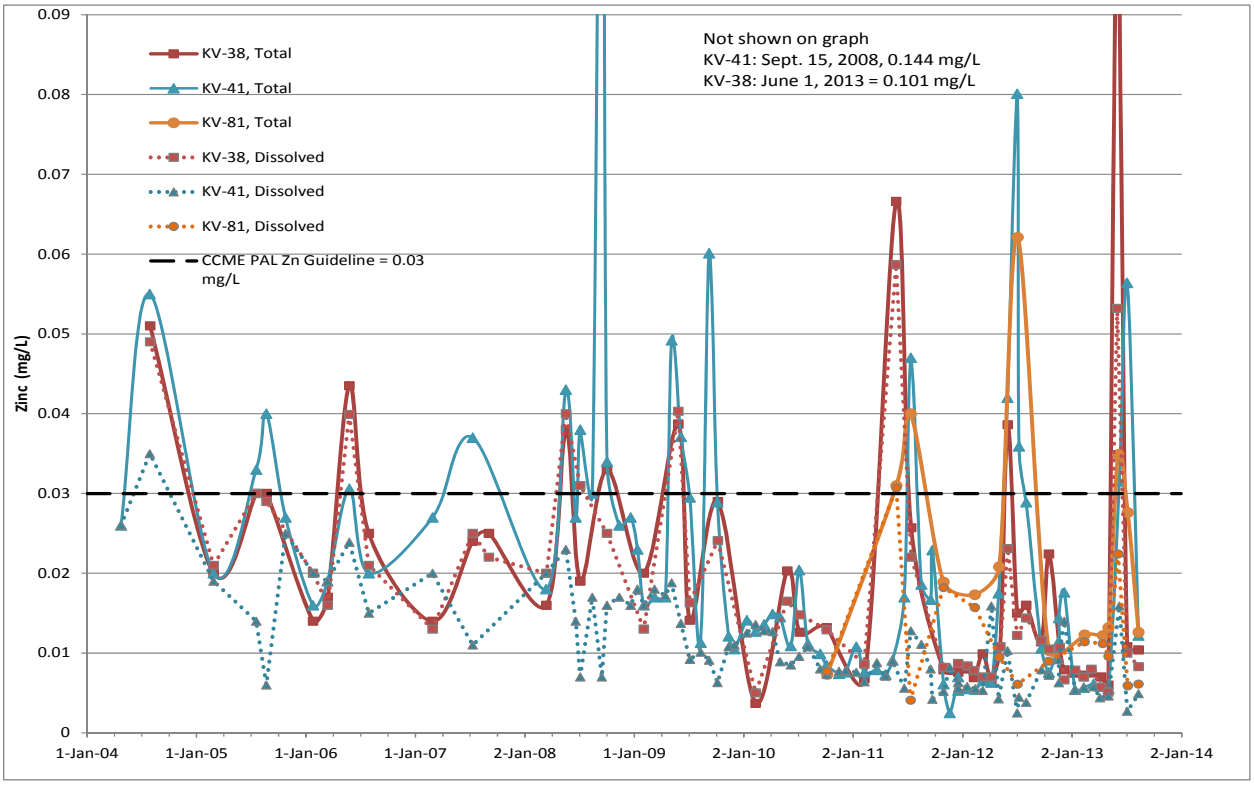

Figure 7: Lower Lightning Creek, Zinc

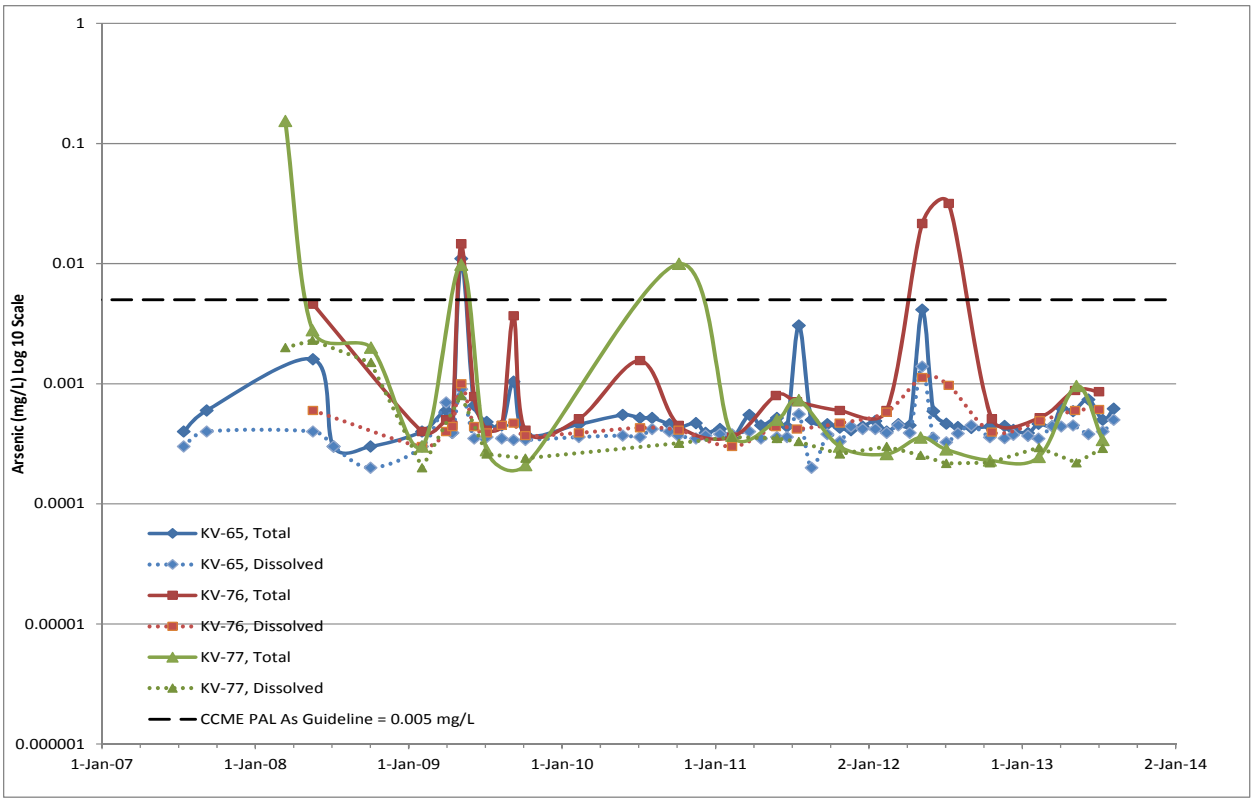

Figure 8: Thunder Gulch, Arsenic

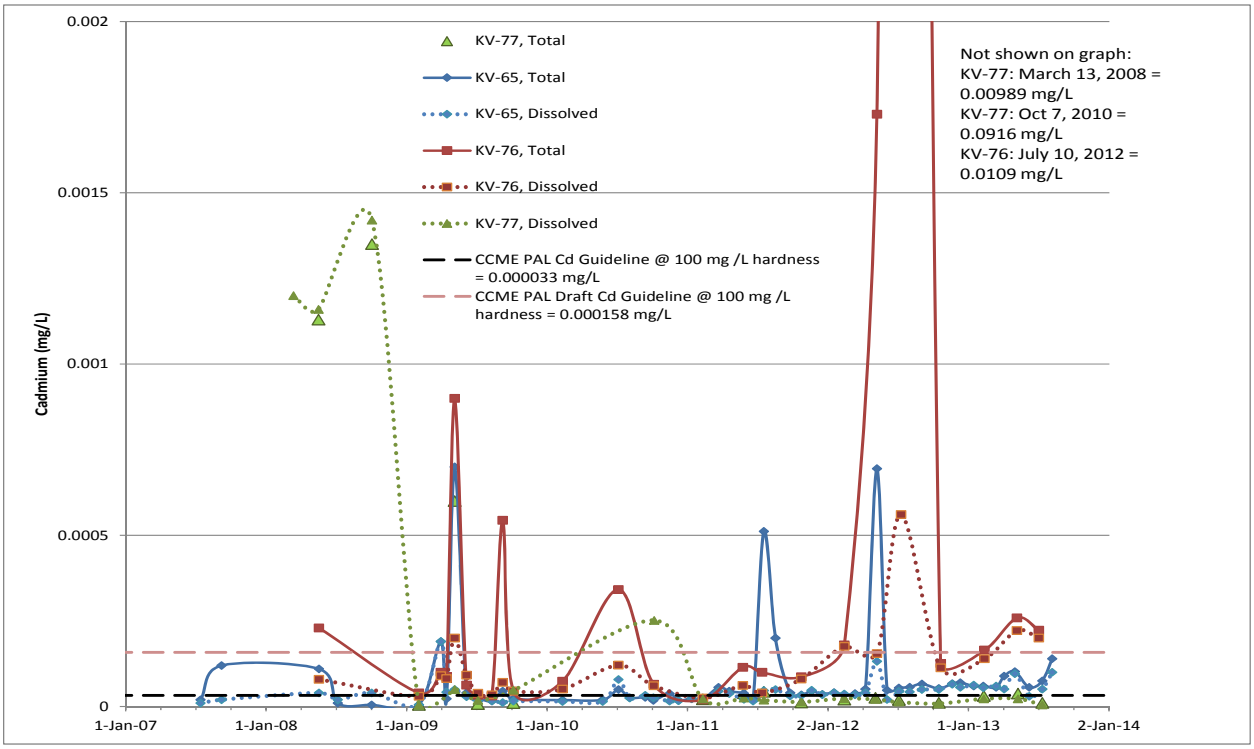

Figure 9: Thunder Gulch, Cadmium

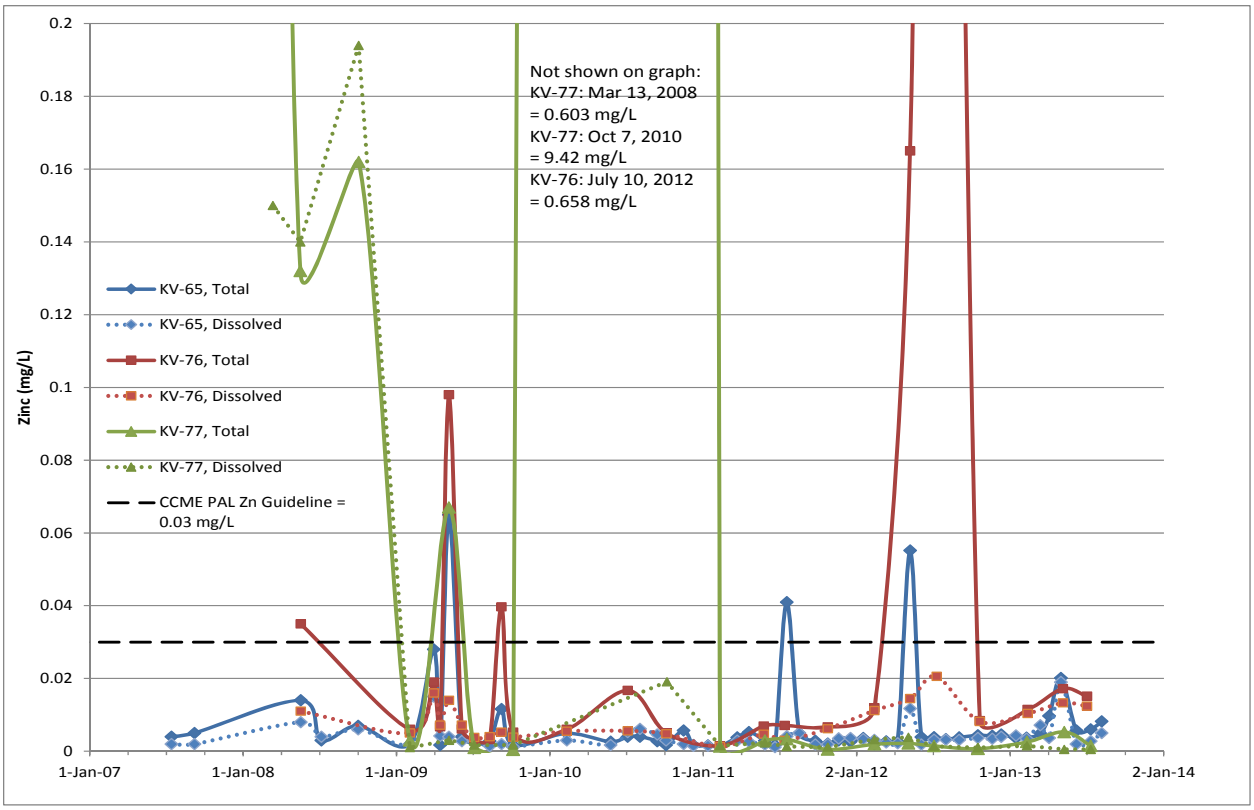

Figure 10: Thunder Gulch, Zinc

3 CHRISTAL CREEK

Christal Creek's headwater is located upstream of Christal Lake where Hinton Creek enters. Christal Creek flows north-northwest into the South McQuesten River. Water quality in the watershed has been characterized by the impacts from historic mining completed in the KHSD. Christal Creek does not meet the CCME guidelines for protection of aquatic life for many parameters. Historic mines in the Christal Creek watershed include: Formo, Galkeno 300, Galkeno 900, Mackeno, Paddy, UN, Onek 400, Lucky Queen, and Klondike Keno. Additionally, there is anecdotal information that tailings from the Mackeno mill were deposited within Christal Lake and are believed to have migrated down Christal Creek. The District Mill and Dry Stack Tailing Facility were constructed in 2010. The full set of Christal Creek data for the stations listed below is presented in Appendix A. Table 2 summarizes the parameters exceeding the CCME PAL guidelines for the periods of 2004 to 2008 and 2009 to 2012.

3.1 UPPER CHRISTAL CREEK

Upper Christal Creek includes KV-48, KV-49, KV-50 and KV-51 prior to the entrance to Christal Lake. The outflow of Christal Lake is monitored at KV-6. KV-48 is on upper Hinton Creek upstream of Calumet Drive and KV-49 is on lower Hinton Creek upstream of Christal Creek. KV-50 is on Christal Creek upstream of Hinton Creek and KV-51 is on Christal Creek downstream of Hinton Creek. Statistical summaries for monitoring results of total arsenic, cadmium and zinc at stations KV-48, KV-49, KV-50, KV-51 and KV-6 are presented in Table 5 Christal Creek Watershed Total Arsenic Cadmium and Zinc Summary Statistics, 2004 - 2008 and

Table 6 Christal Creek Watershed Total Arsenic, Cadmium and Zinc Summary Statistics, 2009 – August 2013. The total and dissolved arsenic, cadmium and zinc concentrations for upper Christal Creek between 2004 and August 2013 are plotted on Figures 11, 13 and 15 respectively.

KV-48 on upper Hinton Creek reports a significant elevation in total cadmium and zinc since 2008, while little change has been observed in total arsenic. Median total arsenic at KV-48 from 2004 to 2008 is 0.0004 mg/L while from 2009 to August 2013 it is 0.0005 mg/L. The median cadmium and zinc is over an order of magnitude greater from 2009 to August 2013 than it was in 2004 to 2008. A similar but much less extreme trend is observed downstream on Hinton Creek at KV-49 where median zinc and cadmium increase by about 2 and 3 times, respectively, while little change was observed in total arsenic concentrations. These trends can be attributed to the Galkeno 300 discharge point being changed and rerouted into the Calumet Drive ditch line before reporting to Hinton Creek. It is important to note that there are only three data points for KV-48 and four data points for KV-49 for the 2004 to 2008 period, all more recent than July 2007. KV-50 and KV-51 upstream and downstream of Hinton Creek prior to the entrance to Christal Lake show very similar median arsenic, cadmium and zinc concentrations; though KV-51 shows somewhat lower median concentrations. KV-50 and KV-51 report an elevation of median total arsenic and zinc and a very slight decrease in total cadmium since 2008. The average median total arsenic for KV-50 and KV-51 increased about 4.5 times from 0.0057 mg/L to 0.0255 mg/L. The average median total zinc for KV-50 and KV-51 increased about 1.5 times from 0.124 mg/L to 0.194 mg/L, while average median total cadmium slightly decreased by about 10% from 0.000365 mg/L to 0.000331 mg/L.

KV-6, monitoring the outflow from Christal Lake, shows a slight increase in total arsenic to August 2013 with a median concentration of 0.005 mg/L, which is equal to the CCME PAL guideline, as compared to the 2004 to 2008 results that had a median concentration of 0.004 mg/L (average total arsenic has remained the same). A decrease in median total cadmium and zinc is reported at KV-6 as observed in Figures 13 and 15. The median total cadmium and zinc concentrations decrease by about 40% since 2008 from 0.00173 mg/L to 0.00105 mg/L and 0.229 mg/L to 0.144 mg/L, respectively. As a result of Care and Maintenance activities taken over by ERDC in 2007, treated discharge from Galkeno 900 and Galkeno 300 flows into Christal Lake, decreasing the overall concentrations of cadmium and zinc, improving water quality. The District Mill and associated Dry Stack Tailings Facility have not discharged any effluent since their construction and therefore no additional load has been attributed in Christal Creek from these facilities. The Christal Creek mass load models presented in the Water Licence Application for the Bellekeno Mine predicted maximum concentrations for total cadmium and zinc of 0.00332 mg/L and 0.320 mg/L, respectively. The total cadmium and zinc concentrations from 2010 to August 2013 have all been below the predicted values with the exception of the July 2010 and May 2012 sampling events as shown on Figures 13 and 15.

Hinton Creek (KV-48 and KV-49) shows periodic exceedances of other CCME PAL guidelines (aluminum, copper, iron, lead and silver. Christal Creek above Christal Lake (KV-50 and KV-51) generally shows more frequent exceedances of these parameters including chromium. KV-6 below Christal Lake also shows periodic exceedances of the selenium guideline, while aluminum, copper and iron exceedances have decreased from above Christal Lake.

3.2 LOWER CHRISTAL CREEK

The water quality stations monitored in Lower Christal Creek are KV-7 at Hanson road and KV-8 at the mouth. Statistical summaries for total zinc and cadmium monitoring results at stations KV-7 and KV-8 are presented in Table 5 Christal Creek Watershed Total Arsenic Cadmium and Zinc Summary Statistics, 2004 - 2008 and Table 6. KV-7 and KV-8 both demonstrate little change in total arsenic concentrations; however, there is a decreasing trend for total cadmium and zinc as shown in Figures 12, 14 and 16. Median total cadmium has decreased by 50% at KV-7 and 38% at KV-8, while median total zinc has decreased by about 60% at KV-7 and KV-8. Treated discharge entering the Christal Creek watershed has contributed to a decreased cadmium and zinc loading. The trends in the Lower Christal Creek stations (KV-7 and KV-8) are similar to those observed at the outlet of Christal Lake (KV-6).

In Lower Christal Creek CCME PAL exceedances of aluminum seem fairly consistent down to the mouth at KV-8 at about 11% of the time. Exceedances of copper iron, lead, selenium and silver increase slightly by KV-8.

Table 5 Christal Creek Watershed Total Arsenic Cadmium and Zinc Summary Statistics, 2004 - 2008

	KV-6	KV-7	KV-8	KV-48	KV-49	KV-50	KV-51
Arsenic, Total (mg/L)							
Average	0.0094	0.0034	0.0030	0.0006	0.0004	0.0065	0.0062
Count	48	51	44	3	4	5	5
Minimum	0.0016	0.001	0.001	0.0004	0.0003	0.0016	0.0019
Maximum	0.15	0.015	0.0114	0.001	0.0006	0.0136	0.0112
Geometric Mean	0.0049	0.0027	0.0027	0.0005	0.0004	0.0053	0.0053
Count <DL	0	0	0	0	0	0	0
Standard Deviation	0.0222	0.0030	0.0017	0.0003	0.0001	0.0044	0.0034
1st Quartile	0.0027	0.0019	0.0021	0.0004	0.0004	0.0052	0.0051
Median	0.0040	0.0022	0.0027	0.0004	0.0004	0.0057	0.0057
3rd Quartile	0.0063	0.0033	0.0032	0.0007	0.0004	0.0065	0.0070
Count Over Guideline	19	8	3	0	0	4	4
% Over Guideline	40	16	7	0	0	80	80
Cadmium, Total (mg/L)							
Average	0.00249	0.00159	0.00176	0.00021	0.00014	0.00037	0.00035
Count	52	55	48	3	4	5	5
Minimum	0.00008	0.0003	0.0006	0.00016	0.0001	0.00024	0.00025
Maximum	0.0188	0.0089	0.0077	0.00025	0.0002	0.00052	0.00045
Geometric Mean	0.0017735	0.0012041	0.0014557	0.0002	0.00013	0.00035	0.00035
Count <DL	0	0	0	0	0	0	0
Standard Deviation	0.0028955	0.0014806	0.0013845	0.00005	0.00005	0.00012	0.00008
1st Quartile	0.0011525	0.00068	0.0010075	0.00018	0.00011	0.00026	0.00032
Median	0.00175	0.00117	0.00131	0.00021	0.00013	0.00038	0.00035
3rd Quartile	0.00324	0.001555	0.0018275	0.00023	0.00016	0.00043	0.0004
Count Over Guideline	51	55	48	3	4	5	5
% Over Guideline	98	100	100	100	100	100	100
Count Over Proposed Guideline	51	54	48	3	4	3	3
% Over Proposed Guideline	98	98	100	100	100	60	60
Zinc, Total (mg/L)							
Average	0.287	0.430	0.387	0.016	0.015	0.116	0.112
Count	53	56	48	3	4	5	5
Minimum	0.015	0.077	0.102	0.011	0.01	0.061	0.06
Maximum	1.01	2.56	1.91	0.018	0.02	0.148	0.154
Geometric Mean	0.238	0.272	0.301	0.015	0.015	0.11	0.107
Count <DL	0	0	0	0	0	0	0
Standard Deviation	0.184	0.57	0.383	0.004	0.004	0.037	0.036
1st Quartile	0.164	0.159	0.2	0.014	0.014	0.094	0.099
Median	0.234	0.216	0.273	0.018	0.015	0.133	0.114
3rd Quartile	0.350	0.360	0.386	0.018	0.017	0.143	0.133
Count Over Guideline	52	56	48	0	0	5	5
% Over Guideline	98	100	100	0	0	100	100

Table 6 Christal Creek Watershed Total Arsenic, Cadmium and Zinc Summary Statistics, 2009 – August 2013

	KV-6	KV-7	KV-8	KV-48	KV-49	KV-50	KV-51
Arsenic, Total (mg/L)							
Average	0.00638	0.00304	0.00318	0.00053	0.000634	0.02953	0.02723
Count	52	57	47	11	13	28	14
Minimum	0.0005	0.00152	0.00158	0.0002	0.000153	0.00607	0.00513
Maximum	0.0513	0.0179	0.00822	0.0012	0.00275	0.096	0.093
Geometric Mean	0.00509	0.00264	0.00292	0.00045	0.00043	0.02621	0.02117
Count <DL	0	0	0	2	0	0	0
Standard Deviation	0.00675	0.00251	0.00157	0.00031	0.000722	0.01624	0.02178
1st Quartile	0.00384	0.00204	0.00211	0.0003	0.00024	0.022	0.01788
Median	0.00516	0.0024	0.0028	0.0005	0.000407	0.0285	0.0224
3rd Quartile	0.00705	0.00305	0.00345	0.0006	0.00065	0.03207	0.02942
Count Over Guideline	28	3	4	0	0	28	14
% Over Guideline	54	5	9	0	0	100	100
Cadmium, Total (mg/L)							
Average	0.001321	0.000814	0.001011	0.00672	0.000445	0.000555	0.000668
Count	52	57	47	11	13	28	14
Minimum	0.000114	0.000298	0.000305	0.0004	0.000098	0.000237	0.000191
Maximum	0.00779	0.00411	0.00292	0.0157	0.000774	0.00384	0.00385
Geometric Mean	0.001078	0.000664	0.000884	0.00494	0.000377	0.000417	0.000427
Count <DL	0	0	0	0	0	0	0
Standard Deviation	0.001111	0.000722	0.000582	0.00442	0.000229	0.000697	0.000961
1st Quartile	0.000802	0.000464	0.000664	0.00367	0.000304	0.000279	0.000257
Median	0.00105	0.000591	0.000818	0.0069	0.000419	0.000352	0.000309
3rd Quartile	0.001452	0.000833	0.001155	0.00781	0.000704	0.000443	0.000473
Count Over Guideline	52	57	47	11	13	28	14
% Over Guideline	100	100	100	100	100	100	100
Count Over Proposed Guideline	50	49	45	11	7	8	5
% Over Proposed Guideline	96	86	96	100	54	29	36
Zinc, Total (mg/L)							
Average	0.1591	0.1058	0.1391	0.1451	0.04	0.2016	0.1948
Count	52	57	47	11	13	28	14
Minimum	0.0107	0.0526	0.0473	0.03	0.0145	0.078	0.0547
Maximum	0.452	0.37	0.31	0.424	0.0693	0.669	0.551
Geometric Mean	0.1385	0.0955	0.1288	0.1197	0.0361	0.1858	0.166
Count <DL	0	0	0	0	0	0	0
Standard Deviation	0.0782	0.0597	0.0586	0.1026	0.018	0.103	0.1211
1st Quartile	0.1065	0.0678	0.1015	0.0933	0.0237	0.1665	0.1358
Median	0.1435	0.0876	0.119	0.145	0.0348	0.1985	0.1895
3rd Quartile	0.1903	0.115	0.1595	0.1615	0.0515	0.2087	0.2028
Count Over Guideline	50	57	47	10	8	28	14
% Over Guideline	96	100	100	91	62	100	100

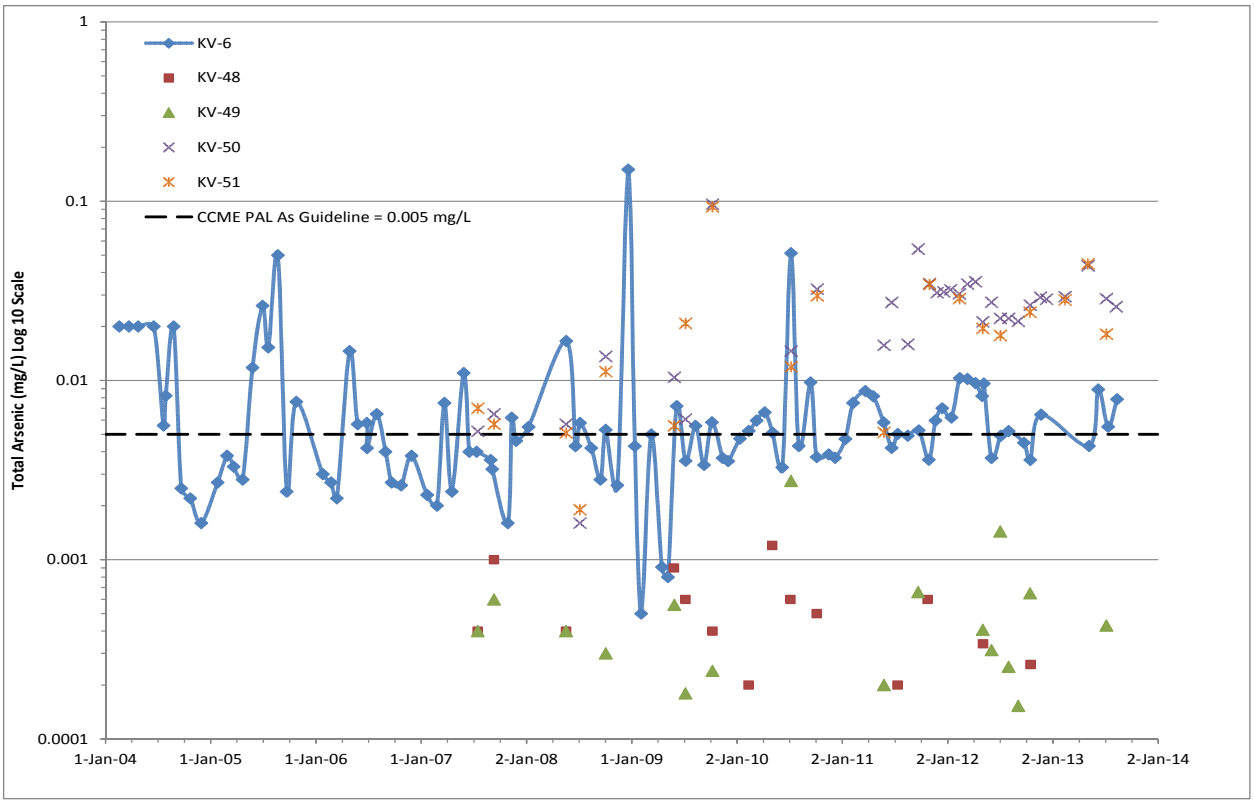

Figure 11 Upper Christal Creek Watershed, Total Arsenic

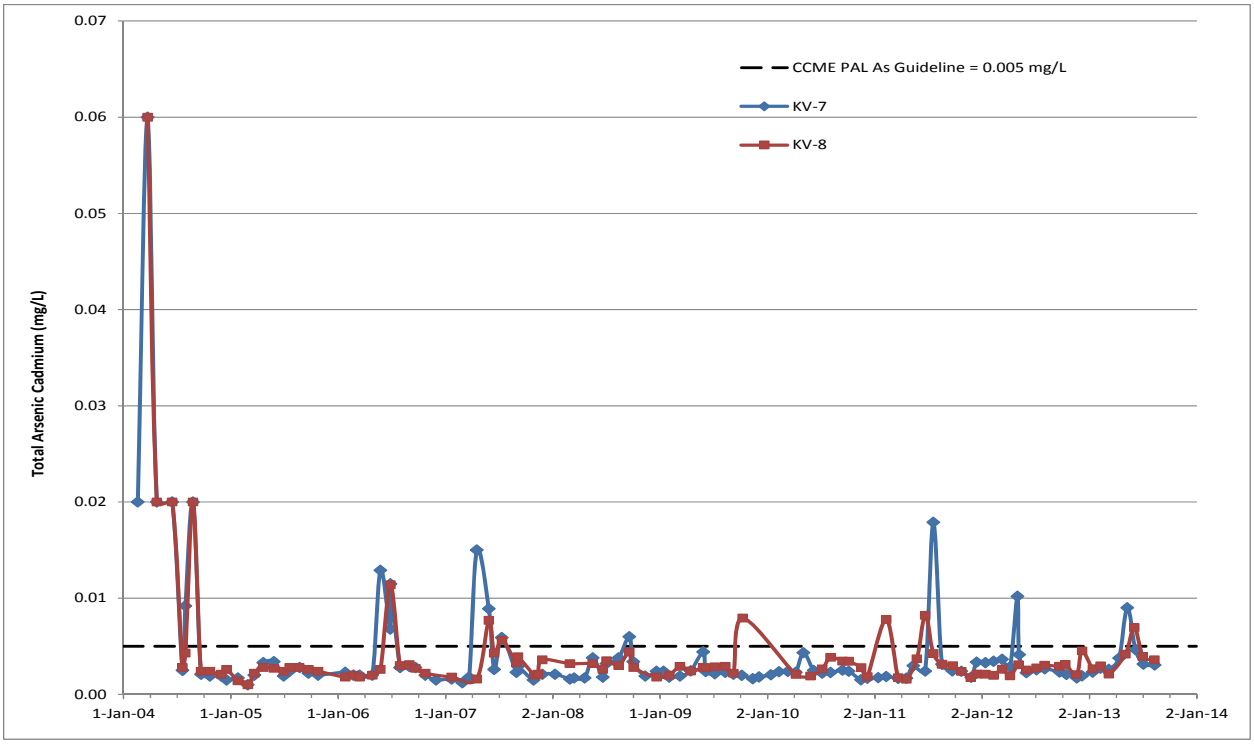

Figure 12 Lower Christal Creek Watershed, Total Arsenic

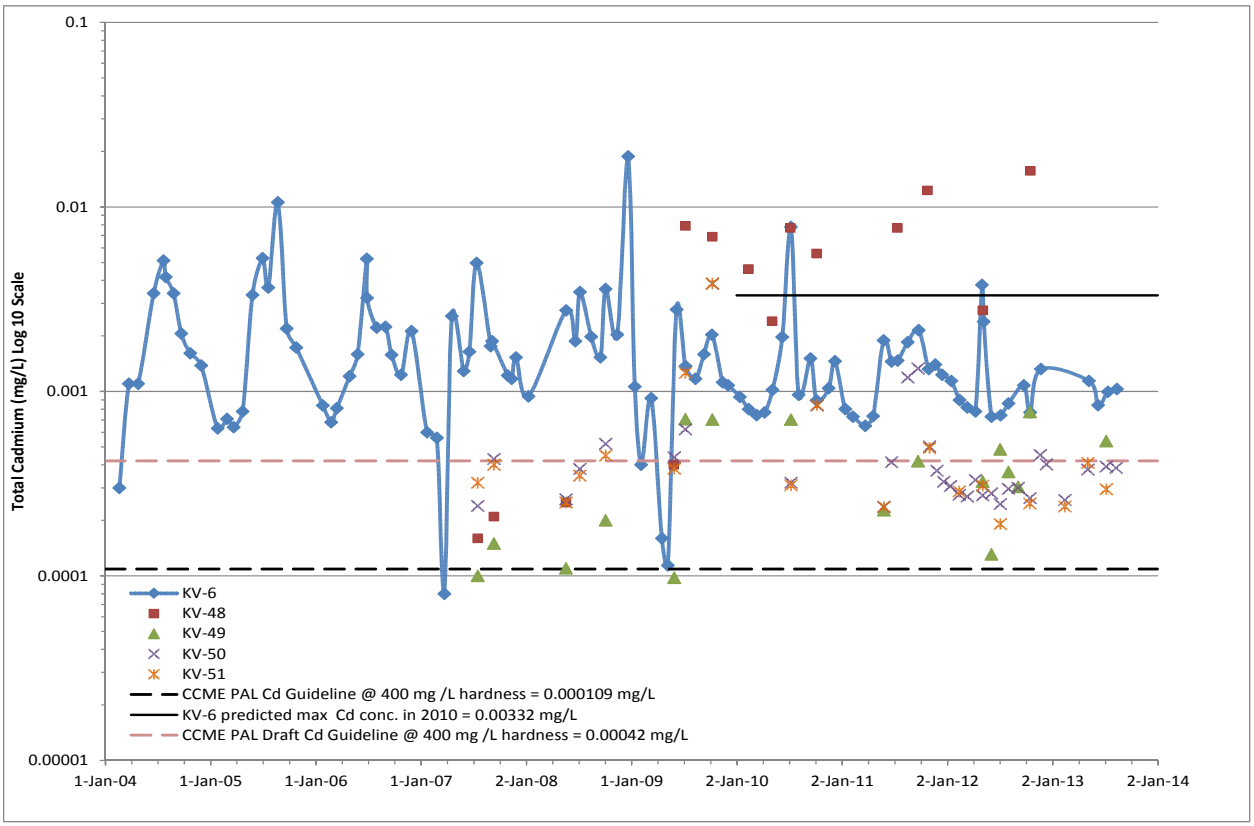

Figure 13 Upper Christal Creek Watershed, Total Cadmium

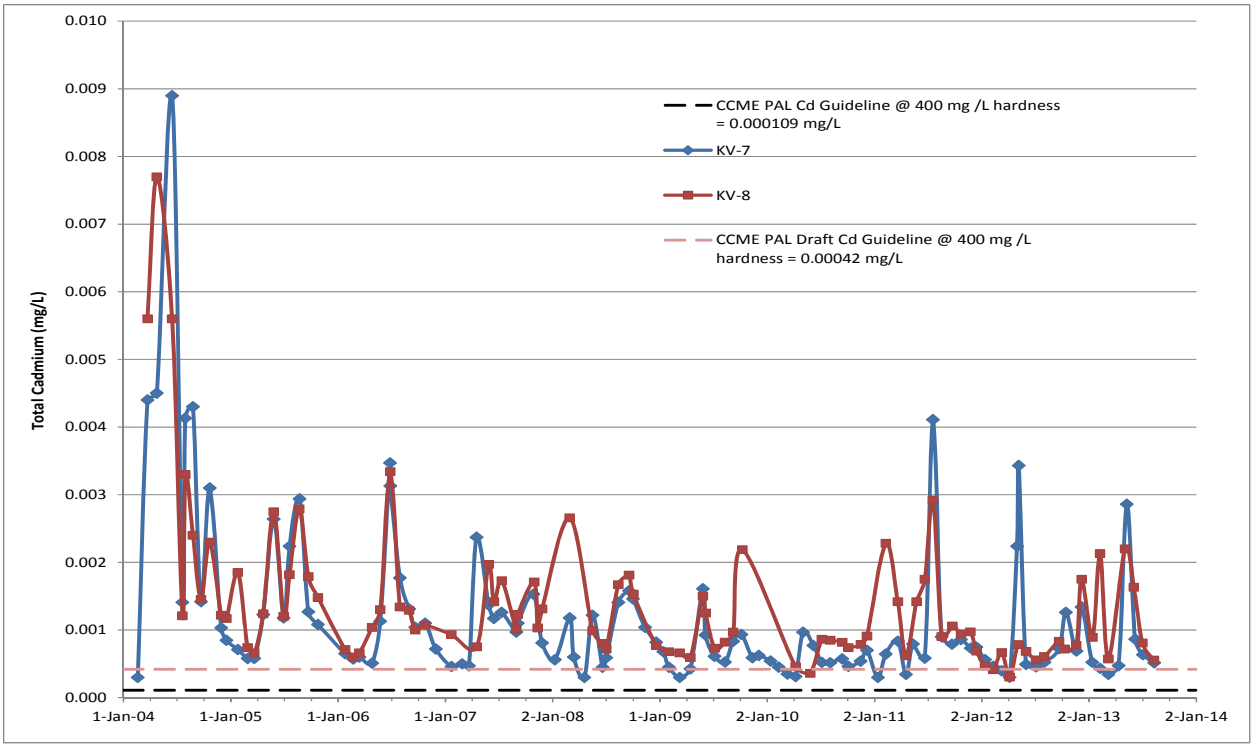

Figure 14 Lower Christal Creek Watershed, Total Cadmium

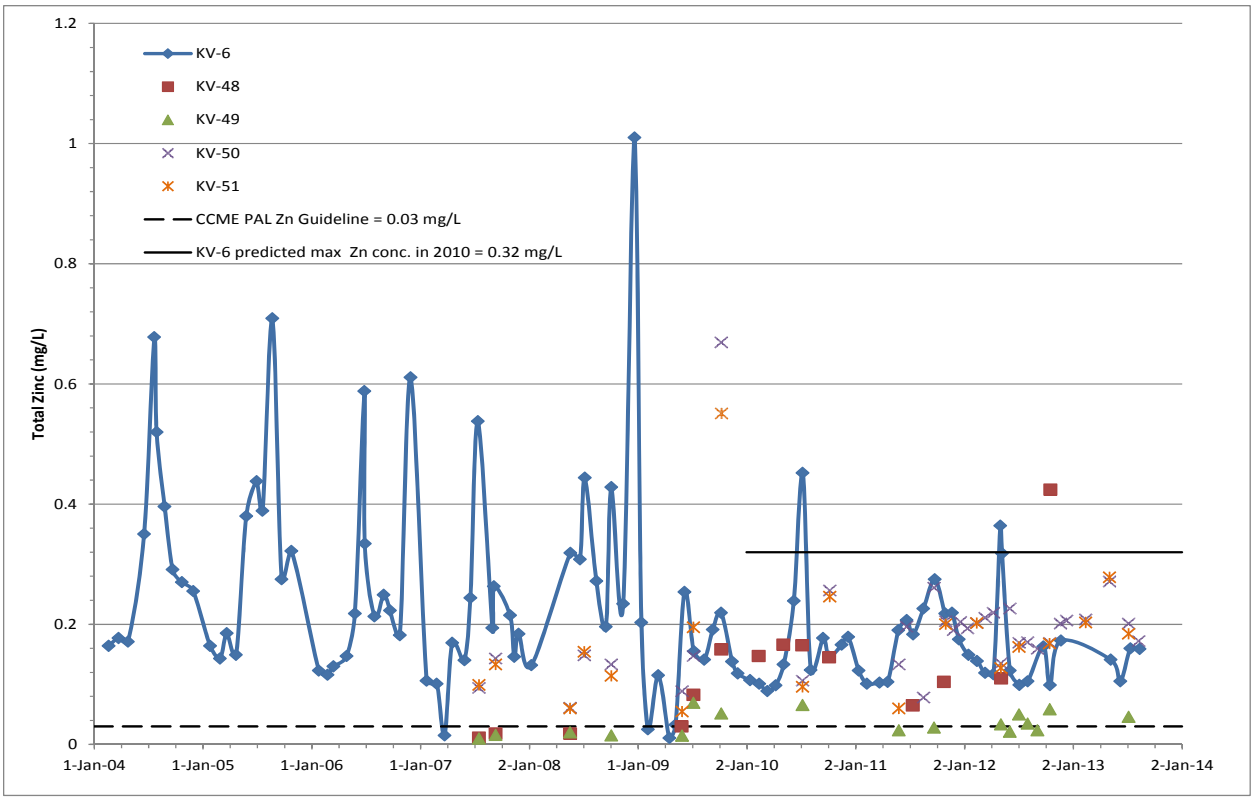

Figure 15 Upper Christal Creek Watershed, Total Zinc

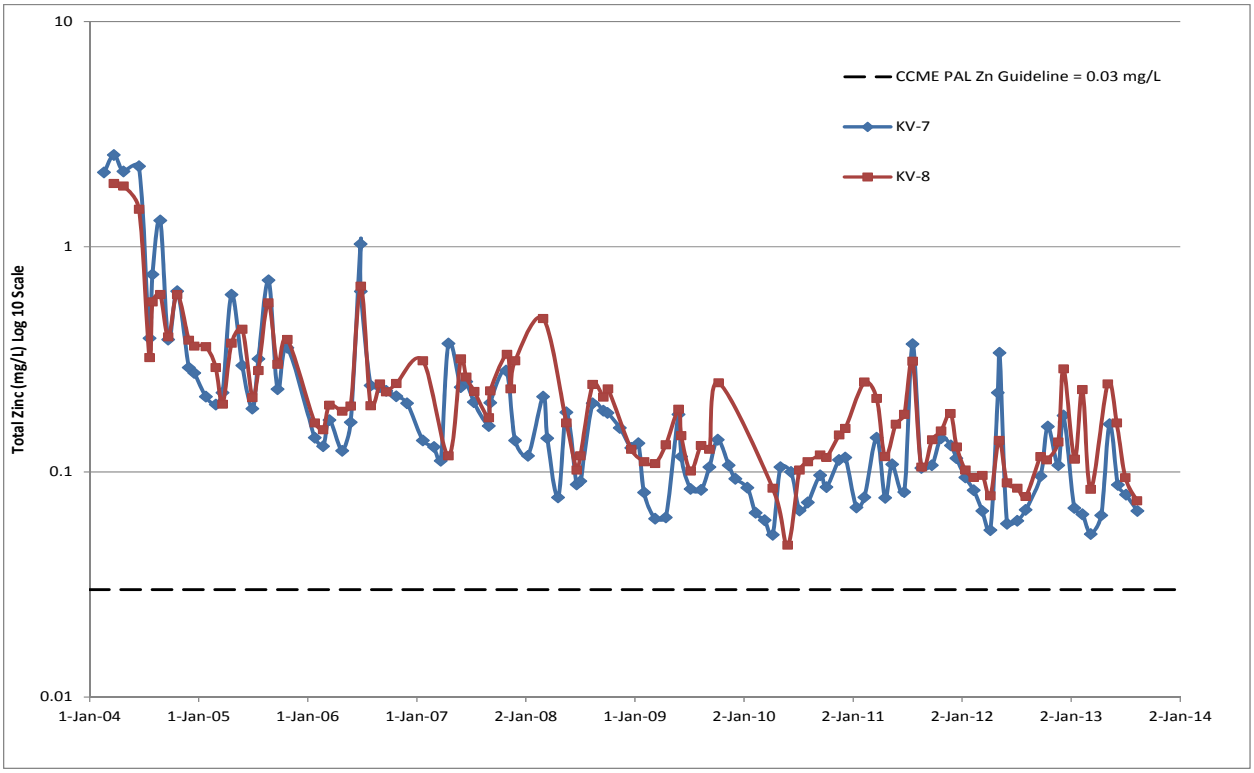

Figure 16 Lower Christal Creek Watershed, Total Zinc

4 SOUTH MCQUESTEN RIVER

The South McQuesten River is the downstream receptor for Christal Creek, Flat Creek and No Cash Creek. There are two stations (KV-1, KV-2) currently monitored in the South McQuesten River watershed as part of Type A Water License QZ09-092. Station KV-1 is located on the South McQuesten River upstream of the confluence with Christal Creek, while KV-2 is located on the South McQuesten River near the pump house downstream of Christal Creek. The full set of water quality data is presented in Appendix A. Table 2 summarizes the parameters exceeding the CCME PAL guideline for the periods of 2004 to 2008 and 2009 to 2012.

The South McQuesten River is monitored at a number of locations downstream of KV-2 including: KV-3, KV-4, KV-5 and KV-15. Station KV-3 is located upstream of the confluence with Flat Creek while KV-4 is located downstream of the confluence with Flat Creek. KV-5 is located 9 km downstream from the confluence of Flat Creek on the South McQuesten River and station KV-15 is the far field receiving environment site on the South McQuesten River at the bridge below Haggart Creek.

Prior to 2006, cadmium and zinc concentrations in the South McQuesten River downstream of the site were typically less than Canadian Water Quality Guidelines (Minnow, 2008). However, during 2007 a notable increase in the concentrations of metals including cadmium and zinc had occurred upstream on the South McQuesten River at KV-1. Between 2006 and 2009 there has been an increasing trend of cadmium and zinc concentrations both upstream (KV-1) and downstream (KV-4 and KV-5) in the South McQuesten River with levels above CWQGs. Further, results indicate that a source upstream of KV-1 was responsible for the increase in concentrations. During 2010, it was identified that Cache Creek, located at the outflow of McQuesten Lake is a major source of loadings to the South McQuesten River (Interralogic, 2011; EDI 2005). The concentrations and rate of increase at the downstream stations are equal to or lower than those upstream, indicating that the KHSD is not causing measurable increases in cadmium and zinc concentrations downstream at KV-4 and KV-5 (Minnow, 2010). Similarly, the KHSD does not appear to be causing a measureable increase in concentrations along the South McQuesten River at intermediate sites KV-2 and KV-3. (Access Consulting, 2011)

Recent analysis of the data with August 2013 inclusive shows that concentrations of zinc and cadmium are increasing at a similar rate downstream (KV-5) as upstream (KV-1). The data indicates that concentrations of these contaminants show similar trends at all stations along the South McQuesten River. Total arsenic also shows similar trends in concentration between the South McQuesten stations although KV-5 typically has the highest concentrations. For cadmium and zinc, all sites on the South McQuesten River are significantly lower than the results seen at KV-1, and that there is a significant trend in decreasing zinc and cadmium concentrations as one moves downstream. The lowest concentrations of arsenic, cadmium and zinc are found at the far field receiving environment station KV-15.

A summary of water quality for the South McQuesten stations KV-1 and KV-2 is provided in Table 7: South McQuesten River Total Arsenic, Cadmium and Zinc Summary Statistics, 2004 – 2008, and 2009 – 2012. Graphs displaying sampling data for total arsenic, cadmium and zinc on the upper South McQuesten River are provided as Figure 17, 18 and 19, respectively. At KV-1, exceedance of the CCME PAL guideline for total aluminum has increased from 67% in 2004 to 2008 to 92% in 2009 to August 2013 while the total zinc exceedance rate has increased from 69% to 98%. Total cadmium, copper and iron CCME PAL guideline

exceedances are slightly higher increasing from 92% to 98%, 52% to 57% and 31% to 49% respectively. At KV-2 total aluminum exceedance of between the two timeframes has increased from 44% to 74% of the time. Total cadmium exceedance of the CCME PAL guideline at KV-2 in 2004 to 2008 was 100% and in 2009 to August 2013 it was 97%. Total copper exceedances at KV-2 also remains similar for the two timeframes, previously 24% and more recently 29%, while total iron has increased from 22% to 32%. Total lead exceedances of the CCME PAL guideline at KV-2 remained similar at 18% and 21% while total zinc increased from 85% to 94% exceedance. Other parameters have been observed to exceed the CCME PAL guidelines at KV-1 and KV-2 but on an infrequent basis.

Table 7: South McQuesten River Total Arsenic, Cadmium and Zinc Summary Statistics, 2004 – 2008 and 2009 - 2012

	KV-1	KV-2	KV-1	KV-2
	2004-2008		2009-2012	
Arsenic, Total (mg/L)				
Average	0.0016	0.0019	0.0020	0.0025
Count	48	28	47	34
Minimum	0.0009	0.001	0.00072	0.00091
Maximum	0.0033	0.003	0.0089	0.00803
Geometric Mean	0.0015	0.0018	0.0015	0.0021
Count <DL	0	0	0	0
Standard Deviation	0.00053	0.00042	0.00194	0.00177
1st Quartile	0.0012	0.0016	0.001005	0.00144
Median	0.0015	0.0018	0.0014	0.0019
3rd Quartile	0.0019	0.002	0.001845	0.00241
Count Over Guideline	0	0	4	3
% Over Guideline	0	0	9	9
Cadmium, Total (mg/L)				
Average	0.00049	0.00035	0.00087	0.00064
Count	50	29	47	34
Minimum	0.00004	0.00009	0.000003	0.000014
Maximum	0.0033	0.00144	0.00216	0.00135
Geometric Mean	0.00030	0.00025	0.00071	0.00054
Count <DL	0	0	1	0
Standard Deviation	0.0005286	0.0003672	0.000424	0.000268
1st Quartile	0.00012	0.00014	0.000632	0.000525
Median	0.00036	0.00020	0.00080	0.00059
3rd Quartile	0.0007	0.00034	0.001001	0.000829
Count Over Guideline	46	29	46	33
% Over Guideline	92	100	98	97
Count Over Proposed Guideline	28	10	45	30
% Over Proposed Guideline	56	34	96	88
Zinc, Total (mg/L)				
Average	0.082	0.071	0.144	0.098
Count	53	33	47	34
Minimum	0.013	0.026	0.0013	0.0014
Maximum	0.247	0.325	0.393	0.175
Geometric Mean	0.06	0.056	0.122	0.081
Count <DL	0	0	0	0
Standard Deviation	0.061	0.065	0.072	0.038
1st Quartile	0.03	0.037	0.1055	0.0821
Median	0.064	0.043	0.134	0.097
3rd Quartile	0.129	0.068	0.1585	0.1177
Count Over Guideline	37	28	46	32
% Over Guideline	70	85	98	94

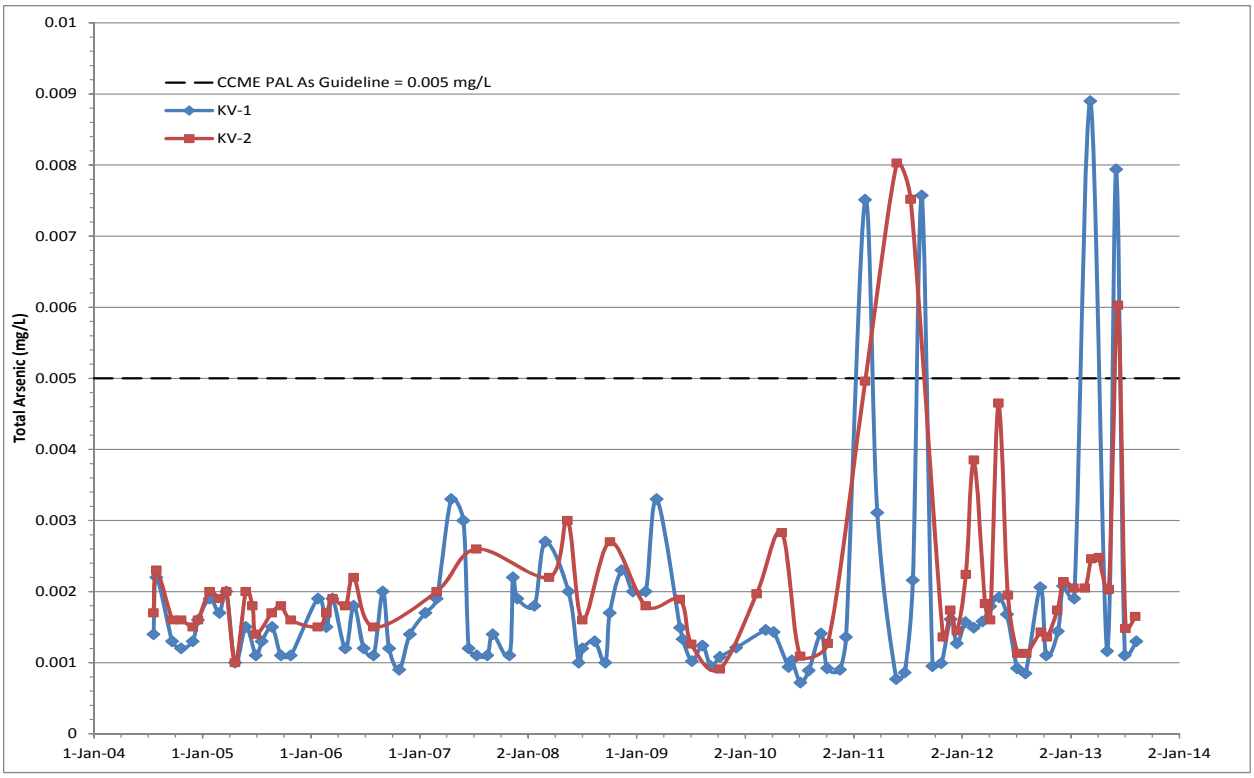

Figure 17: Upper South McQuesten River, Total Arsenic

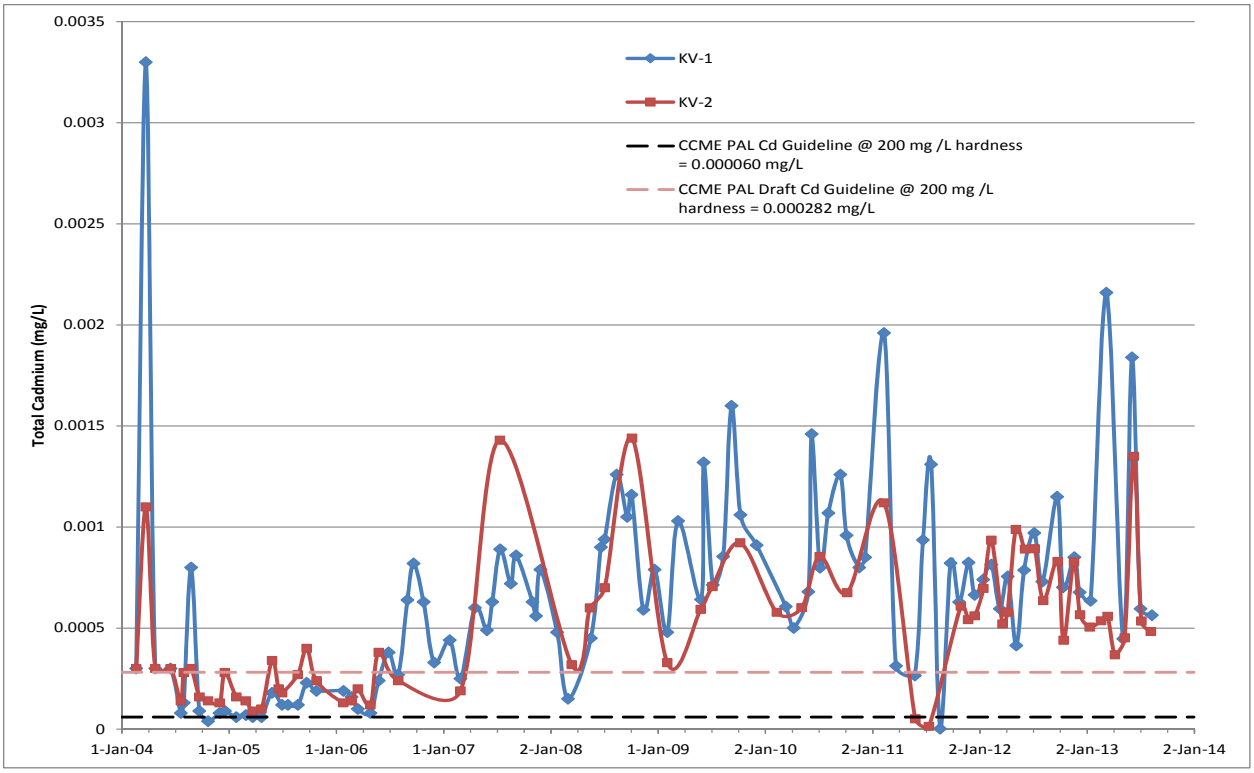

Figure 18: Upper South McQuesten River, Total Cadmium

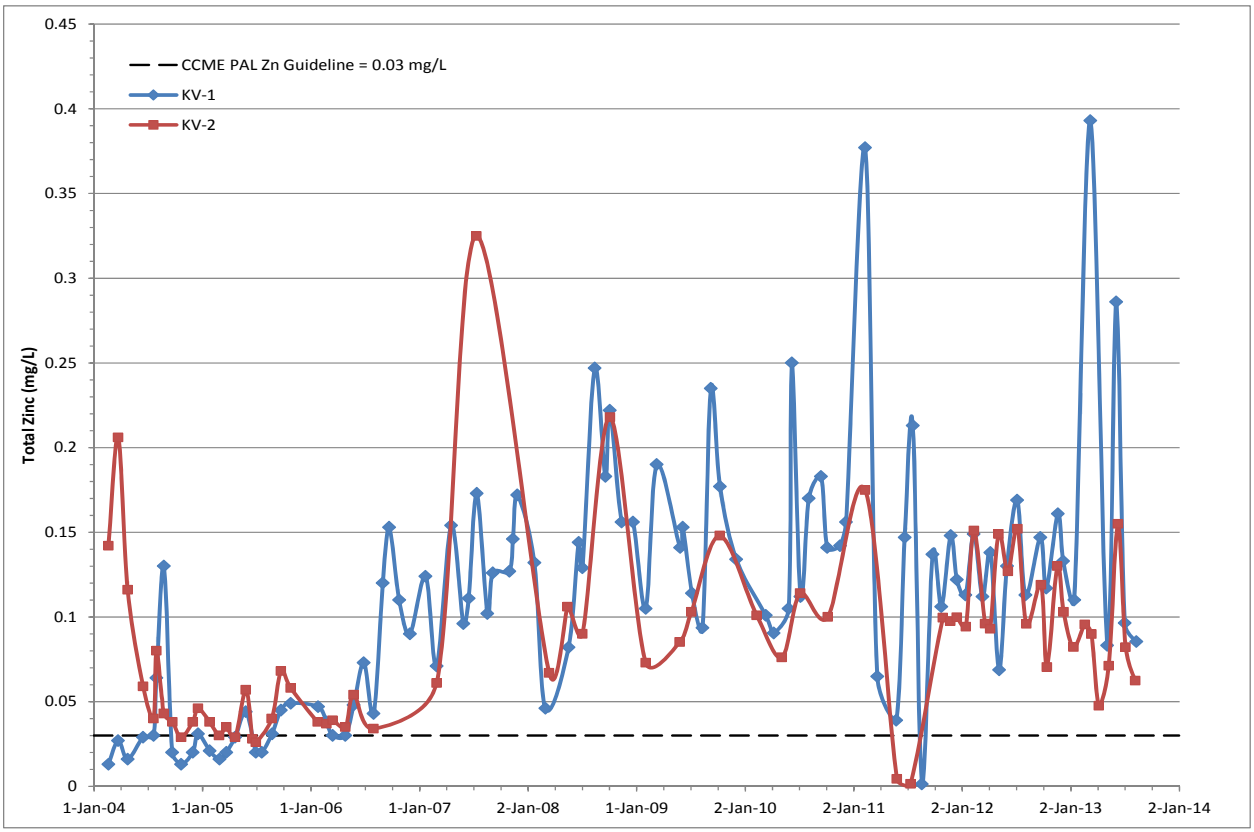

Figure 19: Upper South McQuesten River, Total Zinc

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Appendix A

Surface Water Quality Data Tables

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		24/01/2004	30/07/2004	27/02/2005	19/07/2005	23/08/2005	25/01/2006	16/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	04/09/2007	13/03/2008	18/05/2008	05/07/2008
Discharge (Flow)	L/s		589												225.3	301.1
Total Suspended Solids	mg/L		5	<2	3	<2	<2	<2	15.2					<5	<10	9
pH (field)	pH units	7.13	7.28	7.13	6.98	7.73		7.82			7.67	8.08	7.42	7.63	7.47	7.03
pH (lab)	pH units		7.53	7.8	6.98	7.73	7.5	7.2	7.91	7.74	7.59	7.31	7.68	7.94	6.94	7.46
Specific Conductance (field)	µS/cm															
Specific Conductance (lab)	µS/cm		114	121	138	164	156	134	71.4	130	131	134	163	446	51	142
Temperature (field)	C	0.4	5.1	0.4	6.4	5.4		0.1				5.1	4	0.1	0	5
Dissolved Oxygen (field)	mg/L		10.3			12.1										
Dissolved Oxygen (field)	%															
ORP (field)	mV															
Hardness (from total)	mg/L															
Hardness (from dissolved)	mg/L		52.1	53.4	52	53	57	58	35.8					220	25	64
Alkalinity, total	mg/L		27	38	28	30	17	32								
Chloride	mg/L															
Fluoride	mg/L															
Sulphate, dissolved	mg/L		24.8				23.3	22.7	15.1							
Ammonia (N)	mg/L		<0.05		<0.002	<0.002										
Nitrite (N)	mg/L		<0.05		<0.03	<0.03			0.0379							
Nitrate (N)	mg/L		<0.1		<0.03	<0.03			<0.0010							
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L														10.4	
Aluminum (Al), total	mg/L		0.072	0.011	0.029	0.015	0.012	0.013	0.277	0.014	0.064	0.03	0.021	0.008	0.75	0.056
Antimony (Sb), total	mg/L		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00013	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.0002
Arsenic (As), total	mg/L		0.0028	0.0032	0.0029	0.0022	0.003	0.0033	0.00498	0.0023	0.0038	0.0023	0.0026	0.0079	0.0064	0.0023
Barium (Ba), total	mg/L		0.054	0.06	0.048	0.051	0.067	0.064	0.0429	0.054	0.068	0.049	0.062	0.062	0.047	0.05
Beryllium (Be), total	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L		0.024	0.005	0.002	<0.002	<0.002	<0.002	<0.010	0.005	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd), total	mg/L		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000050	0.00002	<0.00001	0.00002	<0.00001	0.00255	0.00006	0.00002
Calcium (Ca), total	mg/L		16.4	17.6	15.7	17.9	16.6	17.2	10.6	17.7	19	18.2	22.5	62.1	7.9	20.2
Chromium (Cr), total	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	0.0008	0.0005	0.0017	<0.0005
Cobalt (Co), total	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00024	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	<0.0001
Copper (Cu), total	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00215	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001
Iron (Fe), total	mg/L		0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.463	<0.1	0.1	0.9	<0.1	<0.1	0.9	0.1
Lead (Pb), total	mg/L		0.0004	0.0001	0.0002	0.0001	0.0004	0.0004	0.000884	<0.0001	0.0004	0.0001	<0.0001	0.0004	0.0015	0.0003
Lithium (Li), total	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0050	<0.001	0.001	<0.001	<0.001	0.005	0.001	<0.001
Magnesium (Mg), total	mg/L		2.6	3.5	2.9	3.3	2.9	3.3	2.30	3	3.7	3.4	4	12.4	1.6	3.6
Manganese (Mn), total	mg/L		0.015	0.006	0.01	0.009	<0.005	<0.005	0.0205	0.006	0.01	0.01	0.008	0.006	0.034	0.009
Mercury (Hg), total	mg/L															
Molybdenum (Mo), total	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000120	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00117	<0.0005	<0.0005	0.0008	0.001	0.0014	0.0022	0.0011
Phosphorus (P), total	mg/L								<0.30							
Potassium (K), total	mg/L		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<2.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Selenium (Se), total	mg/L		0.0004	0.0003	0.0005	0.0005	0.0004	0.0005	<0.0010	0.0004	0.0003	0.0003	0.0008	0.0016	<0.0002	0.0004
Silicon (Si), total	mg/L		2.14	3.9	2.42	2.5	3.48	3.82	1.72	2.36	3.94	2.04	3.14	2.9	2.04	1.77

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		24/01/2004	30/07/2004	27/02/2005	19/07/2005	23/08/2005	25/01/2006	16/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	04/09/2007	13/03/2008	18/05/2008	05/07/2008
Silver (Ag), total	mg/L		0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000028	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00005	<0.00001
Sodium (Na), total	mg/L		0.6	1	0.5	0.5	1	0.9	<2.0	0.6	0.8	0.5	0.7	1.6	<0.4	0.5
Strontium (Sr), total	mg/L		0.051	0.068	0.057	0.06	0.069	0.066	0.0391	0.058	0.071	0.058	0.072	0.232	0.034	0.067
Sulphur (S), total	mg/L		7.99	6.6	8	10	6.7	7		9.4	7.8	11.6	14.4	45.9	3.2	13.1
Thallium (Tl), total	mg/L		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L		0.0028	0.0007	0.001	0.001	0.0007	0.0006	<0.010	0.0474	0.0132	0.0448	0.0011	0.003	0.0172	0.0028
Uranium (U), total	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000078	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	<0.0005	<0.0005
Vanadium (V), total	mg/L		0.0002	0.0005	0.0002	<0.0001	<0.0001	0.0002	<0.0010	0.0001	0.0002	0.0002	0.0002	0.0002	0.0016	0.0002
Zinc (Zn), total	mg/L		0.008	0.001	0.001	0.002	0.004	0.003	<0.0050	0.01	0.009	0.002	0.006	0.239	0.007	0.002
Zirconium (Zr), total	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L		0.016	<0.005	0.007	<0.005	<0.005	<0.005	0.0507	0.006	0.007	0.01	0.006	<0.02	0.156	0.015
Antimony (Sb), dissolved	mg/L		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00010	<0.0002	<0.0002	<0.0002	0.0012	0.002		0.001
Arsenic (As), dissolved	mg/L		0.0024	0.0029	0.0025	0.0024	0.0027	0.0029	0.00241	0.002	0.0028	0.0022	0.0022	0.0074	0.0024	0.0021
Barium (Ba), dissolved	mg/L		0.047	0.059	0.048	0.053	0.062	0.061	0.0360	0.052	0.068	0.05	0.059	0.05	0.034	0.049
Beryllium (Be), dissolved	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	0.0006	<0.002	<0.0005	<0.0005
Boron (B), dissolved	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L		<0.00001	<0.00001	<0.00001	0.00003	<0.00001	<0.00001	<0.000050	0.0001	0.00002	0.00001	0.00001	0.0028	0.00005	0.00001
Calcium (Ca), dissolved	mg/L		16.6	16.2	15.8	15.7	18	17.7	10.6	18.3	19.5	19.6	22.5	66.2	7.6	19.2
Chromium (Cr), dissolved	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	0.0005	<0.0005	0.0006	<0.002	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001	<0.0001	<0.0001	0.0002	<0.0005	0.0005	<0.0001
Copper (Cu), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00126	<0.001	<0.001	<0.001	<0.001	<0.005	0.002	<0.001
Iron (Fe), dissolved	mg/L		0.04	<0.01	0.02	<0.01	0.03	<0.01	0.073	0.03	0.03	0.04	0.01	0.02	0.15	0.03
Lead (Pb), dissolved	mg/L		0.0002	0.0001	<0.0001	<0.0001	0.0004	0.0004	0.000178	0.0001	0.0025	0.0002	0.0001	<0.0005	0.0005	<0.0001
Lithium (Li), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.0050	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Magnesium (Mg), dissolved	mg/L		2.6	3.1	3	3.3	2.9	3.4	2.25	3.5	3.6	3.3	4	13.3	1.5	3.8
Manganese (Mn), dissolved	mg/L		0.011	<0.005	0.009	0.005	0.006	<0.005	0.00780	0.016	0.007	0.01	0.006	0.006	0.009	0.008
Mercury (Hg), dissolved	mg/L															
Molybdenum (Mo), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000069	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Nickel (Ni), dissolved	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00057	<0.0005	<0.0005	<0.0005	0.0006	<0.002	0.0016	<0.0005
Phosphorus (P), dissolved	mg/L								<0.30							
Potassium (K), dissolved	mg/L		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<2.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Selenium (Se), dissolved	mg/L		0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	<0.0010	<0.0002	0.0004	<0.0002	0.0006	0.002	<0.0002	0.0002
Silicon (Si), dissolved	mg/L		2.24	3.73	2.4	2.68	3.58	4.07	1.54	2.6	3.97	2.01	2.53	3.28	1.35	1.85
Silver (Ag), dissolved	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001	<0.00001
Sodium (Na), dissolved	mg/L		0.5	0.9	0.5	0.5	1.1	0.9	<2.0	0.6	0.9	0.5	0.6	1.8	<0.4	0.5
Strontium (Sr), dissolved	mg/L		0.048	0.067	0.056	0.062	0.07	0.068	0.0363	0.052	0.069	0.056	0.074	0.21	0.029	0.062
Sulphur (S), dissolved	mg/L		8.27	6.5	8.2	10.5	6.9	7.1		10.2	8.3	11.8	14.4	47.2	3.2	13.2
Thallium (Tl), dissolved	mg/L		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Titanium (Ti), dissolved	mg/L		0.0005	<0.0005	0.0006	0.0006	<0.0005	<0.0005	<0.010	0.0457	0.0008	0.0488	0.0008	<0.002	0.001	0.0019
Uranium (U), dissolved	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000042	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005
Vanadium (V), dissolved	mg/L		<0.0001	0.0001	0.0001	0.0004	<0.0001	0.0002	<0.0010	0.0001	<0.0001	0.0001	0.0003	<0.0005	0.0002	<0.0001
Zinc (Zn), dissolved	mg/L		0.007	<0.001	<0.001	0.002	0.004	0.004	0.0031	0.011	0.018	0.003	0.005	0.23	0.006	0.002
Zirconium (Zr), dissolved	mg/L															

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		02/10/2008	02/02/2009	28/05/2009	05/07/2009	07/10/2009	10/02/2010	27/05/2010	08/07/2010	06/10/2010	08/02/2011	25/05/2011	14/07/2011	17/09/2011	30/10/2011	22/11/2011
Discharge (Flow)	L/s	474.275			421.55	443.8		900.9395	594.67633	241.745			1020.97	347.615	206	162
Total Suspended Solids	mg/L	4	5	8	2	<1	<1	3	1	1	2	11	1	<1	<1	<1.0
pH (field)	pH units	7.38		7.31	7.05	7.68	7.96	7.43	8	7.83	7.98	7.75	7.71	7.88	7.72	8.06
pH (lab)	pH units	7.58	7.66	7.6	7.7	7.7	7.9	7.6	7.63	7.52	7.52	7.3	7.55	7.76	7.47	7.73
Specific Conductance (field)	µS/cm												112	171	141.6	
Specific Conductance (lab)	µS/cm	128	123	55	130	142	129	78	140	141	132	61	118	148	134	132
Temperature (field)	C	6		2.1	7	1.6	0.5	5.4	6.4	1	0	3.1	6.5	2	1.4	0
Dissolved Oxygen (field)	mg/L														10.33	12.56
Dissolved Oxygen (field)	%														72.4	86.1
ORP (field)	mV														292.6	
Hardness (from total)	mg/L			24.2	58.8	65.9	61	34.1	58.3	61.9	58	27.8	53.8	63.8	62.7	60.2
Hardness (from dissolved)	mg/L	64	67	24.4	57.7	65.1	60.5	36.9	61.1	63.5	55.1	27.9	52.5	62.1	57.3	56.7
Alkalinity, total	mg/L									34	38	11	26	34	33	
Chloride	mg/L															
Fluoride	mg/L															
Sulphate, dissolved	mg/L					35	24	18	33	38	29	18	30	32.1	27.6	27.9
Ammonia (N)	mg/L													0.01		
Nitrite (N)	mg/L													<0.005	<0.05	<0.005
Nitrate (N)	mg/L													0.07	<0.2	0.143
Total Kjeldahl Nitrogen	mg/L														0.3	0.185
Dissolved Organic Carbon	mg/L	1.4	<0.5	4.1	1.1	0.7	<0.5	2.8	1.3	0.9	1	4.6	2.7	<0.5	1.1	0.62
Aluminum (Al), total	mg/L	<0.005	0.011	0.0811	0.0125	0.0065	0.0088	0.0357	0.0114	0.0066	0.0078	0.0711	0.0288	0.011	0.0086	0.0053
Antimony (Sb), total	mg/L	<0.0002	<0.0002	0.00008	0.00013	0.0001	0.00006	0.00011	0.00012	0.00011	0.00007	0.0001	0.00012	0.00009	0.00009	0.00008
Arsenic (As), total	mg/L	<0.0002	0.0024	0.00335	0.00246	0.00204	0.00249	0.00251	0.00217	0.00223	0.00267	0.00336	0.00217	0.00247	0.00241	0.00251
Barium (Ba), total	mg/L	<0.001	0.058	0.0296	0.0466	0.0512	0.0557	0.0341	0.0489	0.0557	0.0585	0.0305	0.0398	0.052	0.0562	0.0557
Beryllium (Be), total	mg/L	<0.00004	<0.00004	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0001	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	<0.00001	<0.00001	0.00003	0.000012	0.000024	0.000007	0.000017	0.000014	0.000015	0.000008	0.000067	0.000012	0.000025	0.000008	0.000007
Calcium (Ca), total	mg/L	19	20.8	7.25	17.9	19.9	18.6	10.3	17.4	18.7	18.1	8.31	16.2	19.7	19	18.4
Chromium (Cr), total	mg/L	<0.0004	<0.0004	0.0004	0.0001	0.0004	0.0005	0.0002	0.0004	0.0006	0.0003	0.0004	0.0003	0.0001	0.0001	<0.0001
Cobalt (Co), total	mg/L	<0.00002	<0.00002	0.000112	0.000027	0.000026	0.000016	0.000047	0.000034	0.000024	0.00002	0.00012	0.000037	0.000032	0.000021	0.000015
Copper (Cu), total	mg/L	<0.001	<0.001	0.00125	0.00027	0.00035	0.00028	0.0009	0.00044	0.00036	0.00041	0.00127	0.00089	0.00035	0.00025	0.00014
Iron (Fe), total	mg/L	0.06	0.04	0.163	0.039	0.035	0.034	0.084	0.046	0.038	0.047	0.165	0.059	0.055	0.043	0.042
Lead (Pb), total	mg/L	<0.0001	<0.0001	0.000438	0.000129	0.00012	0.000129	0.000364	0.000169	0.000266	0.00028	0.00228	0.000111	0.000787	0.000043	0.000102
Lithium (Li), total	mg/L	<0.001	<0.001	<0.0005	0.0005	0.0006	0.0008	<0.0005	<0.0005	0.0009	0.0008	<0.0005	<0.0005	0.0006	0.0008	0.0008
Magnesium (Mg), total	mg/L	3.66	3.74	1.47	3.45	3.95	3.55	2.04	3.62	3.71	3.13	1.72	3.23	3.57	3.67	3.5
Manganese (Mn), total	mg/L	0.0068	0.0031	0.013	0.00502	0.00689	0.00414	0.00826	0.00837	0.00771	0.00554	0.0193	0.00695	0.00925	0.00731	0.00698
Mercury (Hg), total	mg/L			<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.00002	<0.00002	0.00006	0.00009	0.00013	0.00016	0.00008	0.00009	0.00013	0.00015	0.00008	0.00009	0.00011	0.00013	0.00011
Nickel (Ni), total	mg/L	<0.001	<0.001	0.00078	0.00033	0.0003	0.00022	0.00049	0.00034	0.00028	0.00073	0.00067	0.00047	0.00024	0.00016	0.00014
Phosphorus (P), total	mg/L	<0.01	<0.01	0.018	0.004		0.009	0.008	0.006		0.007	0.019	0.005	0.007	0.004	0.005
Potassium (K), total	mg/L	0.1	0.1	0.19	0.07	0.11	0.19	0.15	0.08	0.15	0.18	0.33	<0.05	0.12	0.16	0.17
Selenium (Se), total	mg/L	<0.0006	<0.0006	0.00018	0.00047	0.00052	0.00053	0.0003	0.00041	0.00054	0.00051	0.00026	0.00038	0.00053	0.00056	0.00063
Silicon (Si), total	mg/L	2.4	3.85	1.23	2.12	2.82	4.61	1.48	1.78	2.94	3.84	1.34	2.04	2.8	3.5	3.6

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		02/10/2008	02/02/2009	28/05/2009	05/07/2009	07/10/2009	10/02/2010	27/05/2010	08/07/2010	06/10/2010	08/02/2011	25/05/2011	14/07/2011	17/09/2011	30/10/2011	22/11/2011
Silver (Ag), total	mg/L	<0.00001	<0.00001	0.000007	<0.000005	<0.000005	<0.000005	0.000012	<0.000005	<0.000005	<0.000005	0.000023	<0.000005	0.00001	<0.000005	<0.000005
Sodium (Na), total	mg/L	0.58	0.98	0.26	0.52	0.66	1	0.31	0.47	0.81	0.86	0.25	0.43	0.62	0.89	0.95
Strontium (Sr), total	mg/L	<0.001	0.063	0.026	0.0569	0.0628	0.0617	0.0355	0.0593	0.0675	0.0637	0.0273	0.049	0.0607	0.0655	0.0654
Sulphur (S), total	mg/L		7	4	11	13	8	<10	12	11	<10	<10	10	13	12	<10
Thallium (Tl), total	mg/L	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), total	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00004	0.00006	0.00001
Titanium (Ti), total	mg/L	<0.0001	0.0009	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0015	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	<0.0004	<0.0004	0.000046	0.000058	0.000055	0.000083	0.000035	0.000052	0.000064	0.000091	0.000039	0.000032	0.000057	0.000066	0.000079
Vanadium (V), total	mg/L	<0.00004	0.00006	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	<0.001	<0.001	0.0021	0.001	0.0011	0.0024	0.0014	0.0012	0.0019	0.0011	0.0049	0.0014	0.0021	0.0006	0.0006
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.011	<0.005	0.0413	0.0094	0.0048	0.0042	0.0235	0.0095	0.0051	0.0035	0.0384	0.0268	0.0045	0.0026	0.0063
Antimony (Sb), dissolved	mg/L	0.0009	0.0008	0.00007	0.00013	0.0001	0.00006	0.0001	0.00013	0.00009	0.00009	0.00009	0.00015	0.00009	0.00008	0.00009
Arsenic (As), dissolved	mg/L	0.0018	0.0023	0.00192	0.00219	0.00195	0.0024	0.00204	0.00206	0.00211	0.0026	0.00193	0.00257	0.00205	0.00208	0.00219
Barium (Ba), dissolved	mg/L	0.042	0.06	0.0271	0.0461	0.0507	0.0575	0.0337	0.0473	0.0533	0.0646	0.0299	0.0425	0.0539	0.0485	0.0579
Beryllium (Be), dissolved	mg/L	<0.00004	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L		<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	<0.00001	<0.00001	0.00001	0.000018	0.000017	<0.000005	0.000026	0.00002	0.000015	0.000011	0.00004	0.000083	0.000011	0.00001	0.000017
Calcium (Ca), dissolved	mg/L	19.3	20.6	7.3	17.5	19.6	18.3	11.1	18.4	19.1	16.3	8.32	15.9	19.1	17.2	17.2
Chromium (Cr), dissolved	mg/L	0.0004	<0.0004	0.0003	0.0002	0.0004	0.0004	0.0002	0.0005	0.0005	0.0005	0.0004	0.0004	<0.0001	0.0001	<0.0001
Cobalt (Co), dissolved	mg/L	0.00014	0.00002	0.000042	0.000022	0.000024	0.000011	0.000031	0.00003	0.000022	0.000019	0.000043	0.000033	0.000021	0.00002	0.000022
Copper (Cu), dissolved	mg/L	<0.001	<0.001	0.00102	0.00049	0.00034	0.0002	0.00076	0.00072	0.00049	0.00062	0.00116	0.00085	0.00032	0.00015	0.00059
Iron (Fe), dissolved	mg/L	0.042	<0.01	0.05	0.023	0.04	0.014	0.034	0.036	0.024	0.011	0.051	0.09	0.021	0.021	0.023
Lead (Pb), dissolved	mg/L	0.0002	<0.0001	0.000132	0.000334	0.000259	0.000071	0.000192	0.000457	0.000169	0.000595	0.000371	0.00143	0.000012	0.000031	0.000218
Lithium (Li), dissolved	mg/L	<0.001	<0.001	<0.0005	<0.0005	0.0005	0.0009	<0.0005	<0.0005	0.0009	0.0009	<0.0005	<0.0005	<0.0005	0.0007	0.0008
Magnesium (Mg), dissolved	mg/L	3.71	3.83	1.51	3.39	3.93	3.6	2.22	3.69	3.82	3.5	1.73	3.1	3.51	3.48	3.32
Manganese (Mn), dissolved	mg/L	0.0047	0.0024	0.0044	0.00452	0.00701	0.00347	0.00468	0.00854	0.00732	0.00495	0.00675	0.0215	0.00644	0.00597	0.00685
Mercury (Hg), dissolved	mg/L			<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	0.00008	<0.00002	0.00006	0.0001	0.00012	0.00014	0.00008	0.00011	0.00012	0.00016	0.00007	0.0001	0.00008	0.0001	0.00014
Nickel (Ni), dissolved	mg/L	<0.001	<0.001	0.0007	0.00033	0.0004	0.00016	0.00048	0.00046	0.0003	0.00042	0.00064	0.00047	0.00027	0.00016	0.00016
Phosphorus (P), dissolved	mg/L	<0.01	<0.01	0.007	0.004	0.007	0.008	0.005	0.005		0.012	0.008	0.003	<0.002	0.003	0.005
Potassium (K), dissolved	mg/L	0.1	0.2	0.2	0.08	0.11	0.18	0.14	0.09	0.17	0.3	0.32	0.06	0.12	0.14	0.17
Selenium (Se), dissolved	mg/L	<0.0006	<0.0006	0.00018	0.00046	0.00052	0.00052	0.00026	0.00042	0.0005	0.00046	0.00025	0.00036	0.00054	0.00054	0.00059
Silicon (Si), dissolved	mg/L	2.37	3.8	1.21	2.11	2.79	4.09	1.57	2.02	3.1	2.99	1.28	2.01	2.5	3.2	3.3
Silver (Ag), dissolved	mg/L	<0.00001	<0.00001	0.000008	0.000008	<0.000005	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	0.000013	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	0.6	1	0.27	0.55	0.66	1.02	0.33	0.51	0.84	1.05	0.26	0.4	0.6	0.86	0.93
Strontium (Sr), dissolved	mg/L	0.055	0.066	0.0254	0.0577	0.0621	0.0635	0.0359	0.0569	0.0645	0.0708	0.0267	0.0497	0.0662	0.0604	0.0654
Sulphur (S), dissolved	mg/L		7.6	5	10	13	8	<10	12	12	<10	<10	11	12	<10	<10
Thallium (Tl), dissolved	mg/L	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.00002	0.00002	<0.00001	0.00013	0.00011	0.00005
Titanium (Ti), dissolved	mg/L	0.0006	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	<0.0004	<0.0004	0.000031	0.000055	0.000057	0.000084	0.000027	0.000048	0.00006	0.000092	0.000019	0.000036	0.00004	0.000069	0.000084
Vanadium (V), dissolved	mg/L	<0.00004	<0.00004	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.003	0.001	0.0013	0.0029	0.0016	0.001	0.0019	0.0035	0.0027	0.0025	0.0042	0.0142	0.0011	0.0007	0.0023
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		18/12/2011	18/12/2011	18/01/2012	09/02/2012	09/03/2012	07/04/2012	06/05/2012	01/06/2012	13/06/2012	01/07/2012	08/07/2012	01/08/2012	20/09/2012	10/10/2012	16/11/2012
Discharge (Flow)	L/s		92.1	119.7	135.3		68.74	62.1	781.25		691.05		62	387.1	261.7388	
Total Suspended Solids	mg/L	1	<1.0	<1.0	4.9	<1.0	<1.0	<1.0	2.5	1.7	1	<1.0	1	<1.0	<1.0	<1.0
pH (field)	pH units		7.4	7.51	7.64	7.37	7.87	8.21	7.65		7.77	7.64	7	8.03	7.6	7.83
pH (lab)	pH units	7.6	7.75	7.73	7.68	7.96	7.77	7.74	7.66	7.43	7.43	7.71	7.51	7.79	7.71	7.38
Specific Conductance (field)	µS/cm			114.7	132.3		154.4	116.0	70.63		146.8	154	160		175.2	149.3
Specific Conductance (lab)	µS/cm	130	131	135	127	143	134	127	90	104	135	143	144	159	147	141
Temperature (field)	C		0	0	0.1	0	0.2	0.5	2		6.5	4.9	5	4.1	0	0.1
Dissolved Oxygen (field)	mg/L		12.43	11.1	13.51	12.4	15.59	14.25			12.06	12.46	13.27	12.11	12.34	13
Dissolved Oxygen (field)	%		85	76	92.6	84.7	107.3	98.90			99.1	97.7	103	92.6	84.5	89
ORP (field)	mV			365.8	167.8	0.04	184.8	88.10			92.2	93	103.6	63.7	176	344.4
Hardness (from total)	mg/L	63.5	58.4	58.2	61.4	64.1	58.8	58.9	35.9	47.5	63.5	59.8	68.7	74.6	65.8	67.4
Hardness (from dissolved)	mg/L	59.9	57.8	56.7	60.7	59.5	61.7	58.7	38	46.9	61.1	61	65.7	73.2	66.7	64.3
Alkalinity, total	mg/L	35.7			37.4			37.7		20.8		28.5			35.5	
Chloride	mg/L							<0.50		<0.50	<0.50				<0.50	
Fluoride	mg/L															
Sulphate, dissolved	mg/L	23.8	29.7	25.7	24.3	27.3	26.1	21.5	20	28.7	34.1	37.7	35.4	43	37.3	29.7
Ammonia (N)	mg/L	0.0076								0.015		<0.0050				
Nitrite (N)	mg/L	<0.005		<0.005	<0.005		<0.005	<0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.077
Nitrate (N)	mg/L	0.155		0.168	0.228		0.141	0.103	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Total Kjeldahl Nitrogen	mg/L			0.054	0.043	<0.20	0.05	0.169	<0.20		<0.20		<0.20	<0.20	0.21	0.22
Dissolved Organic Carbon	mg/L	0.67		0.83	<0.50	0.74	<0.50	1.56	<0.50	1.36	1.22	0.72	1.12	0.69	1.85	<0.50
Aluminum (Al), total	mg/L	0.01	0.005	0.0068	0.0182	0.0066	0.0054	0.00924	0.0364	0.0208	0.0134	0.00855	0.00898	0.00812	0.00593	0.00638
Antimony (Sb), total	mg/L	<0.0005	0.00007	0.00007	0.00008	0.00011	0.00008	0.000075	0.00008	0.000123	0.00012	0.000131	0.00011	0.000092	0.000088	0.000122
Arsenic (As), total	mg/L	0.0027	0.0029	0.00283	0.00347	0.00309	0.00288	0.00309	0.0024	0.00193	0.00238	0.00221	0.00253	0.0025	0.00242	0.00262
Barium (Ba), total	mg/L	0.062	0.0603	0.0634	0.0632	0.0642	0.0638	0.0616	0.0396	0.0391	0.0475	0.0469	0.0541	0.0579	0.055	0.0593
Beryllium (Be), total	mg/L	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	<0.001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.00002	0.000009	0.000012	0.000014	0.000014	0.000014	0.000011	0.0000982	0.0000268	0.0000156	0.0000124	0.000102	0.000013	0.000014	0.000007
Calcium (Ca), total	mg/L	19.3	17.5	17.9	18.8	19.9	18.1	17.4	10.4	14.6	19.7	18.4	21.1	22.8	20.2	20.3
Chromium (Cr), total	mg/L	0.001	0.0002	0.0003	0.0002	0.0006	0.0002	<0.00010	0.00015	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
Cobalt (Co), total	mg/L	<0.0005	0.00002	0.00002	0.000042	0.000041	0.000015	0.000029	0.0000491	0.0000376	0.0000345	0.0000274	0.000052	0.000029	0.000026	0.000033
Copper (Cu), total	mg/L	0.0003	0.00032	0.00036	0.00034	0.00062	0.00016	0.000582	0.000993	0.000613	0.000505	0.000351	0.000385	0.000274	0.000337	0.000387
Iron (Fe), total	mg/L	0.065	0.053	0.049	0.095	0.043	0.03	0.0775	0.0773	0.0592	0.0442	0.0391	0.0576	0.0478	0.0446	0.081
Lead (Pb), total	mg/L	<0.0002	0.000054	0.000363	0.000452	0.000622	0.000064	0.000156	0.000423	0.000155	0.0000535	0.000109	0.000088	0.000055	0.000086	0.000047
Lithium (Li), total	mg/L	<0.005	0.0008	0.0008	0.0008	0.0009	0.0008	0.00083	<0.00050	<0.00050	<0.00050	0.00051	0.00058	0.00051	0.00058	0.00078
Magnesium (Mg), total	mg/L	3.72	3.57	3.27	3.49	3.49	3.33	3.76	2.41	2.68	3.47	3.39	3.91	4.29	3.76	4.05
Manganese (Mn), total	mg/L	0.008	0.00675	0.00658	0.00904	0.00528	0.00398	0.00721	0.00827	0.00535	0.00561	0.00665	0.0107	0.00866	0.00863	0.00973
Mercury (Hg), total	mg/L	<0.00005	<0.00001	<0.000010	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	<0.001	0.00015	0.00013	0.00013	0.00015	0.00015	0.00012	0.00007	0.000082	0.000139	0.000094	0.000136	0.000119	0.000127	0.00016
Nickel (Ni), total	mg/L	<0.001	0.00016	0.00017	0.00015	0.00019	0.00022	0.000254	0.000569	0.000391	0.000327	0.000276	0.000302	0.000234	0.000199	0.000274
Phosphorus (P), total	mg/L	<0.01	0.006	0.01	0.012	0.01	0.006	0.0081	0.0099	0.0049	<0.0020	0.0044	<0.0020	0.004	0.0054	0.0067
Potassium (K), total	mg/L	0.165	0.17	0.2	0.19	0.24	0.17	0.32	0.209	0.09	0.062	0.068	0.069	0.127	0.149	0.187
Selenium (Se), total	mg/L	0.0006	0.00062	0.00062	0.00057	0.0006	0.0006	0.000563	0.000307	0.000415	0.000469	0.000462	0.000475	0.000582	0.000567	0.000639
Silicon (Si), total	mg/L	3.91	3.5	4	4	4.1	3.6	3.35	1.44	1.59	2.15	1.88	2.78	2.69	3.41	3.48

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		18/12/2011	18/12/2011	18/01/2012	09/02/2012	09/03/2012	07/04/2012	06/05/2012	01/06/2012	13/06/2012	01/07/2012	08/07/2012	01/08/2012	20/09/2012	10/10/2012	16/11/2012
Silver (Ag), total	mg/L	<0.00002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	0.0000055	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), total	mg/L	1.02	0.96	1.93	1.03	2.96	1	0.966	0.4	0.338	0.46	0.429	0.648	0.646	0.744	0.981
Strontium (Sr), total	mg/L	0.071	0.0666	0.0663	0.0672	0.0675	0.0661	0.0704	0.0421	0.0419	0.0556	0.0564	0.066	0.0707	0.0654	0.067
Sulphur (S), total	mg/L	8	<10	<10	<10	<10	<10	<10	<10	<10	13	13	13	17	14	11.9
Thallium (Tl), total	mg/L	<0.00005	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000005
Tin (Sn), total	mg/L	<0.005	0.00003	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00032	<0.00020
Titanium (Ti), total	mg/L	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), total	mg/L	<0.0001	0.000078	0.000094	0.000103	0.000095	0.000108	0.000101	0.000044	0.0000229	0.0000552	0.0000372	0.000092	0.000069	0.000059	0.000077
Vanadium (V), total	mg/L	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	0.00024	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	<0.005	0.0006	0.0028	0.0016	0.0052	0.0039	0.00119	0.0102	0.00294	0.00089	0.00135	0.00115	0.00116	0.00156	0.00076
Zirconium (Zr), total	mg/L	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	<0.0030	0.0029	0.0018	0.0024	0.0027	0.0025	0.00628	0.025	0.0106	0.00781	0.00471	0.00568	0.00553	0.00247	0.00202
Antimony (Sb), dissolved	mg/L	<0.00050	0.00008	0.00008	0.00008	0.00007	0.00007	0.000075	0.000073	0.000119	0.000122	0.000108	0.000088	0.000095	0.000081	0.000074
Arsenic (As), dissolved	mg/L	0.00235	0.00243	0.0025	0.00264	0.00271	0.00258	0.00272	0.00201	0.00155	0.00216	0.00202	0.00213	0.00222	0.00202	0.00228
Barium (Ba), dissolved	mg/L	0.0586	0.0601	0.0584	0.0612	0.0601	0.0621	0.0603	0.0387	0.039	0.0459	0.0493	0.0525	0.0589	0.0531	0.0595
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.0010	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.00001	0.000011	0.000006	0.000017	0.000013	0.000016	0.000014	0.0000631	0.0000206	0.0000161	0.0000187	0.00001	0.000017	0.000016	0.000015
Calcium (Ca), dissolved	mg/L	18.3	17.4	17.3	18.8	18.2	19	17.3	11.2	14.4	19	18.6	20.3	22.4	20.2	19.7
Chromium (Cr), dissolved	mg/L	<0.0010	0.0001	0.0002	0.0001	0.0002	0.0001	0.00012	0.00013	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	0.00011	<0.00010
Cobalt (Co), dissolved	mg/L	<0.00050	0.000012	0.000012	0.000006	0.000035	0.000011	0.000026	0.0000301	0.0000169	0.00002	0.0000179	0.000037	0.000023	0.000022	0.000025
Copper (Cu), dissolved	mg/L	0.00023	0.00019	0.0002	0.0003	0.00017	0.00017	0.000614	0.00105	0.000568	0.000448	0.000301	0.000287	0.000277	0.000191	0.000238
Iron (Fe), dissolved	mg/L	0.0238	0.017	0.012	0.011	0.008	0.007	0.046	0.039	0.02	0.0208	0.0203	0.0319	0.0291	0.0276	0.0241
Lead (Pb), dissolved	mg/L	<0.00020	0.00006	0.000051	0.000155	0.000033	0.000019	0.00023	0.00048	0.0000453	0.0000147	0.0000153	0.00001	0.000019	0.000059	0.000018
Lithium (Li), dissolved	mg/L	<0.0050	0.0008	0.001	0.0008	0.001	0.0009	0.0007	<0.00050	<0.00050	<0.00050	0.00051	0.00055	0.00059	0.00063	0.00075
Magnesium (Mg), dissolved	mg/L	3.48	3.47	3.28	3.34	3.44	3.5	3.78	2.43	2.64	3.33	3.56	3.65	4.2	3.94	3.7
Manganese (Mn), dissolved	mg/L	0.0054	0.00565	0.00486	0.00359	0.00306	0.00301	0.0052	0.00491	0.00263	0.00448	0.00589	0.00853	0.00802	0.00844	0.00841
Mercury (Hg), dissolved	mg/L	<0.000050	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	<0.0010	0.00013	0.00014	0.00016	0.00015	0.00014	0.000125	0.000076	0.000077	0.000102	0.000116	0.000092	0.000118	0.000127	0.000161
Nickel (Ni), dissolved	mg/L	<0.0010	0.00015	0.00011	0.00014	0.00013	0.00016	0.000282	0.000666	0.000318	0.000289	0.00029	0.000272	0.000233	0.000228	0.00017
Phosphorus (P), dissolved	mg/L	<0.01	0.006	0.006	0.007	0.008	0.006	0.0062	0.0048	<0.0020	<0.0020	0.0031	0.0022	0.0036	0.0036	0.0053
Potassium (K), dissolved	mg/L	0.186	0.19	0.21	0.27	0.2	0.18	0.312	0.225	0.087	0.058	0.067	0.068	0.127	0.152	0.162
Selenium (Se), dissolved	mg/L	0.00054	0.00056	0.00062	0.00059	0.00059	0.0006	0.000536	0.000371	0.000426	0.00045	0.000489	0.000484	0.000628	0.000601	0.000643
Silicon (Si), dissolved	mg/L	3.71	3.6	3.8	3.8	3.8	3.8	3.29	1.6	1.57	2.03	1.91	2.55	2.63	3.09	3.59
Silver (Ag), dissolved	mg/L	<0.000020	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1	1	1.02	0.99	1.36	1.07	0.995	0.408	0.338	0.437	0.47	0.602	0.655	0.791	0.891
Strontium (Sr), dissolved	mg/L	0.0665	0.0662	0.0668	0.0677	0.0656	0.0662	0.0677	0.0411	0.0432	0.0544	0.0583	0.0617	0.0727	0.0673	0.0685
Sulphur (S), dissolved	mg/L	9	<10	<10	<10	<10	<10	<10	<10	<10	13	13	12	16	15	10.2
Thallium (Tl), dissolved	mg/L	<0.000050	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), dissolved	mg/L	<0.0050	<0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	<0.00010	0.000079	0.000083	0.000083	0.000105	0.000115	0.000093	0.0000362	0.000015	0.0000428	0.0000349	0.000042	0.000082	0.000065	0.000116
Vanadium (V), dissolved	mg/L	<0.0050	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	0.00024	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	<0.0050	0.0023	0.0009	0.0021	0.0023	0.0029	0.0019	0.00761	0.00325	0.00103	0.0018	0.00127	0.00137	0.00262	0.00065
Zirconium (Zr), dissolved	mg/L	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00018	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		18/11/2012	06/12/2012	11/01/2013	09/02/2013	12/03/2013	08/04/2013	02/05/2013	01/06/2013	04/07/2013	11/08/2013
Discharge (Flow)	L/s				96.06	0.1343		70.3	2210.99	495.451	231.37
Total Suspended Solids	mg/L	<1.0	<1.0	6.1	1.2	1	4.6	<1.0	15.8	1.6	<1.0
pH (field)	pH units	6.75	7.06	7.76	7.44	7.46	8.43	7.32	7.06	7.51	7.61
pH (lab)	pH units	7.7	7.86	7.87	7.69	7.75	7.86	7.99	7.24	7.57	7.60
Specific Conductance (field)	µS/cm	128.4	150	145	141.7	83.8	127.4	148.8	46.8	153.8	146.4
Specific Conductance (lab)	µS/cm	141	135	138	139	136	133	139	40.8	148	161
Temperature (field)	C	0.1	0.14	0.14	0.2	0	0.2	0.3	2.5	5.5	8.3
Dissolved Oxygen (field)	mg/L	8.2		11.52	13.95	15.17	12.44	12.58	10.38	11.1	11.42
Dissolved Oxygen (field)	%	68		79.2	99.4	107.4	89.2	89.9	77.6	90.4	99.5
ORP (field)	mV		136.9		193.9	50.6	106	48.4	16.7	71.1	186.7
Hardness (from total)	mg/L	65.9	59.5	65.1	62.5	63.7	64.4	61.7	19.5	66.0	75.8
Hardness (from dissolved)	mg/L	66.6	63.6	66.4	60.8	62.9	64.6	61.4	18.7	66.4	72.7
Alkalinity, total	mg/L	37.6			38	38.8	44.1	41.1	9.3	28.4	
Chloride	mg/L	<0.50			0.83	0.87	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride	mg/L						0.052	0.051	0.026	0.031	0.044
Sulphate, dissolved	mg/L	29.5	25.6	25.8	29.1	29.6	26.7	26.8	9.21	40.0	41.3
Ammonia (N)	mg/L	0.0082				0.011					
Nitrite (N)	mg/L	<0.050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nitrate (N)	mg/L	<0.20	0.176	0.162	0.165	0.159	0.150	0.134	0.0145	0.0363	0.0229
Total Kjeldahl Nitrogen	mg/L		0.088	0.023	0.03	0.025	<0.050	<0.050	0.258	0.052	0.074
Dissolved Organic Carbon	mg/L	<0.50	0.7	<0.50	<0.50	<0.50	0.51	0.98	4.25	1.29	0.64
Aluminum (Al), total	mg/L	0.00716	0.00696	0.00925	0.00538	0.0102	0.0232	0.0105	0.306	0.0365	0.0155
Antimony (Sb), total	mg/L	0.000088	0.000085	0.000094	0.000124	0.000089	<0.00010	<0.00010	0.00019	0.00015	0.00012
Arsenic (As), total	mg/L	0.00245	0.00294	0.00302	0.00321	0.00308	0.00327	0.00329	0.00596	0.00286	0.00297
Barium (Ba), total	mg/L	0.0617	0.0664	0.0695	0.0637	0.0646	0.0737	0.0651	0.0281	0.0531	0.0637
Beryllium (Be), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000011	0.000011	0.000028	0.000048	0.000019	0.000020	0.000013	0.000074	0.000013	0.000011
Calcium (Ca), total	mg/L	20	17.8	20.3	19	19.4	19.5	18.7	5.74	20.2	23.0
Chromium (Cr), total	mg/L	0.0004	<0.00010	<0.00010	0.00016	0.00013	0.00040	0.00026	0.00067	0.00018	0.00017
Cobalt (Co), total	mg/L	0.000027	0.000028	0.000028	0.000017	0.000036	<0.00010	<0.00010	0.00030	<0.00010	<0.00010
Copper (Cu), total	mg/L	0.000411	0.000244	0.000266	0.000276	0.00036	<0.00050	0.00051	0.00251	0.00058	<0.00050
Iron (Fe), total	mg/L	0.0531	0.0569	0.0632	0.0436	0.0648	0.091	0.065	0.581	0.107	0.083
Lead (Pb), total	mg/L	0.000114	0.000495	0.000151	0.000492	0.000249	0.000409	0.000085	0.00247	0.000128	0.000055
Lithium (Li), total	mg/L	0.00079	0.00072	0.00085	0.00083	0.00089	<0.00050	0.00078	<0.00050	<0.00050	<0.00050
Magnesium (Mg), total	mg/L	3.86	3.62	3.5	3.65	3.71	3.80	3.65	1.25	3.80	4.45
Manganese (Mn), total	mg/L	0.00904	0.00959	0.00868	0.0078	0.0101	0.0102	0.00902	0.0251	0.0138	0.0166
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000163	0.000121	0.000156	0.000152	0.000144	0.000155	0.000168	0.000116	0.000134	0.000147
Nickel (Ni), total	mg/L	0.000191	0.000414	0.000161	0.000234	0.000167	<0.00050	<0.00050	0.00129	<0.00050	<0.00050
Phosphorus (P), total	mg/L	0.0076	0.0078	0.01	0.005	0.0087	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	0.17	0.232	0.219	0.198	0.203	0.24	0.20	0.38	<0.10	0.11
Selenium (Se), total	mg/L	0.000608	0.000601	0.000518	0.000723	0.000538	0.00058	0.00056	0.00021	0.00045	0.00047
Silicon (Si), total	mg/L	3.85	3.46	4.4	3.91	4.21	3.90	3.84	1.19	2.12	2.73

Station Name		KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37	KV-37
Sample Date		18/11/2012	06/12/2012	11/01/2013	09/02/2013	12/03/2013	08/04/2013	02/05/2013	01/06/2013	04/07/2013	11/08/2013
Silver (Ag), total	mg/L	<0.0000050	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	0.000042	<0.000010	<0.000010
Sodium (Na), total	mg/L	0.929	1	1.01	1.2	1.14	0.911	1.02	0.209	0.533	0.692
Strontium (Sr), total	mg/L	0.0696	0.0688	0.0709	0.0704	0.0695	0.0757	0.0705	0.0188	0.0603	0.0745
Sulphur (S), total	mg/L	10.5	10.1	10.8	8.8	9.4	8.87	9.38	3.18	12.9	14.0
Thallium (Tl), total	mg/L	<0.0000020	<0.0000020	0.000009	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00013	<0.00010
Titanium (Ti), total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), total	mg/L	0.000089	0.000083	0.000091	0.000135	0.0001	0.000101	0.000122	0.000070	0.000063	0.000063
Vanadium (V), total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.00111	0.00084	0.00229	0.00472	0.00252	<0.0030	<0.0030	0.0076	<0.0030	0.0035
Zirconium (Zr), total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00212	0.00242	0.00198	0.00275	0.00286	0.0030	0.0024	0.0448	0.0074	0.0041
Antimony (Sb), dissolved	mg/L	0.000077	0.000083	0.00009	0.000116	0.000106	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Arsenic (As), dissolved	mg/L	0.00212	0.00225	0.00277	0.00284	0.00268	0.00283	0.00270	0.00222	0.00240	0.00269
Barium (Ba), dissolved	mg/L	0.0577	0.0626	0.0689	0.0628	0.0654	0.0602	0.0635	0.0210	0.0538	0.0620
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000012	0.000014	0.000029	0.000049	0.000017	0.000011	0.000012	0.000025	0.000010	0.000013
Calcium (Ca), dissolved	mg/L	20.6	19.1	20.7	18.5	19.1	19.7	18.6	5.61	20.3	22.2
Chromium (Cr), dissolved	mg/L	0.00025	0.00015	0.00012	0.00028	0.00105	0.00028	0.00022	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000022	0.000027	0.00002	0.000015	0.000043	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.000235	0.000167	0.000311	0.000312	0.000511	0.00036	0.00040	0.00141	0.00045	<0.00020
Iron (Fe), dissolved	mg/L	0.0281	0.0225	0.0194	0.0197	0.313	0.029	0.027	0.066	0.042	0.040
Lead (Pb), dissolved	mg/L	0.000021	0.000023	0.000029	0.000075	0.000653	<0.000050	0.000055	0.000094	0.000064	<0.000050
Lithium (Li), dissolved	mg/L	0.00074	0.00084	0.00082	0.0007	0.00089	<0.00050	0.00103	<0.00050	<0.00050	<0.00050
Magnesium (Mg), dissolved	mg/L	3.68	3.86	3.58	3.58	3.67	3.76	3.62	1.14	3.84	4.20
Manganese (Mn), dissolved	mg/L	0.00793	0.00838	0.00689	0.00717	0.0121	0.00816	0.00817	0.00925	0.0122	0.0151
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000137	0.000147	0.000135	0.000155	0.000248	0.000144	0.000162	0.000064	0.000112	0.000106
Nickel (Ni), dissolved	mg/L	0.000189	0.000158	0.000121	0.000125	0.000581	<0.00050	<0.00050	0.00061	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	0.0054	0.0034	0.0047	0.0071	0.0068	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.159	0.208	0.211	0.207	0.205	0.23	0.21	0.33	<0.10	<0.10
Selenium (Se), dissolved	mg/L	0.000705	0.000599	0.000607	0.00054	0.000627	0.00055	0.00058	0.00014	0.00044	0.00047
Silicon (Si), dissolved	mg/L	4	3.99	4.57	3.87	4.12	3.85	3.76	0.874	2.11	2.66
Silver (Ag), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	0.911	1.04	1.07	1.4	1.12	0.904	0.988	0.192	0.511	0.673
Strontium (Sr), dissolved	mg/L	0.0672	0.0704	0.0712	0.0721	0.0705	0.0809	0.0712	0.0176	0.0583	0.0706
Sulphur (S), dissolved	mg/L	9.9	8.5	10.6	8.9	8.9	8.86	9.17	3.10	12.6	13.3
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.0000020	0.00001	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000082	0.000071	0.000093	0.000136	0.000099	0.000103	0.000112	0.000027	0.000049	0.000051
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.00020	0.00027	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.00085	0.00069	0.00254	0.00541	0.00187	0.0011	0.0013	0.0020	<0.0010	0.0011
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		30/07/2004	27/02/2005	20/07/2005	23/08/2005	25/01/2006	15/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	04/09/2007	14/03/2008	18/05/2008	05/07/2008	02/10/2008	02/02/2009
Discharge (Flow)	L/s	836												595.72	482.8	842.38	
Total Suspended Solids	mg/L	5	<2	<2	<2	<2	<2	6.5					<5	6	<3	2	7
pH (field)	pH units	7.19	7.17	7.62	7.7	7.28	7.74			7.63	8.09	7.16	7.51	7.53	7.21	7.4	
pH (lab)	pH units	7.66	7.6	7.62	7.7	7.5	7.01	7.83	7.66	7.64	7.37	7.76	7.6	7.26	7.8	7.58	7.57
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	139	181	166	189	200	127	103	159	180	155	185	183	82	157	163	177
Temperature (field)	C	5.1	0.4	5.9	5.5	0.2	0.1				4.9	4.1	0.1	0.9	5	3	
Dissolved Oxygen (field)	mg/L	10.8															
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L	66.5	77.9	65	66	78	82	52.0					83	39.7	72	82	97
Alkalinity, total	mg/L	36	49	35	34	44	36										
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	31.8				43	36	25.4									
Ammonia (N)	mg/L	<0.05		0.003	<0.002												
Nitrite (N)	mg/L	<0.05		<0.03	<0.03			0.0593									
Nitrate (N)	mg/L	<0.1		<0.03	0.04			<0.0010									
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L	0.044	<0.005	0.016	<0.02	<0.005	0.007	0.0909	0.01	0.011	0.026	0.013	0.008	0.261	0.021	0.04	0.027
Antimony (Sb), total	mg/L	0.0004	0.0003	0.0003	<0.001	0.0002	0.0002	0.00034	0.0003	0.0002	0.0003	0.0003	0.0002	0.0003	0.0002	<0.0002	0.0003
Arsenic (As), total	mg/L	0.0032	0.0027	0.0032	0.002	0.0024	0.0029	0.00394	0.0026	0.0029	0.0024	0.0026	0.0026	0.0036	0.0021	0.003	0.0026
Barium (Ba), total	mg/L	0.056	0.054	0.048	0.054	0.06	0.059	0.0389	0.059	0.06	0.049	0.063	0.057	0.038	0.05	0.053	0.058
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001
Boron (B), total	mg/L	0.004	0.041	0.003	<0.01	<0.002	<0.002	<0.010	0.004	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005
Cadmium (Cd), total	mg/L	0.00044	0.00016	0.00025	0.00028	0.0001	0.00013	0.000476	0.0002	0.00008	0.00021	0.00019	0.00009	0.00033	0.00015	0.00031	0.00017
Calcium (Ca), total	mg/L	20.2	25.3	19.8	23	23.4	25.4	15.5	22.8	26	21.5	26.2	24.2	12.1	22.2	24.6	29.8
Chromium (Cr), total	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	0.0009	0.0005	0.0008	0.0005	0.0007	0.0005
Cobalt (Co), total	mg/L	0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.00004	0.00006
Copper (Cu), total	mg/L	0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.00161	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.001	<0.001	<0.001
Iron (Fe), total	mg/L	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	0.156	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.08	0.08	0.04
Lead (Pb), total	mg/L	0.0019	0.0003	0.0005	<0.0005	0.0005	0.0006	0.00166	0.0003	0.0005	0.0004	0.0003	0.0002	0.0018	0.0003	0.0008	0.0007
Lithium (Li), total	mg/L	0.002	0.001	0.001	<0.005	0.001	0.001	<0.0050	0.001	0.001	0.001	0.001	0.002	<0.001	<0.001	<0.001	0.001
Magnesium (Mg), total	mg/L	3.2	4.8	3.7	4	4	4.7	3.23	3.9	4.9	4	4.6	4.4	2.3	4	4.8	5.31
Manganese (Mn), total	mg/L	0.012	<0.005	0.007	<0.02	<0.005	<0.005	0.0133	<0.005	<0.005	<0.005	0.008	<0.005	0.021	<0.005	0.0082	0.014
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.000142	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00009	<0.00002
Nickel (Ni), total	mg/L	0.0007	<0.0005	0.0005	<0.0025	<0.0005	<0.0005	0.00082	<0.0005	<0.0005	0.0006	0.0009	<0.0005	0.0013	0.0011	<0.001	<0.001
Phosphorus (P), total	mg/L							<0.30								<0.01	<0.01
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<2	<0.4	<0.4	<2.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.1	0.2
Selenium (Se), total	mg/L	0.0005	0.0007	0.0006	<0.001	0.0005	0.0006	<0.0010	0.0006	0.0005	0.0005	0.0008	0.0006	0.0003	0.0006	<0.0006	<0.0006
Silicon (Si), total	mg/L	2.28	3.54	2.59	2.7	3.17	3.6	1.70	2.62	3.53	2.27	2.8	3.05	1.72	1.98	2.52	3.58

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		30/07/2004	27/02/2005	20/07/2005	23/08/2005	25/01/2006	15/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	04/09/2007	14/03/2008	18/05/2008	05/07/2008	02/10/2008	02/02/2009
Silver (Ag), total	mg/L	0.0002	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	0.000022	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001
Sodium (Na), total	mg/L	0.6	1	0.6	<2	1.1	1	<2.0	0.7	0.9	0.6	0.8	1.1	0.4	0.6	0.69	1.06
Strontium (Sr), total	mg/L	0.065	0.086	0.072	0.078	0.085	0.085	0.0491	0.075	0.09	0.067	0.086	0.096	0.046	0.077	0.083	0.087
Sulphur (S), total	mg/L	10	12.2	11.2	13	11.6	12.1		12.7	12.8	13.6	16.5	12.8	5.9	14.2		12.7
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Titanium (Ti), total	mg/L	0.0013	0.0008	0.0007	<0.002	0.0008	0.0009	<0.010	0.0573	0.001	0.0457	0.001	0.0009	0.0048	0.0019	0.0012	0.0006
Uranium (U), total	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	0.000116	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Vanadium (V), total	mg/L	0.0001	0.0005	0.0001	<0.0005	<0.0001	0.0002	<0.0010	0.0001	<0.0001	0.0001	0.0002	0.0002	0.0005	0.0001	0.00015	0.00008
Zinc (Zn), total	mg/L	0.051	0.02	0.03	0.03	0.014	0.017	0.0435	0.025	0.014	0.024	0.025	0.016	0.038	0.019	0.033	0.02
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.016	<0.005	0.007	<0.005	<0.005	<0.005	0.0468	<0.005	<0.005	0.01	0.007	<0.02	0.111	0.007	0.015	<0.005
Antimony (Sb), dissolved	mg/L	0.0004	<0.0002	0.0003	0.0003	0.0003	0.0002	0.00029	0.0003	0.0003	0.0003	0.0016	<0.001		0.0009	0.001	0.0008
Arsenic (As), dissolved	mg/L	0.0032	0.0028	0.0028	0.003	0.0028	0.0027	0.00277	0.002	0.0024	0.0023	0.0024	0.003	0.0028	0.0024	0.0023	0.0021
Barium (Ba), dissolved	mg/L	0.05	0.053	0.05	0.055	0.069	0.056	0.0361	0.053	0.062	0.051	0.062	0.059	0.036	0.052	0.044	0.059
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.00004	<0.00004
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	0.0012	<0.002	<0.0005	<0.0005		<0.0001
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.004	<0.004
Cadmium (Cd), dissolved	mg/L	0.00045	0.00017	0.00028	0.00029	0.00013	0.00011	0.000379	0.00021	0.0001	0.00023	0.00019	0.0001	0.00034	0.00021	0.00027	0.0001
Calcium (Ca), dissolved	mg/L	20.9	24.3	20	19.8	24.2	25.2	15.5	22.8	26.2	22.9	25.4	25.4	12.1	22.1	24.9	29.9
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	0.0009	<0.002	<0.0005	0.0006	0.0004	<0.0004
Cobalt (Co), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001	<0.0001	<0.0001	0.0003	<0.0005	<0.0001	<0.0001	0.00005	0.00004
Copper (Cu), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00122	<0.001	<0.001	<0.001	<0.001	<0.005	0.003	0.002	<0.001	<0.001
Iron (Fe), dissolved	mg/L	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.048	0.02	0.01	0.02	0.01	0.01	0.11	0.07	0.024	<0.01
Lead (Pb), dissolved	mg/L	0.0004	0.0001	0.0002	<0.0001	0.0004	0.0004	0.000357	0.0001	0.0003	0.0003	0.0001	<0.0005	0.0016	0.0017	0.0004	<0.0001
Lithium (Li), dissolved	mg/L	0.001	0.001	0.001	0.001	0.002	0.001	<0.0050	<0.001	0.001	<0.001	0.001	<0.005	<0.001	<0.001	<0.001	0.001
Magnesium (Mg), dissolved	mg/L	3.4	4.2	3.7	4.1	4.2	4.7	3.21	4.4	4.8	3.9	4.4	4.8	2.3	4.1	4.85	5.44
Manganese (Mn), dissolved	mg/L	0.008	<0.005	0.006	<0.005	<0.005	<0.005	0.00645	0.006	<0.005	0.006	0.006	<0.005	0.008	0.01	0.0045	0.0021
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000139	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.00012	0.00004
Nickel (Ni), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00069	<0.0005	<0.0005	<0.0005	0.0012	<0.002	0.0011	0.0008	<0.001	<0.001
Phosphorus (P), dissolved	mg/L							<0.30								0.01	<0.01
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<2.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	0.1	0.2
Selenium (Se), dissolved	mg/L	0.0003	0.0006	0.0006	0.0007	0.0007	0.0006	<0.0010	<0.0002	0.0005	0.0004	0.0008	<0.001	<0.0002	0.0002	<0.0006	<0.0006
Silicon (Si), dissolved	mg/L	2.49	2.9	2.59	3.17	3.16	3.79	1.66	2.93	3.7	2.24	2.62	3.52	1.6	2.14	2.49	3.58
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000012	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Sodium (Na), dissolved	mg/L	0.6	1.1	0.7	0.8	1.7	1	<2.0	0.7	1	0.6	0.8	1.2	0.5	0.9	0.7	1.1
Strontium (Sr), dissolved	mg/L	0.062	0.09	0.071	0.077	0.103	0.085	0.0467	0.064	0.086	0.066	0.09	0.091	0.04	0.072	0.07	0.083
Sulphur (S), dissolved	mg/L	10.6	10.2	11.2	14.1	12	12.4		13.1	13	13.8	16.1	13.3	6	14		13.8
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005	<0.00001	<0.00001
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.0001	<0.0001
Titanium (Ti), dissolved	mg/L	0.0007	<0.0005	0.0007	0.0007	0.0011	0.0007	<0.010	0.0474	0.0011	0.0486	0.0012	<0.002	0.0008	0.0008	0.0007	0.0003
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000097	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0004	<0.0004
Vanadium (V), dissolved	mg/L	<0.0001	0.0001	<0.0001	0.0006	<0.0001	0.0002	<0.0010	0.0001	<0.0001	0.0001	0.0003	<0.0005	0.0002	<0.0001	0.00005	<0.00004
Zinc (Zn), dissolved	mg/L	0.049	0.021	0.03	0.029	0.02	0.016	0.0399	0.021	0.013	0.025	0.022	0.02	0.04	0.031	0.025	0.013
Zirconium (Zr), dissolved	mg/L															<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		28/05/2009	05/07/2009	07/10/2009	10/02/2010	27/05/2010	08/07/2010	06/10/2010	08/02/2011	25/05/2011	14/07/2011	30/10/2011	18/12/2011	18/01/2012	09/02/2012	09/03/2012	07/04/2012
Discharge (Flow)	L/s		625.68									330.5	205.3	100.3	168.7	134.1	107.3
Total Suspended Solids	mg/L	10	1	3	<1	7	2	<1	1	13	3	<1	<1.0	<1.0	<1.0	1.8	<1.0
pH (field)	pH units	6.71	7.27	7.63	8.04		7.9	7.97	8.12	7.73	7.75	7.86	7.56	7.62	7.84	7.44	8.2
pH (lab)	pH units	7.4	7.8	7.7	7.9	7.7	7.78	7.56	7.56	7.39	7.37	7.66	7.72	7.72	7.93	7.8	7.9
Specific Conductance (field)	µS/cm										128	185.3	182.5	174	186.2	188.1	217.3
Specific Conductance (lab)	µS/cm	78	150	179	163	91	157	166	173	77	129	180	182	186	180	185	188
Temperature (field)	C	2.5	7.6	1.3	0.5		6.7	1.3	0.1	4.3	5.7	0.6	0	0	0.1	-0.1	0.1
Dissolved Oxygen (field)	mg/L											10.58	13.01	11.7	14.11	12.67	15.71
Dissolved Oxygen (field)	%											73.7	89.3	80	97	86.5	107.7
ORP (field)	mV											271		369.4	172.3	0.09	210.1
Hardness (from total)	mg/L	34.3	72.7	80.6	77.7	40	68	76.1	77.7	34.3	61	87	82.6	80.3	86.7	87.8	85.8
Hardness (from dissolved)	mg/L	35.6	72.9	80.7	81.1	42.5	70.7	78.2	72.4	34.4	60.4	78.3	80.4	84.1	84.7	84.8	86.7
Alkalinity, total	mg/L							38	44	12	26	41			45.8		
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L			45	32			50	40	22	31	40.8	43.4	42.5	42.6	41.9	42.3
Ammonia (N)	mg/L																
Nitrite (N)	mg/L											<0.05		<0.005	<0.005	<0.05	<0.005
Nitrate (N)	mg/L											<0.2		0.181	0.269	0.26	0.162
Total Kjeldahl Nitrogen	mg/L											0.2		0.037	0.041	<0.20	0.042
Dissolved Organic Carbon	mg/L							1	<0.5	4.6	2.8	0.9		<0.50	0.92	<0.50	<0.50
Aluminum (Al), total	mg/L	0.0811	0.0117	0.0286	0.005	0.0552	0.0128	0.0059	0.0044	0.0767	0.039	0.0056	0.0036	0.0034	0.0029	0.0111	0.0024
Antimony (Sb), total	mg/L	0.00032	0.00028	0.00037	0.00022	0.00027	0.00027	0.00025	0.00024	0.00043	0.00039	0.00025	0.00022	0.00024	0.00022	0.00025	0.00025
Arsenic (As), total	mg/L	0.00408	0.00265	0.00333	0.00242	0.00364	0.00272	0.0025	0.00249	0.00496	0.00305	0.0023	0.00255	0.0026	0.00253	0.00284	0.0026
Barium (Ba), total	mg/L	0.0324	0.048	0.0547	0.0569	0.0363	0.0508	0.0581	0.0616	0.0328	0.0419	0.0603	0.0592	0.0606	0.0565	0.0593	0.056
Beryllium (Be), total	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000009	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000403	0.000164	0.000327	0.000033	0.000242	0.000172	0.000142	0.00007	0.000784	0.000291	0.000089	0.000077	0.000083	0.000076	0.000103	0.000076
Calcium (Ca), total	mg/L	10.2	22.2	24.6	23.9	12.1	20.4	22.9	24.1	10.4	18.6	27.4	25.2	24.5	26.8	27.2	26.4
Chromium (Cr), total	mg/L	0.0005	0.0001	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0003	0.0004	<0.0001	0.0002	0.0002	<0.0001	0.0001	<0.0001
Cobalt (Co), total	mg/L	0.000141	0.000025	0.000068	0.00002	0.000104	0.000037	0.000026	0.000016	0.000154	0.000053	0.000014	0.000012	0.000011	0.000008	0.000037	0.000006
Copper (Cu), total	mg/L	0.00158	0.0003	0.00064	0.00028	0.00119	0.00044	0.00026	0.0001	0.00155	0.00128	0.00021	0.0003	0.00024	0.00016	0.00027	0.00018
Iron (Fe), total	mg/L	0.172	0.028	0.078	0.02	0.126	0.046	0.032	0.03	0.202	0.072	0.021	0.018	0.022	0.009	0.042	0.009
Lead (Pb), total	mg/L	0.005	0.000245	0.00328	0.000159	0.00202	0.000328	0.000187	0.000193	0.0103	0.0013	0.000225	0.000097	0.000446	0.000129	0.00369	0.000077
Lithium (Li), total	mg/L	0.0006	0.0007	0.001	0.001	<0.0005	0.0007	0.0011	0.0011	<0.0005	0.0007	0.0011	0.0011	0.0013	0.0011	0.0012	0.0011
Magnesium (Mg), total	mg/L	2.12	4.21	4.69	4.36	2.4	4.16	4.58	4.28	2.03	3.55	4.55	4.79	4.62	4.79	4.85	4.83
Manganese (Mn), total	mg/L	0.0211	0.00465	0.0106	0.0037	0.0143	0.00779	0.00785	0.00483	0.032	0.00896	0.00389	0.00277	0.00314	0.002	0.00633	0.002
Mercury (Hg), total	mg/L	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00012	0.00016	0.00018	0.00024	0.00013	0.00014	0.00022	0.00025	0.00011	0.00013	0.00017	0.00021	0.00022	0.00021	0.00021	0.00021
Nickel (Ni), total	mg/L	0.00102	0.00034	0.00052	0.00021	0.00056	0.00042	0.00032	0.00025	0.00092	0.00064	0.00022	0.00027	0.00023	0.00021	0.00022	0.00021
Phosphorus (P), total	mg/L	0.024	0.004		0.009	0.015	0.004		0.007	0.029	0.008	0.003	0.004	0.009	0.007	0.02	0.004
Potassium (K), total	mg/L	0.21	0.09	0.12	0.19	0.15	0.08	0.15	0.17	0.32	0.12	0.16	0.16	0.19	0.18	0.19	0.17
Selenium (Se), total	mg/L	0.00022	0.00054	0.00062	0.00059	0.00032	0.00046	0.0006	0.00062	0.00031	0.00039	0.00075	0.00076	0.00078	0.0008	0.0008	0.0008
Silicon (Si), total	mg/L	1.4	2.38	2.91	4.13	1.59	2.03	3.05	3.57	1.46	2.21	3.6	3.4	3.7	3.7	3.7	3.5

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		28/05/2009	05/07/2009	07/10/2009	10/02/2010	27/05/2010	08/07/2010	06/10/2010	08/02/2011	25/05/2011	14/07/2011	30/10/2011	18/12/2011	18/01/2012	09/02/2012	09/03/2012	07/04/2012
Silver (Ag), total	mg/L	0.000019	<0.000005	0.000052	<0.000005	0.000015	<0.000005	<0.000005	<0.000005	0.000056	0.000009	<0.000005	<0.000005	0.000022	<0.000005	0.000006	<0.000005
Sodium (Na), total	mg/L	0.34	0.63	0.73	1.13	0.38	0.58	0.91	0.99	0.3	0.56	0.91	1.01	1.04	1.06	1.1	1.13
Strontium (Sr), total	mg/L	0.0349	0.069	0.0805	0.0735	0.0426	0.0693	0.0821	0.0857	0.0329	0.0582	0.0838	0.0877	0.0884	0.086	0.0851	0.0861
Sulphur (S), total	mg/L	6	14	16	13	<10	14	15	11	<10	11	16	15	17	16	15	15
Thallium (Tl), total	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), total	mg/L	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00004	0.0001	0.00004	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti), total	mg/L	0.0008	<0.0005	<0.0005	<0.0005	0.0014	<0.0005	<0.0005	<0.0005	0.0015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	0.000077	0.000119	0.000173	0.000226	0.000079	0.000104	0.000159	0.000242	0.000071	0.000078	0.000161	0.000199	0.000225	0.000223	0.000212	0.000272
Vanadium (V), total	mg/L	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.0387	0.0141	0.029	0.0037	0.0203	0.0126	0.0132	0.0068	0.0666	0.0257	0.0079	0.0076	0.008	0.0069	0.0099	0.0067
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.043	0.0125	0.0077	0.0044	0.0221	0.0092	0.0037	0.0022	0.0361	0.0261	0.0031	0.002	0.0016	0.0018	0.0023	0.0021
Antimony (Sb), dissolved	mg/L	0.00032	0.00029	0.0003	0.00024	0.00026	0.00028	0.00025	0.00022	0.00028	0.00033	0.00023	0.00021	0.00022	0.00024	0.00023	0.00025
Arsenic (As), dissolved	mg/L	0.00285	0.00244	0.00246	0.0025	0.00252	0.00248	0.00236	0.00218	0.00263	0.0026	0.00217	0.00246	0.00238	0.00247	0.0025	0.00264
Barium (Ba), dissolved	mg/L	0.0287	0.0482	0.053	0.06	0.0354	0.0494	0.0583	0.0554	0.0307	0.0434	0.0526	0.059	0.0569	0.0588	0.0575	0.0567
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00037	0.00019	0.000266	0.000039	0.000183	0.000168	0.000136	0.000061	0.000603	0.000249	0.000086	0.000071	0.000078	0.000075	0.000063	0.000076
Calcium (Ca), dissolved	mg/L	10.6	22.3	24.3	24.8	12.8	21.3	23.5	22.2	10.4	18.5	23.5	24	25.9	26.2	26	26.7
Chromium (Cr), dissolved	mg/L	0.0004	0.0001	0.0003	0.0004	0.0002	0.0005	0.0005	0.0004	0.0003	0.0004	0.0001	0.0001	0.0002	0.0001	0.0001	<0.0001
Cobalt (Co), dissolved	mg/L	0.000054	0.000023	0.000026	0.000017	0.000029	0.000033	0.000021	0.000023	0.000053	0.000032	0.00001	0.00001	0.000011	<0.000005	0.000006	0.000006
Copper (Cu), dissolved	mg/L	0.00145	0.00039	0.00022	0.00023	0.00075	0.00063	0.00042	0.00079	0.00117	0.0013	0.00015	0.0001	0.00022	0.00486	0.00012	0.00016
Iron (Fe), dissolved	mg/L	0.052	0.021	0.016	0.011	0.031	0.032	0.017	0.012	0.044	0.036	0.008	0.005	0.004	0.004	0.002	0.002
Lead (Pb), dissolved	mg/L	0.00213	0.000415	0.000158	0.000099	0.000169	0.000781	0.000064	0.000716	0.000775	0.000355	0.000042	0.000048	0.000034	0.000676	0.000017	0.000021
Lithium (Li), dissolved	mg/L	<0.0005	0.0007	0.0012	0.0011	0.0006	0.0007	0.0013	0.0009	<0.0005	0.0006	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012
Magnesium (Mg), dissolved	mg/L	2.21	4.21	4.83	4.64	2.55	4.24	4.71	4.09	2.07	3.48	4.74	4.96	4.7	4.69	4.82	4.87
Manganese (Mn), dissolved	mg/L	0.0134	0.00447	0.00585	0.00337	0.00412	0.00755	0.0072	0.00471	0.00726	0.00536	0.00399	0.00264	0.00222	0.00161	0.00163	0.00143
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	0.00012	0.00015	0.00017	0.00027	0.00014	0.00016	0.00021	0.00026	0.00011	0.00015	0.00017	0.00019	0.00019	0.00023	0.00021	0.00021
Nickel (Ni), dissolved	mg/L	0.00094	0.00043	0.0004	0.00026	0.00051	0.00082	0.00033	0.00038	0.00077	0.00053	0.00018	0.00027	0.00019	0.00026	0.00018	0.00023
Phosphorus (P), dissolved	mg/L	0.009	0.003	0.006	0.009	0.004	0.004		0.006	0.009	0.003	0.002	0.005	0.004	0.006	0.007	0.005
Potassium (K), dissolved	mg/L	0.23	0.11	0.12	0.2	0.15	0.11	0.16	0.29	0.3	0.08	0.15	0.18	0.19	0.18	0.18	0.18
Selenium (Se), dissolved	mg/L	0.00026	0.00053	0.0006	0.00066	0.0003	0.00045	0.00058	0.00059	0.00028	0.00039	0.0007	0.00071	0.00082	0.00076	0.0008	0.00081
Silicon (Si), dissolved	mg/L	1.38	2.37	2.88	4.31	1.79	2.27	3.18	3.07	1.4	2.22	3.1	3.4	3.5	3.5	3.6	3.5
Silver (Ag), dissolved	mg/L	0.000019	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000017	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	0.36	0.66	0.74	1.19	0.4	0.62	0.93	1.06	0.31	0.49	0.97	1.05	1.06	1.04	1.12	1.17
Strontium (Sr), dissolved	mg/L	0.0342	0.07	0.0812	0.0806	0.0429	0.067	0.0834	0.0777	0.033	0.0579	0.0819	0.0874	0.0844	0.086	0.0847	0.084
Sulphur (S), dissolved	mg/L	8	14	18	14	<10	13	16	11	<10	12	15	16	15	15	15	14
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.00002	<0.00001	0.00001	0.00008	0.00002	<0.0002	0.0003	<0.0002	<0.0002
Titanium (Ti), dissolved	mg/L	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.000052	0.000119	0.000161	0.00024	0.00006	0.000102	0.000157	0.000217	0.000049	0.00008	0.000161	0.000184	0.000201	0.000213	0.000267	0.000273
Vanadium (V), dissolved	mg/L	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0403	0.0163	0.0241	0.005	0.0165	0.0148	0.0129	0.0086	0.0587	0.022	0.0082	0.0087	0.0084	0.0078	0.007	0.007
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		06/05/2012	01/06/2012	02/07/2012	01/08/2012	20/09/2012	16/10/2012	21/11/2012	06/12/2012	11/01/2013	09/02/2013	07/03/2013	08/04/2013	02/05/2013	01/06/2013	04/07/2013	11/08/2013
Discharge (Flow)	L/s	127.8	997.6025	1544.98	668	647	478.1913				127.78	217.8		106		575.523	337.64
Total Suspended Solids	mg/L	<1.0	1.9	7.3	<1.0	<1.0	<1.0	4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	19.8	<1.0	<1.0
pH (field)	pH units	7.74	7.68	7.64	7.13	7.95	6.96	8.43	6.89	7.66	7.58	7.32	8.32	7.4	7.11	7.54	7.45
pH (lab)	pH units	7.82	7.65	7.58	7.73	7.88	7.76	7.98	7.96	7.87	7.74	7.87	7.96	7.96	7.35	7.64	8.37
Specific Conductance (field)	µS/cm	173.0	94.69	152.4	198.1		210.3		214	199	194.9	116.3	177.3	207.2	65.5	173.3	172.9
Specific Conductance (lab)	µS/cm	181	122	140	178	187	184	186	188	188	189	191	188	192	57.7	165	188
Temperature (field)	C	0.9	2.6	4.6	4.9	4.2	0.9	0.3	0.16	0.09	0.2	0	0.1	0.4	3.3	5.3	7.6
Dissolved Oxygen (field)	mg/L	13.46		12.73	13.47	12.27	12.59	13		11.68	14.28	15.66	12.97	12.74	10.62	11.28	11.72
Dissolved Oxygen (field)	%	94.90		98.9	105.2	94	88.3	100		80.2	100.8	109.9	91.3	90.7	81	90.8	99.7
ORP (field)	mV	71.20		90.5	105.3	90.3	213.8	347	139.4		234.4	43.3	111.5	48.8	29.9	87.2	194.6
Hardness (from total)	mg/L	86.1	50.8	67	84.4	85.3	89.1	89.9	86.3	90.4	87.2	87.9	95.3	88.3	28.5	74.2	89.8
Hardness (from dissolved)	mg/L	83.6	50.9	63.9	85.5	87.2	84.6	86.1	83	90	87.3	90	94.9	87.2	26.8	76.3	86.5
Alkalinity, total	mg/L	44.4		28.3			38				45.8		36.8	49.6	12.2	32.2	
Chloride	mg/L	<0.50		<0.50			<0.50				0.56		<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride	mg/L												0.070	0.069	0.032	0.044	0.059
Sulphate, dissolved	mg/L	43	29.7	34.9	47.8	53.4	50.4	46.1	48.3	40.9	46.5	47.9	45.9	45.1	14.1	45.1	49.7
Ammonia (N)	mg/L																
Nitrite (N)	mg/L	<0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	0.0019	<0.0010	<0.0010
Nitrate (N)	mg/L	0.102	<0.20	<0.20	<0.20	<0.20	<0.20	0.22	0.195	0.172	0.18	0.174	0.164	0.137	0.0288	0.0295	0.0250
Total Kjeldahl Nitrogen	mg/L	0.508	0.23	<0.20	0.24	<0.20	0.22	<0.20	0.059	0.02	<0.020	<0.020	<0.050	<0.050	0.217	0.059	0.085
Dissolved Organic Carbon	mg/L	1.29	2.7	1.8	0.94	1.02	0.72	0.81	0.89	<0.50	0.52	<0.50	0.60	0.69	3.50	1.25	0.60
Aluminum (Al), total	mg/L	0.00711	0.0358	0.0398	0.00634	0.00715	0.0654	0.0122	0.00728	0.0034	0.00328	0.00334	0.0215	0.0053	0.500	0.0228	0.0099
Antimony (Sb), total	mg/L	0.000268	0.000293	0.000274	0.000271	0.000256	0.000283	0.000278	0.000223	0.000217	0.000243	0.000224	0.00024	0.00024	0.00116	0.00026	0.00026
Arsenic (As), total	mg/L	0.00299	0.00302	0.00332	0.00262	0.00271	0.00623	0.00254	0.00258	0.0027	0.00274	0.00269	0.00307	0.00281	0.0127	0.00265	0.00289
Barium (Ba), total	mg/L	0.0573	0.0418	0.0437	0.0555	0.0589	0.0689	0.063	0.0648	0.0649	0.0571	0.0607	0.0641	0.0587	0.0353	0.0539	0.0678
Beryllium (Be), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000112	0.000423	0.000174	0.000168	0.000135	0.000309	0.000101	0.000065	0.000089	0.000064	0.000069	0.000076	0.000059	0.00119	0.000110	0.000091
Calcium (Ca), total	mg/L	26.1	14.9	20.6	25.6	25.9	27.9	27.3	26.2	28.1	26.6	27.1	29.1	26.8	8.36	22.6	27.4
Chromium (Cr), total	mg/L	<0.00010	0.00011	0.00026	<0.00010	<0.00010	0.00019	0.00018	<0.00010	<0.00010	<0.00010	<0.00010	0.00021	0.00025	0.00082	0.0184	0.00016
Cobalt (Co), total	mg/L	0.000009	0.0000495	0.000074	0.000029	0.000021	0.000214	0.000058	0.000016	0.000014	0.000007	0.000016	<0.00010	<0.00010	0.00053	<0.00010	<0.00010
Copper (Cu), total	mg/L	0.000495	0.00127	0.000829	0.000352	0.00037	0.00128	0.000852	0.000428	0.00622	0.000112	0.000476	<0.00050	<0.00050	0.00444	0.00149	0.00077
Iron (Fe), total	mg/L	0.0308	0.0657	0.123	0.0299	0.0302	0.384	0.0562	0.0246	0.0209	0.0135	0.0137	0.059	0.015	1.03	0.057	0.047
Lead (Pb), total	mg/L	0.000304	0.00125	0.00175	0.000164	0.000101	0.00477	0.00707	0.000856	0.000229	0.0001	0.000136	0.000463	0.000128	0.0351	0.000551	0.000443
Lithium (Li), total	mg/L	0.00112	0.00057	0.00059	0.00094	0.0008	0.00096	0.00101	0.00113	0.00113	0.00104	0.00122	<0.00050	0.00117	<0.00050	<0.00050	0.00052
Magnesium (Mg), total	mg/L	5.1	3.32	3.8	4.97	4.99	4.71	5.25	5.04	4.92	5.02	4.91	5.48	5.16	1.84	4.32	5.22
Manganese (Mn), total	mg/L	0.00367	0.00824	0.0125	0.00698	0.00574	0.0439	0.011	0.00508	0.00351	0.00273	0.00295	0.00524	0.00243	0.0716	0.0112	0.0106
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000204	0.000124	0.000101	0.000165	0.000161	0.000143	0.000222	0.000202	0.000241	0.000236	0.000249	0.000246	0.000258	0.000181	0.000216	0.000198
Nickel (Ni), total	mg/L	0.000267	0.000898	0.000551	0.000354	0.000289	0.000563	0.00029	0.000491	0.000201	0.00027	0.00022	<0.00050	<0.00050	0.00219	0.00075	<0.00050
Phosphorus (P), total	mg/L	0.0061	0.0099	0.0061	<0.0020	0.0033	0.0258	0.0091	0.0049	0.0071	0.0047	0.007	<0.050	<0.050	0.059	<0.050	<0.050
Potassium (K), total	mg/L	0.262	0.23	0.077	0.095	0.145	0.154	0.198	0.201	0.211	0.186	0.193	0.23	0.20	0.43	0.11	0.13
Selenium (Se), total	mg/L	0.000919	0.000454	0.000448	0.000667	0.000703	0.00071	0.000616	0.000881	0.000561	0.000877	0.000971	0.00073	0.00073	0.00024	0.00052	0.00055
Silicon (Si), total	mg/L	3.36	1.74	2.17	2.9	2.72	3.44	3.46	3.35	4.15	3.77	3.63	3.73	3.64	1.64	2.34	2.93

Station Name		KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38	KV-38
Sample Date		06/05/2012	01/06/2012	02/07/2012	01/08/2012	20/09/2012	16/10/2012	21/11/2012	06/12/2012	11/01/2013	09/02/2013	07/03/2013	08/04/2013	02/05/2013	01/06/2013	04/07/2013	11/08/2013
Silver (Ag), total	mg/L	<0.0000050	0.0000806	0.0000169	<0.0000050	<0.0000050	0.000014	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	0.000550	<0.000010	<0.000010
Sodium (Na), total	mg/L	1.08	0.611	0.506	0.777	0.753	0.781	1.1	1.05	1.08	1.1	1.11	0.998	1.19	0.283	0.642	0.828
Strontium (Sr), total	mg/L	0.0865	0.0554	0.0589	0.0806	0.0844	0.0863	0.0911	0.0907	0.0907	0.088	0.0904	0.107	0.0999	0.0272	0.0675	0.0931
Sulphur (S), total	mg/L	16	10	14	17	19	20	16.6	16.6	17.1	15.7	15.1	15.6	15.9	4.99	14.3	16.6
Thallium (Tl), total	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000003	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00023	<0.00010
Titanium (Ti), total	mg/L	<0.00050	0.0006	0.00076	<0.00050	<0.00050	0.00237	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	0.013	<0.010	<0.010
Uranium (U), total	mg/L	0.000281	0.000111	0.0000783	0.000122	0.000134	0.000186	0.000231	0.00023	0.000232	0.000273	0.00028	0.000306	0.000332	0.000122	0.000094	0.000134
Vanadium (V), total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	0.0013	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.0108	0.0386	0.015	0.016	0.0114	0.0224	0.0105	0.00789	0.00748	0.00725	0.00751	0.0070	0.0060	0.101	0.0108	0.0104
Zirconium (Zr), total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00605	0.0218	0.0149	0.00479	0.00499	0.00246	0.00224	0.00159	0.00165	0.00246	0.00121	0.0025	0.0019	0.0453	0.0078	0.0048
Antimony (Sb), dissolved	mg/L	0.000274	0.000267	0.000228	0.000278	0.000265	0.000234	0.000235	0.000219	0.000217	0.000232	0.000229	0.00022	0.00023	0.00034	0.00022	0.00025
Arsenic (As), dissolved	mg/L	0.0027	0.00245	0.00223	0.00247	0.0025	0.00232	0.00215	0.0022	0.00246	0.00248	0.00246	0.00271	0.00254	0.00287	0.00242	0.00262
Barium (Ba), dissolved	mg/L	0.0563	0.0414	0.0432	0.0542	0.0603	0.061	0.0621	0.064	0.0616	0.0564	0.059	0.0567	0.0593	0.0234	0.0537	0.0627
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.00009	0.000232	0.000122	0.000166	0.000131	0.000102	0.00009	0.00006	0.000079	0.000067	0.000062	0.000058	0.000055	0.000598	0.000098	0.000083
Calcium (Ca), dissolved	mg/L	25.2	15	19.8	26.5	26.7	26	26.7	25.3	27.8	27.1	27.6	29.1	26.6	8.03	23.4	26.5
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00017	0.00019	<0.00010	0.00011	0.00011	0.00011	0.00024	0.00012	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000019	0.0000256	0.0000238	0.00003	0.000014	0.000019	0.00002	0.000011	0.000009	0.000005	0.000008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.00054	0.000902	0.000603	0.000306	0.000307	0.000382	0.000944	0.000406	0.000874	0.000161	0.000287	0.00047	0.00030	0.00210	0.00045	0.00031
Iron (Fe), dissolved	mg/L	0.0197	0.0266	0.0225	0.0163	0.0162	0.0095	0.0074	0.0051	0.0036	0.0034	0.0038	<0.010	<0.010	0.054	0.020	0.017
Lead (Pb), dissolved	mg/L	0.000279	0.00027	0.0000602	0.00004	0.000029	0.000075	0.000673	0.000049	0.000025	0.000036	0.000071	0.000056	0.000090	0.00199	0.000105	0.000118
Lithium (Li), dissolved	mg/L	0.00112	0.00059	0.00067	0.00094	0.00089	0.00098	0.00109	0.00108	0.00115	0.00105	0.00123	<0.00050	0.00122	<0.00050	<0.00050	0.00083
Magnesium (Mg), dissolved	mg/L	5.04	3.27	3.53	4.67	5	4.8	4.69	4.83	5.03	4.74	5.14	5.39	5.06	1.64	4.38	4.94
Manganese (Mn), dissolved	mg/L	0.00319	0.00312	0.00358	0.00599	0.00506	0.00502	0.00507	0.00363	0.00267	0.00219	0.0026	0.00231	0.00187	0.0115	0.00766	0.00934
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000231	0.000127	0.000083	0.000164	0.000196	0.000165	0.00023	0.000196	0.000225	0.00023	0.000237	0.000244	0.000241	0.000089	0.000153	0.000187
Nickel (Ni), dissolved	mg/L	0.000595	0.000634	0.000405	0.000335	0.000302	0.000264	0.000392	0.000245	0.000231	0.000307	0.000234	<0.00050	<0.00050	0.00090	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	0.0074	<0.0020	0.0032	<0.0020	0.0026	0.0042	0.0052	<0.0020	0.0063	0.0061	0.0064	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.27	0.203	0.067	0.091	0.146	0.163	0.281	0.174	0.202	0.18	0.238	0.22	0.19	0.35	0.11	0.12
Selenium (Se), dissolved	mg/L	0.000853	0.000404	0.000426	0.000584	0.000585	0.000722	0.000748	0.000732	0.0007	0.000811	0.000745	0.00076	0.00078	0.00020	0.00052	0.00052
Silicon (Si), dissolved	mg/L	3.26	1.76	2.08	2.89	2.84	3.19	3.5	3.22	4.05	3.82	3.87	3.61	3.56	1.03	2.38	2.85
Silver (Ag), dissolved	mg/L	<0.0000050	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.13	0.522	0.467	0.727	0.752	0.802	1.03	1	1.11	1.11	1.21	1.01	1.10	0.252	0.629	0.786
Strontium (Sr), dissolved	mg/L	0.0841	0.0547	0.0585	0.08	0.0855	0.0839	0.0874	0.0884	0.0875	0.09	0.0909	0.105	0.0888	0.0241	0.0677	0.0855
Sulphur (S), dissolved	mg/L	14	<10	13	17	18	19	15.8	14.7	17.1	15.2	14.7	15.2	15.4	4.72	14.4	16.0
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000273	0.000102	0.0000633	0.000112	0.000139	0.000134	0.000208	0.00019	0.000239	0.00028	0.000278	0.000290	0.000297	0.000048	0.000087	0.000118
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.0108	0.0231	0.0122	0.0144	0.0116	0.0105	0.0107	0.00663	0.00786	0.00698	0.00798	0.0057	0.0051	0.0532	0.0100	0.0083
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39
Sample Date		19/07/2005	26/05/2006	16/07/2007	08/09/2007	13/03/2008	18/05/2008	05/07/2008	02/10/2008	02/02/2009	28/05/2009	05/07/2009	07/10/2009	27/05/2010	08/07/2010	06/10/2010
Discharge (Flow)	L/s											7	15	207.1065	33.62243	12
Total Suspended Solids	mg/L	<2	<3.0			<5	7	<3	<2	7	3	2	140	9	1	<1
pH (field)	pH units			8.13	7.63	7.5	7.44	7.17	7.4		7.03	7.66	7.69	7.87	8.13	7.95
pH (lab)	pH units	7.78	7.98	7.74	7.96	7.68	7.22	7.93	7.8	7.79	7.6	7.9	7.9	7.8	7.76	7.79
Specific Conductance (field)	µS/cm															
Specific Conductance (lab)	µS/cm	249	192	245	257	574	161	229	266	411	130	280	320	130	268	338
Temperature (field)	C			7	3.0	0.1	0	6	3		3.4	8.3	0.8	5.5	7.5	0.3
Dissolved Oxygen (field)	mg/L															
Dissolved Oxygen (field)	%															
ORP (field)	mV															
Hardness (from total)	mg/L										59.3	132	152	57.5	113	163
Hardness (from dissolved)	mg/L	110	96.5			281	75	100	141	240	60.1	133	153	61.5	126	165
Alkalinity, total	mg/L	47														58
Chloride	mg/L															
Fluoride	mg/L															
Sulphate, dissolved	mg/L		56.8										96	33	82	120
Ammonia (N)	mg/L	0.003														
Nitrite (N)	mg/L	0.05	0.226													
Nitrate (N)	mg/L	<0.03	<0.0010													
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L															0.7
Aluminum (Al), total	mg/L	0.008	0.0189	0.006	0.012	0.01	0.18	0.008	0.025	<0.005	0.0594	0.0124	0.617	0.0769	0.011	0.0133
Antimony (Sb), total	mg/L	0.0019	0.00174	0.0016	0.0018	0.0018	0.0018	0.0017	0.0011	0.0018	0.00139	0.00185	0.00435	0.00125	0.00168	0.00154
Arsenic (As), total	mg/L	0.0091	0.00925	0.0081	0.0105	0.0103	0.0132	0.0074	0.0112	0.0069	0.00878	0.00829	0.0472	0.00938	0.00851	0.00806
Barium (Ba), total	mg/L	0.045	0.0364	0.046	0.049	0.079	0.033	0.043	0.047	0.065	0.0322	0.0464	0.0796	0.0315	0.0466	0.0534
Beryllium (Be), total	mg/L	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	0.000006	<0.000005	0.000098	0.000007	<0.000005	<0.000005
Boron (B), total	mg/L	<0.002	<0.010	0.002	0.003	0.002	<0.002	0.002	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.0035	0.00403	0.00283	0.00318	0.00288	0.00373	0.00256	0.00236	0.00368	0.00284	0.00283	0.00606	0.00153	0.00229	0.00254
Calcium (Ca), total	mg/L	32.3	30.4	34.6	35.9	78.5	23.6	33.4	43.2	72.4	18.1	40.4	46.2	17.5	32.9	48.5
Chromium (Cr), total	mg/L	<0.0005	<0.00050	<0.0005	0.0006	0.0006	0.0008	<0.0005	0.0004	<0.0004	0.0004	<0.0001	0.0012	0.0003	0.0003	0.0004
Cobalt (Co), total	mg/L	<0.0001	<0.00010	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.00004	0.00002	0.00008	0.000013	0.00171	0.000154	0.000023	0.000026
Copper (Cu), total	mg/L	<0.001	0.00210	<0.001	0.001	<0.001	0.009	0.001	0.001	<0.001	0.00268	0.00152	0.00958	0.00235	0.00053	0.00041
Iron (Fe), total	mg/L	<0.1	<0.030	<0.1	<0.1	<0.1	0.4	<0.05	0.05	<0.01	0.073	0.011	1.82	0.14	0.017	0.024
Lead (Pb), total	mg/L	0.0025	0.00454	0.0013	0.0024	0.0005	0.0324	0.0014	0.0017	0.0008	0.00919	0.00124	0.177	0.00531	0.000973	0.00173
Lithium (Li), total	mg/L	0.003	<0.0050	0.002	0.003	0.008	0.002	0.003	0.002	0.003	0.001	0.0024	0.0032	0.0014	0.0023	0.0027
Magnesium (Mg), total	mg/L	5.7	5.32	6.5	6.3	17.8	4.2	6.1	7.89	13.9	3.41	7.62	8.91	3.33	7.42	10.2
Manganese (Mn), total	mg/L	<0.005	0.00805	<0.005	<0.005	0.006	0.09	<0.005	0.0022	0.0008	0.0148	0.00105	0.255	0.019	0.00189	0.00283
Mercury (Hg), total	mg/L										<0.00001	<0.00001		<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	0.000252	<0.001	<0.001	<0.001	<0.001	<0.001	0.00027	0.00032	0.00021	0.00037	0.00048	0.00024	0.00038	0.00043
Nickel (Ni), total	mg/L	0.001	0.00121	0.0006	0.0016	0.0015	0.0023	0.0021	0.001	0.001	0.0015	0.0013	0.00415	0.00104	0.0009	0.00098
Phosphorus (P), total	mg/L		<0.30						<0.01	<0.01	0.015	0.005		0.023	0.005	
Potassium (K), total	mg/L	<0.4	<2.0	<0.4	<0.4	1.3	0.4	<0.4	0.2	0.2	0.22	0.18	0.22	0.17	0.18	0.19
Selenium (Se), total	mg/L	0.0007	<0.0010	0.0006	0.0012	0.002	<0.0002	0.0008	0.002	0.0009	0.00036	0.00105	0.0011	0.00039	0.00075	0.0012
Silicon (Si), total	mg/L	2.82	1.80	2.65	2.55	3.54	1.92	2.31	2.74	3.36	1.59	2.77	3.38	1.73	2.2	2.88

Station Name		KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39
Sample Date		19/07/2005	26/05/2006	16/07/2007	08/09/2007	13/03/2008	18/05/2008	05/07/2008	02/10/2008	02/02/2009	28/05/2009	05/07/2009	07/10/2009	27/05/2010	08/07/2010	06/10/2010
Silver (Ag), total	mg/L	<0.0001	0.000034	<0.0001	<0.0001	<0.00001	0.00029	0.00003	<0.00001	<0.00001	0.000051	0.000009	0.00152	0.000032	<0.000005	0.000014
Sodium (Na), total	mg/L	0.9	<2.0	0.9	1	2.4	0.6	0.9	1.12	1.66	0.46	1.04	1.1	0.47	0.95	1.29
Strontium (Sr), total	mg/L	0.108	0.0777	0.122	0.133	0.288	0.082	0.121	0.103	0.199	0.0559	0.127	0.143	0.0574	0.125	0.155
Sulphur (S), total	mg/L	20.3		23.6	23.9	59.6	14.5	22.5		44.4	14	26	34	12	28	39
Thallium (Tl), total	mg/L	<0.00005	<0.00010	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	0.000003	<0.000002	0.000035	0.000002	0.000002	0.000002
Tin (Sn), total	mg/L	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.00001	0.00011	0.00003	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.0014	<0.010	0.042	0.0019	0.004	0.0055	0.0024	0.0014	0.0004	0.0015	<0.0005	0.0157	0.0018	0.0006	<0.0005
Uranium (U), total	mg/L	<0.0005	0.000325	<0.0005	0.0005	0.002	<0.0005	<0.0005	0.0005	0.0016	0.000161	0.00058	0.00125	0.000173	0.000482	0.000968
Vanadium (V), total	mg/L	<0.0001	<0.0010	<0.0001	0.0001	0.0002	0.0004	<0.0001	0.00009	<0.00004	<0.0002	<0.0002	0.0012	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.271	0.363	0.238	0.304	0.276	0.359	0.229	0.249	0.26	0.256	0.198	0.468	0.133	0.158	0.191
Zirconium (Zr), total	mg/L	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	<0.005	0.0093	0.006	0.011	<0.02	0.043	0.007	<0.005	<0.005	0.0348	0.007	0.0183	0.0192	0.0055	0.0082
Antimony (Sb), dissolved	mg/L	0.002	0.00173	0.0017	0.0026	0.002		0.0024	0.002	0.0024	0.00132	0.00184	0.0016	0.00125	0.00165	0.00153
Arsenic (As), dissolved	mg/L	0.0092	0.00898	0.0089	0.0089	0.01	0.0074	0.0075	0.009	0.0065	0.00745	0.00818	0.00823	0.00772	0.00798	0.00833
Barium (Ba), dissolved	mg/L	0.046	0.0369	0.048	0.047	0.076	0.029	0.043	0.045	0.055	0.0308	0.0465	0.0519	0.0298	0.044	0.0532
Beryllium (Be), dissolved	mg/L	<0.0001	<0.00050	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.00050	<0.0005	<0.0005	<0.002	<0.0005	<0.0005		<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.010	<0.002	<0.002	<0.01	<0.002	<0.002	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00366	0.00411	0.00304	0.00294	0.0032	0.00418	0.00272	0.0026	0.00354	0.00279	0.00281	0.00258	0.00136	0.00221	0.0024
Calcium (Ca), dissolved	mg/L	33.1	30.0	37.1	38.6	82.5	23	31.6	43.3	72.4	18.3	40.8	46.9	18.6	38.3	48.3
Chromium (Cr), dissolved	mg/L	<0.0005	<0.00050	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0004	<0.0004	0.0004	<0.0001	0.0003	0.0002	0.0005	0.0006
Cobalt (Co), dissolved	mg/L	<0.0001	<0.00010	<0.0001	0.0002	<0.0005	0.0002	<0.0001	0.00009	0.00004	0.000045	0.00001	0.000075	0.000023	0.000014	0.000016
Copper (Cu), dissolved	mg/L	0.003	0.00185	<0.001	<0.001	<0.005	0.008	0.001	<0.001	<0.001	0.00253	0.00043	0.00033	0.00162	0.00085	0.00053
Iron (Fe), dissolved	mg/L	<0.01	<0.030	<0.01	0.01	0.02	0.03	0.02	<0.01	<0.01	0.018	0.002	0.023	0.011	0.01	0.017
Lead (Pb), dissolved	mg/L	0.0017	0.00213	0.0014	0.0022	<0.0005	0.0081	0.0008	0.0008	0.0007	0.00273	0.000807	0.00103	0.000617	0.00055	0.000293
Lithium (Li), dissolved	mg/L	0.002	<0.0050	0.002	0.002	<0.005	0.001	0.002	0.002	0.003	0.0011	0.0023	0.0025	0.0014	0.0022	0.0027
Magnesium (Mg), dissolved	mg/L	5.9	5.26	6	6.6	18.2	4.2	6.2	7.99	14.3	3.49	7.66	8.74	3.66	7.38	10.9
Manganese (Mn), dissolved	mg/L	0.008	0.00452	<0.005	<0.005	0.006	0.018	<0.005	0.0008	0.0008	0.00449	0.00055	0.014	0.00204	0.00113	0.00109
Mercury (Hg), dissolved	mg/L										<0.00001	<0.00001	<0.00001	<0.00001	0.00001	
Molybdenum (Mo), dissolved	mg/L	<0.001	0.000277	<0.001	<0.001	<0.005	<0.001	<0.001	0.00029	0.00028	0.0002	0.00038	0.00041	0.00026	0.00037	0.00044
Nickel (Ni), dissolved	mg/L	0.0006	0.00126	<0.0005	0.0016	<0.002	0.0016	0.0008	0.001	0.001	0.00134	0.00092	0.00122	0.00082	0.00095	0.00105
Phosphorus (P), dissolved	mg/L		<0.30						<0.01	<0.01	0.006	0.004	0.005	0.005	0.005	
Potassium (K), dissolved	mg/L	<0.4	<2.0	<0.4	<0.4	1.3	<0.4	<0.4	0.2	<0.1	0.24	0.2	0.19	0.18	0.2	0.22
Selenium (Se), dissolved	mg/L	0.0008	<0.0010	0.0006	0.0007	0.002	0.0003	0.0007	<0.0006	0.0012	0.00031	0.00098	0.00105	0.0004	0.00078	0.00114
Silicon (Si), dissolved	mg/L	2.83	1.80	2.57	2.67	3.95	1.77	2.46	2.7	3.34	1.55	2.68	2.89	1.97	2.71	2.91
Silver (Ag), dissolved	mg/L	<0.0001	0.000020	<0.0001	<0.0001	<0.00005	0.00005	0.00001	<0.00001	<0.00001	0.000029	<0.000005	0.00001	0.000088	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	0.9	<2.0	0.9	1.1	2.5	0.6	1	1.1	1.8	0.48	1.06	1.13	0.5	0.97	1.41
Strontium (Sr), dissolved	mg/L	0.113	0.0798	0.117	0.118	0.26	0.069	0.114	0.118	0.188	0.055	0.125	0.142	0.0586	0.118	0.154
Sulphur (S), dissolved	mg/L	20.6		23.8	25.1	59.9	14.3	22.1		47.8	15	26	35	12	26	39
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00010	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005	<0.00001	<0.00001	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002
Tin (Sn), dissolved	mg/L	<0.001	<0.00010	<0.001	<0.001	<0.005	<0.001	<0.001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001
Titanium (Ti), dissolved	mg/L	0.0013	<0.010	0.0484	0.0018	0.003	0.0008	0.0007	0.0005	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	<0.0005	0.000326	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	0.0006	0.0013	0.000155	0.000584	0.000867	0.000133	0.000511	0.001
Vanadium (V), dissolved	mg/L	0.0001	<0.0010	<0.0001	0.0003	<0.0005	0.0001	<0.0001	0.0001	<0.00004	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.286	0.365	0.241	0.26	0.27	0.391	0.221	0.212	0.263	0.234	0.197	0.202	0.123	0.155	0.196
Zirconium (Zr), dissolved	mg/L								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Station Name		KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39
Sample Date		25/05/2011	14/07/2011	30/10/2011	09/02/2012	06/05/2012	02/07/2012	10/10/2012	09/02/2013	02/05/2013	04/07/2013
Discharge (Flow)	L/s	369.035	142.08	2			58.88	11.94225		0	
Total Suspended Solids	mg/L	24	1	<1	<1.0	1.2	2.2	<1.0	<1.0		<1.0
pH (field)	pH units	7.92	7.92	7.77	7.71	8.11	8.03	7.5	7.55		7.76
pH (lab)	pH units	7.51	7.56	7.76	7.88	7.78	7.58	7.84	7.93		7.82
Specific Conductance (field)	µS/cm		191	372.5	405.2	272.1	255.4	365.9	453.8		285.4
Specific Conductance (lab)	µS/cm	141	194	356	413	286	230	318	434		270
Temperature (field)	C	4.2	5.8	0.5	-0.1	0.0	4.6	-0.1	0		6.5
Dissolved Oxygen (field)	mg/L			10.85	13.3	14.56	13.19	12.4	13.04		10.92
Dissolved Oxygen (field)	%			75.3	91	99.60	102.3	84.5	92.5		91.6
ORP (field)	mV			276.6	194.5	74.10	148.3	161.8	236.1		83.4
Hardness (from total)	mg/L	58.8	93.4	182	211	143	113	146	216		134
Hardness (from dissolved)	mg/L	62.5	94.5	163	204	135	109	148	221		131
Alkalinity, total	mg/L	25	38	58	68.8	47.8	43	54.1	78.1		47.8
Chloride	mg/L					<0.50	<0.50	0.91	1.1		<0.50
Fluoride	mg/L										0.065
Sulphate, dissolved	mg/L	41	56	107	138	92.8	63.5	107	149		84.0
Ammonia (N)	mg/L					0.015					
Nitrite (N)	mg/L										<0.0010
Nitrate (N)	mg/L										0.0824
Total Kjeldahl Nitrogen	mg/L										
Dissolved Organic Carbon	mg/L	3.4	1	<0.5	0.99	6.68	0.76	1.85	<0.50		0.82
Aluminum (Al), total	mg/L	0.0516	0.0146	0.0075	0.0066	0.163	0.0149	0.00628	0.00393		0.0130
Antimony (Sb), total	mg/L	0.0019	0.00144	0.00174	0.00168	0.00136	0.00147	0.00143	0.00155		0.00211
Arsenic (As), total	mg/L	0.0104	0.00999	0.00712	0.00572	0.00467	0.00941	0.00895	0.00794		0.00796
Barium (Ba), total	mg/L	0.0328	0.0375	0.0593	0.0668	0.0626	0.0417	0.0533	0.0648		0.0497
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.00010
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.00050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050		<0.010
Cadmium (Cd), total	mg/L	0.00486	0.00198	0.00242	0.00225	0.00135	0.0018	0.00198	0.00297		0.00223
Calcium (Ca), total	mg/L	18.1	28.7	55.7	63.9	42.6	35	45	65.9		40.8
Chromium (Cr), total	mg/L	0.0001	0.0003	<0.0001	<0.0001	0.00015	0.00014	<0.00010	<0.00010		0.00016
Cobalt (Co), total	mg/L	0.000119	0.000027	0.000008	0.000012	0.000267	0.0000267	0.000013	0.000005		<0.00010
Copper (Cu), total	mg/L	0.00232	0.00064	0.00028	0.0003	0.00214	0.000567	0.000319	0.000251		0.00078
Iron (Fe), total	mg/L	0.092	0.028	0.009	0.008	0.117	0.0346	0.0087	0.0027		0.024
Lead (Pb), total	mg/L	0.0264	0.00186	0.000435	0.00079	0.001	0.00173	0.000483	0.000227		0.00120
Lithium (Li), total	mg/L	0.0008	0.0016	0.0025	0.0023	0.00183	0.00203	0.00203	0.00324		0.00190
Magnesium (Mg), total	mg/L	3.3	5.26	10.5	12.4	8.81	6.31	8.24	12.4		7.81
Manganese (Mn), total	mg/L	0.0262	0.00363	0.00151	0.00253	0.0187	0.00441	0.00166	0.00237		0.00216
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010
Molybdenum (Mo), total	mg/L	0.00013	0.00032	0.00046	0.00056	0.000442	0.000395	0.00037	0.000521		0.000471
Nickel (Ni), total	mg/L	0.00138	0.00076	0.00083	0.00077	0.00111	0.000793	0.000751	0.00109		0.00078
Phosphorus (P), total	mg/L	0.012	0.006	0.005	0.008	0.0082	0.0068	0.0055	0.0042		<0.050
Potassium (K), total	mg/L	0.25	0.15	0.21	0.33	0.32	0.169	0.216	0.287		0.21
Selenium (Se), total	mg/L	0.00047	0.00062	0.00156	0.00168	0.00101	0.000852	0.00119	0.0017		0.00091
Silicon (Si), total	mg/L	1.79	2.49	3.4	3.4	2.64	2.89	3.16	3.56		2.67

Station Name		KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39	KV-39
Sample Date		25/05/2011	14/07/2011	30/10/2011	09/02/2012	06/05/2012	02/07/2012	10/10/2012	09/02/2013	02/05/2013	04/07/2013
Silver (Ag), total	mg/L	0.000422	0.000012	0.000006	0.000006	0.000012	0.0000275	0.000008	<0.0000050		0.000014
Sodium (Na), total	mg/L	0.45	0.74	1.41	2.2	1.17	0.865	1.09	1.77		0.985
Strontium (Sr), total	mg/L	0.0543	0.0861	0.167	0.186	0.132	0.103	0.134	0.208		0.122
Sulphur (S), total	mg/L	16	19	42	52	34	24	39	46.1		27.5
Thallium (Tl), total	mg/L	0.000007	<0.000002	<0.000002	<0.000002	0.000002	<0.0000020	<0.0000020	<0.0000020		<0.000010
Tin (Sn), total	mg/L	<0.00001	<0.00001	0.00008	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00010
Titanium (Ti), total	mg/L	0.0011	<0.0005	<0.0005	<0.0005	0.00213	0.00119	<0.00050	<0.00050		<0.010
Uranium (U), total	mg/L	0.000111	0.00029	0.00111	0.00147	0.00113	0.000412	0.000704	0.00151		0.000499
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010
Zinc (Zn), total	mg/L	0.401	0.15	0.169	0.152	0.0952	0.143	0.152	0.253		0.126
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.00012	<0.00010	<0.00010	<0.00010		<0.00080
Aluminum (Al), dissolved	mg/L	0.0307	0.0053	0.0042	0.0021	0.122	0.00342	0.00212	0.0017		0.0066
Antimony (Sb), dissolved	mg/L	0.00139	0.00145	0.00158	0.00177	0.00138	0.00142	0.00139	0.00156		0.00202
Arsenic (As), dissolved	mg/L	0.00751	0.00957	0.00671	0.00561	0.00453	0.00862	0.0083	0.00863		0.00762
Barium (Ba), dissolved	mg/L	0.0331	0.0373	0.0521	0.069	0.0606	0.0414	0.0521	0.0635		0.0491
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.00010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.00050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050		<0.010
Cadmium (Cd), dissolved	mg/L	0.00455	0.00194	0.00225	0.0023	0.00131	0.00177	0.00203	0.00295		0.00217
Calcium (Ca), dissolved	mg/L	19.1	29.4	48.4	62	39.9	33.5	45.1	66.3		39.9
Chromium (Cr), dissolved	mg/L	0.0003	0.0003	<0.0001	<0.0001	0.00015	<0.00010	<0.00010	<0.00010		<0.00010
Cobalt (Co), dissolved	mg/L	0.000057	0.000011	0.000007	0.000009	0.000206	0.0000115	0.000006	<0.0000050		<0.00010
Copper (Cu), dissolved	mg/L	0.00217	0.00063	0.00037	0.00026	0.0021	0.000468	0.000258	0.000245		0.00129
Iron (Fe), dissolved	mg/L	0.021	0.002	<0.001	0.002	0.068	0.0022	<0.0010	0.0014		<0.010
Lead (Pb), dissolved	mg/L	0.00403	0.000388	0.000128	0.000216	0.00076	0.0002	0.0001	0.000098		0.000489
Lithium (Li), dissolved	mg/L	0.0009	0.0015	0.0024	0.0024	0.00157	0.00196	0.00224	0.00315		0.00186
Magnesium (Mg), dissolved	mg/L	3.57	5.11	10.3	12	8.55	6.2	8.69	13.4		7.59
Manganese (Mn), dissolved	mg/L	0.0105	0.0009	0.00045	0.00194	0.0166	0.000902	0.00093	0.0023		0.000978
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00019	0.00033	0.00044	0.00057	0.000432	0.000669	0.000405	0.000482		0.000428
Nickel (Ni), dissolved	mg/L	0.0015	0.00074	0.00088	0.00067	0.00099	0.000833	0.000774	0.00126		0.00068
Phosphorus (P), dissolved	mg/L	0.007	0.003	0.004	0.007	0.0085	<0.0020	0.0058	0.0026		<0.050
Potassium (K), dissolved	mg/L	0.26	0.15	0.19	0.33	0.281	0.172	0.214	0.297		0.21
Selenium (Se), dissolved	mg/L	0.0004	0.0006	0.00148	0.00173	0.00105	0.000832	0.00104	0.00175		0.00088
Silicon (Si), dissolved	mg/L	1.67	2.62	2.9	3.2	2.44	2.73	2.88	3.66		2.60
Silver (Ag), dissolved	mg/L	0.00005	<0.000005	<0.000005	<0.000005	0.000009	0.0000064	<0.0000050	<0.0000050		<0.000010
Sodium (Na), dissolved	mg/L	0.49	0.71	1.4	1.87	1.15	0.857	1.16	1.92		0.944
Strontium (Sr), dissolved	mg/L	0.0574	0.085	0.159	0.184	0.125	0.104	0.139	0.195		0.117
Sulphur (S), dissolved	mg/L	14	19	38	50	31	23	36	46.6		26.4
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.000010
Tin (Sn), dissolved	mg/L	<0.00001	<0.00001	0.00012	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.00055	<0.00050	<0.00050	<0.00050		<0.010
Uranium (U), dissolved	mg/L	0.000141	0.000285	0.00118	0.00134	0.00107	0.000414	0.000799	0.00147		0.000475
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010
Zinc (Zn), dissolved	mg/L	0.412	0.144	0.171	0.153	0.0888	0.138	0.159	0.236		0.124
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.00022	<0.00010	<0.00010	<0.00010		<0.00080

Station Name		KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40
Sample Date		19/07/2005	16/07/2007	08/09/2007	14/03/2008	18/05/2008	05/07/2008	02/10/2008	28/05/2009	05/07/2009	07/10/2009	27/05/2010	08/07/2010	25/05/2011	14/07/2011	30/10/2011	09/02/2012
Discharge (Flow)	L/s									1.5	3	2	2	17	10	0.333333	0
Total Suspended Solids	mg/L	<2			7	<3	<3	2	1	<1	<1	<1	6	2	<1	2	
pH (field)	pH units		8.06	7.91	7.60	7.48	7.14	7.33	6.75	8.23	7.8		8.35	7.81	7.78	7.87	
pH (lab)	pH units	7.72	7.63		7.64	7.17	7.95	7.64	7.3	7.9	7.8	7.8	7.79	7.37	7.62	7.49	
Specific Conductance (field)	µS/cm														409	431	
Specific Conductance (lab)	µS/cm	347	348		174	249	325	444	240	350	413	314	381	215	418	415	
Temperature (field)	C		2.3	2.0	0.2	0	2	5	2.5	3.2	2		2.3	3.1	2.7	0.3	
Dissolved Oxygen (field)	mg/L															9.8	
Dissolved Oxygen (field)	%															67.8	
ORP (field)	mV															269.4	
Hardness (from total)	mg/L								109	168	202	148	179	99.1	207	205	
Hardness (from dissolved)	mg/L	159			79	116	161	244	113	175	196	157	191	96.1	206	202	
Alkalinity, total	mg/L	34												15	33	38	
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L													78	170	158	
Ammonia (N)	mg/L	<0.002															
Nitrite (N)	mg/L	0.1															
Nitrate (N)	mg/L	<0.03															
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L													5.2	1	0.8	
Aluminum (Al), total	mg/L	0.008	0.006	0.01	0.008	0.044	0.013	0.348	0.112	0.009	0.0044	0.0219	0.0461	0.149	0.0562	0.0278	
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	0.00011	0.00009	0.00009	0.00009	0.00011	0.00011	0.00009	0.00009	
Arsenic (As), total	mg/L	0.0009	0.0008	0.0009	0.0028	0.0004	0.0008	0.0007	0.00031	0.00072	0.00075	0.00045	0.00113	0.00044	0.00072	0.00091	
Barium (Ba), total	mg/L	0.064	0.059	0.072	0.062	0.035	0.059	0.072	0.0263	0.0549	0.0702	0.0312	0.0633	0.0277	0.0523	0.071	
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	
Boron (B), total	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Cadmium (Cd), total	mg/L	0.00004	0.00003	0.00005	0.0001	0.00006	0.00004	0.00016	0.000096	0.000034	0.000036	0.000037	0.000065	0.000144	0.000083	0.000037	
Calcium (Ca), total	mg/L	42.6	45.3	49.5	23.3	29.7	46.2	65.2	28	46.3	55.9	39.3	48.5	26.1	55.9	55.6	
Chromium (Cr), total	mg/L	<0.0005	<0.0005	<0.0005	0.0006	0.0006	0.0006	0.0004	0.0003	<0.0001	0.0003	0.0002	0.0004	0.0003	0.0003	0.0001	
Cobalt (Co), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00104	0.000115	0.000017	0.000013	0.000024	0.000123	0.000248	0.000193	0.000033	
Copper (Cu), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.004	0.00161	0.00007	0.00045	0.00056	0.00036	0.00165	0.00052	0.00033	
Iron (Fe), total	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.02	0.017	0.002	0.006	0.006	0.089	0.035	0.043	0.005	
Lead (Pb), total	mg/L	0.0001	<0.0001	<0.0001	0.0002	<0.0001	0.0002	0.0002	0.000222	0.000033	0.000084	0.000153	0.00118	0.000421	0.000506	0.000123	
Lithium (Li), total	mg/L	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.0026	0.0021	0.0024	0.0021	0.0022	0.0021	0.0021	0.0023	
Magnesium (Mg), total	mg/L	11.7	13.4	12.6	4.2	10.8	12.3	20	9.38	12.7	15.2	12.2	14.1	8.24	16.5	16.1	
Manganese (Mn), total	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.0513	0.00892	0.00074	0.00041	0.0013	0.0114	0.0236	0.0148	0.00176	
Mercury (Hg), total	mg/L								<0.00001	0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00007	0.00009	0.00007	0.0001	0.0001	0.00009	0.00007	0.00009	0.00007	
Nickel (Ni), total	mg/L	0.0008	<0.0005	0.0021	<0.0005	0.0037	0.0024	0.008	0.00638	0.00098	0.00086	0.00274	0.0011	0.00481	0.00192	0.00083	
Phosphorus (P), total	mg/L							<0.01	0.006	0.005		0.003	0.014	0.009	0.011	0.005	
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<0.4	0.4	<0.4	0.2	0.24	0.13	0.16	0.17	0.15	0.31	0.13	0.17	
Selenium (Se), total	mg/L	0.0014	0.0012	0.0017	0.0008	0.0002	0.0015	0.0026	0.00041	0.0015	0.00149	0.00064	0.00158	0.0004	0.00125	0.00175	
Silicon (Si), total	mg/L	2.91	2.87	2.89	3.08	1.82	2.67	2.94	2	2.82	2.98	2.18	2.79	2.25	3.16	3.2	

Station Name		KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40	KV-40
Sample Date		19/07/2005	16/07/2007	08/09/2007	14/03/2008	18/05/2008	05/07/2008	02/10/2008	28/05/2009	05/07/2009	07/10/2009	27/05/2010	08/07/2010	25/05/2011	14/07/2011	30/10/2011	09/02/2012
Silver (Ag), total	mg/L	<0.0001	<0.0001	<0.0001	<0.00001	0.00002	<0.00001	<0.00001	0.00001	<0.000005	<0.000005	<0.000005	0.00001	0.000027	<0.000005	<0.000005	
Sodium (Na), total	mg/L	0.8	0.9	1	1.2	0.5	1	1.16	0.54	0.87	0.97	0.73	0.91	0.51	0.98	1.06	
Strontium (Sr), total	mg/L	0.154	0.185	0.174	0.095	0.125	0.177	0.216	0.105	0.157	0.185	0.138	0.173	0.0928	0.188	0.188	
Sulphur (S), total	mg/L	39.4	43.3	45.2	11.9	32.9	40.7		30	42	56	41	51	30	61	61	
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001	0.00002	0.00007	
Titanium (Ti), total	mg/L	0.0021	0.0425	0.0028	0.0009	0.003	0.0042	0.0004	<0.0005	<0.0005	<0.0005	<0.0005	0.0021	<0.0005	0.0006	<0.0005	
Uranium (U), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	0.000046	0.00004	0.000031	0.000051	0.000048	0.000042	0.000041	0.00005	
Vanadium (V), total	mg/L	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	0.00004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Zinc (Zn), total	mg/L	0.003	0.004	0.009	0.017	0.012	0.009	0.019	0.0087	0.0023	0.0024	0.0029	0.0045	0.0093	0.0056	0.0028	
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aluminum (Al), dissolved	mg/L	<0.005	<0.005	<0.005	<0.02	0.04	0.008	0.056	0.096	0.007	0.004	0.0187	0.0076	0.118	0.0093	0.0116	
Antimony (Sb), dissolved	mg/L	<0.0002	<0.0002	0.0009	<0.001		0.0008	0.002	0.00013	0.00008	0.00009	0.0001	0.00009	0.00009	0.00009	0.00009	
Arsenic (As), dissolved	mg/L	0.0008	0.0008	0.0009	0.002	0.0005	0.0008	0.0005	0.00043	0.00075	0.00076	0.00039	0.00076	0.00032	0.00058	0.0008	
Barium (Ba), dissolved	mg/L	0.066	0.062	0.07	0.062	0.035	0.059	0.06	0.0259	0.0563	0.0706	0.032	0.0613	0.0269	0.0539	0.061	
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005		<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Cadmium (Cd), dissolved	mg/L	0.00004	0.00003	0.00003	0.0001	0.00007	0.00004	0.00014	0.00015	0.000036	0.000032	0.000045	0.000036	0.000107	0.000053	0.00003	
Calcium (Ca), dissolved	mg/L	43.7	48.7	51.9	24.1	28.5	43.9	64.6	29.1	48.1	54.2	41.4	52.6	24.9	55.7	54.5	
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	0.0005	0.0004	0.0001	0.0003	0.0002	0.0004	0.0003	0.0004	<0.0001	
Cobalt (Co), dissolved	mg/L	<0.0001	<0.0001	0.0001	<0.0005	0.0001	<0.0001	0.00093	0.000082	0.000008	0.00001	0.000017	0.000018	0.000122	0.00002	<0.000005	
Copper (Cu), dissolved	mg/L	<0.001	<0.001	<0.001	<0.005	0.002	<0.001	<0.001	0.00186	0.00018	0.00015	0.00056	0.00037	0.00177	0.00087	0.00008	
Iron (Fe), dissolved	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.02	0.019	0.003	0.006	0.004	0.007	0.01	0.006	<0.001	
Lead (Pb), dissolved	mg/L	0.0001	<0.0001	<0.0001	<0.0005	0.0006	0.0001	0.0006	0.00176	0.000124	0.000044	0.000056	0.000182	0.000366	0.000284	0.000007	
Lithium (Li), dissolved	mg/L	0.002	0.002	0.002	<0.005	0.001	0.002	0.003	0.0025	0.0023	0.0023	0.0022	0.0021	0.0019	0.002	0.0023	
Magnesium (Mg), dissolved	mg/L	12	12.6	12.9	4.5	10.9	12.5	20.1	9.72	13.3	14.7	13	14.4	8.24	16.3	16.1	
Manganese (Mn), dissolved	mg/L	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	0.0416	0.0119	0.00051	0.00081	0.00045	0.00153	0.0103	0.00104	0.00015	
Mercury (Hg), dissolved	mg/L								<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.00005	0.00009	<0.00005	0.00007	0.0001	0.00008	0.00008	0.00009	0.00007	
Nickel (Ni), dissolved	mg/L	<0.0005	<0.0005	0.0014	<0.002	0.0032	0.0008	0.007	0.00638	0.00093	0.0009	0.00261	0.00093	0.00468	0.00148	0.0008	
Phosphorus (P), dissolved	mg/L							0.01	0.005	0.008	0.009	0.002	0.007	0.005	0.006	0.005	
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.2	0.27	0.14	0.16	0.16	0.2	0.3	0.15	0.15	
Selenium (Se), dissolved	mg/L	0.0013	0.0011	0.0019	<0.001	<0.0002	0.0013	<0.0006	0.00038	0.00154	0.00147	0.00065	0.00168	0.00039	0.00117	0.0018	
Silicon (Si), dissolved	mg/L	2.95	2.82	3.01	3.59	1.81	2.82	2.85	1.98	3.05	3	2.47	3.02	2.05	3.12	3.1	
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001	<0.00001	<0.00001	0.000016	<0.000005	<0.000005	<0.000005	<0.000005	0.000016	<0.000005	<0.000005	
Sodium (Na), dissolved	mg/L	0.8	0.9	1	1.2	0.5	1	1.2	0.62	0.92	0.95	0.75	0.99	0.54	0.95	1.08	
Strontium (Sr), dissolved	mg/L	0.158	0.172	0.174	0.09	0.108	0.164	0.203	0.105	0.158	0.185	0.143	0.172	0.0928	0.191	0.184	
Sulphur (S), dissolved	mg/L	40.5	44	45.7	12.3	32	40.4		31	47	54	43	49	27	62	57	
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.0001	0.00003	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.00005	<0.00001	
Titanium (Ti), dissolved	mg/L	0.0024	0.0433	0.0026	<0.002	0.001	0.0012	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0004	0.000042	0.000043	0.000031	0.000048	0.000047	0.000029	0.000037	0.000054	
Vanadium (V), dissolved	mg/L	<0.0001	<0.0001	0.0003	<0.0005	0.0001	<0.0001	<0.00004	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Zinc (Zn), dissolved	mg/L	0.005	0.004	0.005	0.02	0.009	0.005	0.011	0.0177	0.0038	0.0028	0.0037	0.0042	0.0092	0.0058	0.0027	
Zirconium (Zr), dissolved	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Station Name		KV-40	KV-40	KV-40	KV-40	KV-40
Sample Date		06/05/2012	02/07/2012	10/10/2012	02/05/2013	04/07/2013
Discharge (Flow)	L/s				0	2.83
Total Suspended Solids	mg/L	<1.0	<1.0	<1.0		<1.0
pH (field)	pH units	7.90	7.81	7.38		7.76
pH (lab)	pH units	7.38	7.44	7.51		7.79
Specific Conductance (field)	µS/cm	67.6	421			361
Specific Conductance (lab)	µS/cm	70.8	381	437		328
Temperature (field)	C	0.0	2	0.6		2.4
Dissolved Oxygen (field)	mg/L	14.18	13.68	13.7		12.41
Dissolved Oxygen (field)	%	96.90	99.1	95.3		93
ORP (field)	mV	89.80	107.7	174		87.2
Hardness (from total)	mg/L	32.1	187	209		166
Hardness (from dissolved)	mg/L	32.6	186	211		167
Alkalinity, total	mg/L	16.1	36.7	37.1		40.2
Chloride	mg/L	0.54	<0.50	0.71		<0.50
Fluoride	mg/L					0.063
Sulphate, dissolved	mg/L	13.8	139	180		124
Ammonia (N)	mg/L	0.019				
Nitrite (N)	mg/L					<0.0010
Nitrate (N)	mg/L					0.146
Total Kjeldahl Nitrogen	mg/L					
Dissolved Organic Carbon	mg/L	9.83	0.56	1.74		0.71
Aluminum (Al), total	mg/L	0.1	0.00989	0.0072		0.0105
Antimony (Sb), total	mg/L	0.000121	0.000099	0.000084		<0.00010
Arsenic (As), total	mg/L	0.000426	0.000944	0.000899		0.00089
Barium (Ba), total	mg/L	0.0199	0.0588	0.0764		0.0542
Beryllium (Be), total	mg/L	<0.000010	<0.000010	<0.000010		<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.0000050		<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.050		<0.010
Cadmium (Cd), total	mg/L	0.000078	0.0000412	0.000036		0.000036
Calcium (Ca), total	mg/L	8.21	51.4	58.2		45.2
Chromium (Cr), total	mg/L	0.00012	0.00013	0.00013		0.00019
Cobalt (Co), total	mg/L	0.000149	0.0000337	0.000008		<0.00010
Copper (Cu), total	mg/L	0.00669	0.000921	0.000161		<0.00050
Iron (Fe), total	mg/L	0.0513	0.0084	0.0033		<0.010
Lead (Pb), total	mg/L	0.000571	0.000489	0.000056		<0.000050
Lithium (Li), total	mg/L	0.0013	0.00205	0.00217		0.00148
Magnesium (Mg), total	mg/L	2.81	14.2	15.5		13.0
Manganese (Mn), total	mg/L	0.0173	0.00236	0.00053		0.00154
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010		<0.000010
Molybdenum (Mo), total	mg/L	0.000057	0.000085	0.000069		0.000083
Nickel (Ni), total	mg/L	0.00384	0.001	0.000733		0.00081
Phosphorus (P), total	mg/L	0.0121	0.0065	0.0055		<0.050
Potassium (K), total	mg/L	1.3	0.141	0.185		0.15
Selenium (Se), total	mg/L	0.000094	0.00157	0.00204		0.00159
Silicon (Si), total	mg/L	1.46	3.2	3.37		2.85

Station Name		KV-40	KV-40	KV-40	KV-40	KV-40
Sample Date		06/05/2012	02/07/2012	10/10/2012	02/05/2013	04/07/2013
Silver (Ag), total	mg/L	0.000026	<0.0000050	<0.0000050		<0.000010
Sodium (Na), total	mg/L	0.217	0.934	0.959		0.866
Strontium (Sr), total	mg/L	0.0323	0.164	0.193		0.138
Sulphur (S), total	mg/L	<10	52	69		39.9
Thallium (Tl), total	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00020	<0.00020		<0.00010
Titanium (Ti), total	mg/L	0.00071	<0.00050	<0.00050		<0.010
Uranium (U), total	mg/L	0.000058	0.0000349	0.000033		0.000040
Vanadium (V), total	mg/L	<0.00020	<0.00020	<0.00020		<0.0010
Zinc (Zn), total	mg/L	0.00719	0.00352	0.00262		0.0031
Zirconium (Zr), total	mg/L	0.0002	<0.00010	<0.00010		<0.00080
Aluminum (Al), dissolved	mg/L	0.0935	0.00794	0.00721		0.0068
Antimony (Sb), dissolved	mg/L	0.000115	0.000094	0.000075		<0.00010
Arsenic (As), dissolved	mg/L	0.000454	0.000907	0.000944		0.00088
Barium (Ba), dissolved	mg/L	0.0192	0.0603	0.0739		0.0543
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.000010		<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050		<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.050		<0.010
Cadmium (Cd), dissolved	mg/L	0.000078	0.0000432	0.000041		0.000032
Calcium (Ca), dissolved	mg/L	8.41	50.5	57.8		45.6
Chromium (Cr), dissolved	mg/L	0.00015	0.00013	0.00012		<0.00010
Cobalt (Co), dissolved	mg/L	0.000164	0.0000084	<0.0000050		<0.00010
Copper (Cu), dissolved	mg/L	0.00669	0.000193	0.000288		0.00021
Iron (Fe), dissolved	mg/L	0.0492	0.006	0.0023		<0.010
Lead (Pb), dissolved	mg/L	0.000604	0.000462	0.000154		<0.000050
Lithium (Li), dissolved	mg/L	0.00119	0.00203	0.00231		0.00159
Magnesium (Mg), dissolved	mg/L	2.82	14.5	16.3		12.9
Manganese (Mn), dissolved	mg/L	0.016	0.000581	0.000438		0.000133
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010		<0.000010
Molybdenum (Mo), dissolved	mg/L	<0.000050	0.000082	0.000072		0.000069
Nickel (Ni), dissolved	mg/L	0.00417	0.00105	0.000669		0.00071
Phosphorus (P), dissolved	mg/L	0.0127	0.0046	0.0045		<0.050
Potassium (K), dissolved	mg/L	1.23	0.147	0.187		0.16
Selenium (Se), dissolved	mg/L	<0.000040	0.00162	0.00188		0.00170
Silicon (Si), dissolved	mg/L	1.47	3.03	3.07		2.85
Silver (Ag), dissolved	mg/L	0.000018	<0.0000050	<0.0000050		<0.000010
Sodium (Na), dissolved	mg/L	0.231	0.948	1.01		0.843
Strontium (Sr), dissolved	mg/L	0.0309	0.166	0.199		0.139
Sulphur (S), dissolved	mg/L	<10	50	63		39.7
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	<0.00020		<0.00010
Titanium (Ti), dissolved	mg/L	0.00077	<0.00050	<0.00050		<0.010
Uranium (U), dissolved	mg/L	0.000052	0.0000392	0.000037		0.000040
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.00020		<0.0010
Zinc (Zn), dissolved	mg/L	0.00813	0.0026	0.0026		0.0025
Zirconium (Zr), dissolved	mg/L	0.00024	<0.00010	<0.00010		<0.00080

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		24/01/2004	24/04/2004	29/07/2004	27/02/2005	30/06/2005	19/07/2005	22/08/2005	25/10/2005	25/01/2006	14/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	13/03/2008	18/05/2008
Discharge (Flow)	L/s	63		961	63	1526	1362	963		192	192						
Total Suspended Solids	mg/L		<3	38	<2		32	62	5	2	4	17.2				<5	156
pH (field)	pH units	7.16		7.73	7.16	7.7	7.23	7.89		7.42	8.76			7.81	8.19	7.46	7.40
pH (lab)	pH units		7.8	7.74	7.8		7.23	7.89		7.73	7.51	7.98	7.92	7.8	7.32	7.8	7.36
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm		228	148	239		183	201	223	243	230	99.8	171	242	163	249	91
Temperature (field)	C	0.1		6.1	0.1	7.1	6.5	6.6		0.1	0.1				5.2	0.2	2.0
Dissolved Oxygen (field)	mg/L			10.4				12.5									
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L		112	71.2	112		74	76		100	110	52.5				120	43
Alkalinity, total	mg/L		60	36	62		42	44	48	54	57						
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L		51.7	32.6						54	50	21.8					
Ammonia (N)	mg/L			<0.05			0.021	0.006	<0.002								
Nitrite (N)	mg/L			<0.05			0.03	<0.03				0.0627					
Nitrate (N)	mg/L			<0.1			<0.03	0.04				<0.0010					
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																11.9
Aluminum (Al), total	mg/L		0.03	0.782	0.02		1.12	1.8	0.077	0.028	0.019	0.322	0.094	0.23	3.25	0.045	2.1
Antimony (Sb), total	mg/L		<0.02	0.0004	0.0002		0.0005	0.0007	0.0003	0.0002	0.0002	0.00054	0.0002	0.0002	0.0005	<0.0002	0.0004
Arsenic (As), total	mg/L		<0.04	0.0051	0.002		0.0267	0.029	0.0027	0.0022	0.002	0.00317	0.0027	0.004	0.008	0.0017	0.0057
Barium (Ba), total	mg/L		0.0584	0.072	0.052		0.065	0.091	0.053	0.059	0.055	0.0399	0.057	0.052	0.118	0.054	0.074
Beryllium (Be), total	mg/L		<0.0006	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		<0.02	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L			0.004	0.023		0.003	<0.002	<0.002	<0.002	<0.002	<0.010	0.004	<0.002	0.004	<0.002	<0.002
Cadmium (Cd), total	mg/L		<0.0006	0.00042	0.00013		0.00023	0.00031	0.00017	0.0001	0.00012	0.000306	0.00014	0.00004	0.00028	0.00006	0.00033
Calcium (Ca), total	mg/L		18.5	22.4	36.3		22.8	25.5	29.7	31.8	32.2	15.8	24.7	36.8	23.4	36.9	14.2
Chromium (Cr), total	mg/L		<0.001	0.0012	<0.0005		0.0021	0.0038	<0.0005	<0.0005	<0.0005	0.00058	<0.0005	0.0005	0.0047	0.0007	0.0039
Cobalt (Co), total	mg/L		<0.001	0.0007	<0.0001		0.002	0.0024	0.0002	<0.0001	<0.0001	0.00026	0.0009	0.0004	0.0017	<0.0001	0.0015
Copper (Cu), total	mg/L		<0.001	0.004	<0.001		0.006	0.008	0.001	<0.001	<0.001	0.00242	<0.001	0.001	0.006	<0.001	0.007
Iron (Fe), total	mg/L		0.068	0.9	<0.1		2.6	4.6	0.1	<0.1	<0.1	0.485	0.2	0.5	3.1	<0.1	2.6
Lead (Pb), total	mg/L		<0.01	0.005	0.0005		0.0166	0.0316	0.0007	0.0009	0.0008	0.00219	0.0012	0.003	0.0065	0.0004	0.0075
Lithium (Li), total	mg/L		<0.007	0.003	0.002		0.003	0.004	0.002	0.002	0.002	<0.0050	0.002	0.002	0.005	0.003	0.003
Magnesium (Mg), total	mg/L		4.61	3.7	6.4		4.3	5	4.9	5.1	5.6	3.14	4.1	6.7	4.6	6	2.9
Manganese (Mn), total	mg/L		0.0022	0.044	0.01		0.113	0.173	0.019	0.005	0.008	0.0193	0.065	0.033	0.081	0.007	0.076
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L		<0.01	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.000175	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L		<0.002	0.002	<0.0005		0.004	0.0044	0.0008	<0.0005	<0.0005	0.00136	0.0007	0.0017	0.0048	0.0006	0.0046
Phosphorus (P), total	mg/L		<0.06									<0.30					
Potassium (K), total	mg/L		<1	<0.4	<0.4		0.4	<0.4	<0.4	<0.4	<0.4	<2.0	<0.4	<0.4	0.7	<0.4	0.7
Selenium (Se), total	mg/L		<0.1	0.0004	0.001		0.0006	0.0007	0.0008	0.0007	0.0009	<0.0010	0.0006	0.001	0.0004	0.0009	0.0004
Silicon (Si), total	mg/L		3.5	3.16	3.39		4.48	6.56	3	3.01	3.3	1.87	2.71	3.58	7.29	3.09	4.71

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		24/01/2004	24/04/2004	29/07/2004	27/02/2005	30/06/2005	19/07/2005	22/08/2005	25/10/2005	25/01/2006	14/03/2006	26/05/2006	30/07/2006	28/02/2007	12/07/2007	13/03/2008	18/05/2008
Silver (Ag), total	mg/L		<0.002	0.0002	<0.0001		0.0003	0.0009	<0.0001	<0.0001	<0.0001	0.000059	<0.0001	<0.0001	0.0002	<0.00001	0.00013
Sodium (Na), total	mg/L		0.54	0.7	1.1		0.8	0.7	2.4	1	1.4	<2.0	0.7	0.9	0.7	1.1	0.5
Strontium (Sr), total	mg/L		0.104	0.067	0.098		0.074	0.075	0.099	0.094	0.092	0.0473	0.074	0.1	0.076	0.113	0.049
Sulphur (S), total	mg/L		19.2	10.5	17.9		11.4	13	15.4	15.7	15.7		12.8	18.7	13.1	19.3	6.3
Thallium (Tl), total	mg/L			<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.01	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L		<0.004	0.0266	0.0016		0.0483	0.0899	0.0152	0.0018	0.0016	<0.010	0.0551	0.0226	0.163	0.0025	0.0715
Uranium (U), total	mg/L		<0.07	<0.0005	0.0009		0.0005	0.0006	<0.0005	0.0006	0.0006	0.000183	<0.0005	0.0007	<0.0005	0.0008	<0.0005
Vanadium (V), total	mg/L		<0.001	0.0019	0.0004		0.0034	0.006	0.0004	0.0001	0.0003	<0.0010	0.0004	0.0008	0.0103	0.0003	0.0053
Zinc (Zn), total	mg/L		0.026	0.055	0.02		0.033	0.04	0.027	0.016	0.019	0.0306	0.02	0.027	0.037	0.018	0.043
Zirconium (Zr), total	mg/L		<0.006	<0.001	<0.001		0.002	0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.003	<0.001	0.001
Aluminum (Al), dissolved	mg/L		<0.01	0.019	<0.005		0.013	<0.005	<0.005	<0.005	<0.005	0.0597	<0.005	<0.005	0.035	<0.02	0.152
Antimony (Sb), dissolved	mg/L		<0.02	0.0004	0.0002		0.0003	0.0003	0.0002	0.0002	0.0002	0.00020	0.0002	<0.0002	0.0003	<0.001	
Arsenic (As), dissolved	mg/L		<0.04	0.0025	0.0017		0.0021	0.0023	0.002	0.0021	0.002	0.00171	0.0017	0.0009	0.0018	0.001	0.002
Barium (Ba), dissolved	mg/L		0.0544	0.047	0.051		0.04	0.043	0.05	0.062	0.056	0.0306	0.048	0.046	0.054	0.05	0.036
Beryllium (Be), dissolved	mg/L		<0.0006	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
Bismuth (Bi), dissolved	mg/L		<0.02	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.002	<0.0005
Boron (B), dissolved	mg/L			<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.01	<0.002
Cadmium (Cd), dissolved	mg/L		<0.0006	0.00029	0.00014		0.00012	0.00007	0.00017	0.00011	0.00012	0.000220	0.00014	0.00003	0.00012	0.00008	0.0002
Calcium (Ca), dissolved	mg/L		16.9	22.4	35		22.9	23.2	29.8	31.6	35.5	15.9	24.9	36.2	24.6	36.8	13.3
Chromium (Cr), dissolved	mg/L		<0.001	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0005	<0.0005	<0.0005	<0.002	0.0005
Cobalt (Co), dissolved	mg/L		<0.001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001	<0.0001	0.0001	<0.0005	0.0001
Copper (Cu), dissolved	mg/L		<0.001	<0.001	<0.001		0.002	<0.001	<0.001	<0.001	<0.001	0.00141	<0.001	<0.001	<0.001	<0.005	0.003
Iron (Fe), dissolved	mg/L		0.021	0.05	0.02		<0.01	<0.01	0.01	<0.01	<0.01	0.055	<0.01	<0.01	0.05	0.02	0.18
Lead (Pb), dissolved	mg/L		<0.01	0.0003	0.0001		0.0003	<0.0001	0.0001	0.0004	0.0003	0.000305	0.0001	0.0003	0.0003	<0.0005	0.001
Lithium (Li), dissolved	mg/L		<0.007	0.001	0.002		0.002	0.002	0.002	0.002	0.002	<0.0050	0.001	0.001	<0.001	<0.005	<0.001
Magnesium (Mg), dissolved	mg/L		3.64	3.7	6		4.1	4.5	5	5	6.3	3.10	4.7	6.3	4.1	6.2	2.5
Manganese (Mn), dissolved	mg/L		0.0022	0.011	<0.005		0.015	0.012	0.069	<0.005	<0.005	0.00594	<0.005	<0.005	0.037	<0.005	0.014
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L		<0.01	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.000118	<0.001	<0.001	<0.001	<0.005	<0.001
Nickel (Ni), dissolved	mg/L		<0.002	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00073	<0.0005	<0.0005	<0.0005	<0.002	0.0012
Phosphorus (P), dissolved	mg/L		<0.06									<0.30					
Potassium (K), dissolved	mg/L		<1	<0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<2.0	<0.4	<0.4	<0.4	<0.4	<0.4
Selenium (Se), dissolved	mg/L		<0.1	0.0004	0.0007		0.0006	0.0008	0.0008	0.0011	0.001	<0.0010	<0.0002	0.001	0.0004	<0.001	<0.0002
Silicon (Si), dissolved	mg/L		3.4	2.52	3.29		2.66	3.24	3.08	2.91	3.67	1.56	3	3.35	2.37	3.35	1.62
Silver (Ag), dissolved	mg/L		<0.002	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001
Sodium (Na), dissolved	mg/L		0.53	0.7	1.3		0.7	0.4	0.9	1.1	1	<2.0	0.6	0.9	0.6	1.2	0.6
Strontium (Sr), dissolved	mg/L		0.098	0.062	0.1		0.07	0.078	0.094	0.109	0.099	0.0430	0.065	0.089	0.067	0.1	0.042
Sulphur (S), dissolved	mg/L		18.2	10.8	17.8		11.6	14.4	15.8	15.6	16.7		13.3	18.7	13.2	19.4	6.3
Thallium (Tl), dissolved	mg/L			<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010		<0.00005	<0.00005	<0.0002	<0.00005
Tin (Sn), dissolved	mg/L		<0.01	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.001	<0.001	<0.001	<0.005	<0.001
Titanium (Ti), dissolved	mg/L		<0.004	0.0008	0.0007		0.0011	0.0007	0.0009	0.0012	0.0012	<0.010	0.0452	0.0016	0.0484	<0.002	0.0025
Uranium (U), dissolved	mg/L		<0.06	<0.0005	0.0008		<0.0005	<0.0005	<0.0005	0.0006	0.0006	0.000139	<0.0005	0.0008	<0.0005	<0.002	<0.0005
Vanadium (V), dissolved	mg/L		<0.001	<0.0001	0.0001		0.0001	0.0007	0.0003	<0.0001	0.0002	<0.0010	0.0001	<0.0001	0.0002	<0.0005	0.0004
Zinc (Zn), dissolved	mg/L		0.026	0.035	0.019		0.014	0.006	0.025	0.02	0.019	0.0239	0.015	0.02	0.011	0.02	0.023
Zirconium (Zr), dissolved	mg/L		<0.005														

Data omitted from calculation of summary statistics.

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		20/06/2008	05/07/2008	14/08/2008	15/09/2008	02/10/2008	12/11/2008	20/12/2008	12/01/2009	02/02/2009	10/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009
Discharge (Flow)	L/s		664	1492.925	713.355	1190.65								3589.96	718.62		1035.19
Total Suspended Solids	mg/L	44	71	55	256	52	5	<5	13	10	<5	<4	110	110	180	19	320
pH (field)	pH units		7.21	7.64		7.41							7.16	7.62	8.13		7.39
pH (lab)	pH units	7.74	7.88	7.9	7.85	7.8	7.75	7.97	7.7	7.93	7.82	8	7.7	7.5	7.9	7.9	7.8
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	144	162	163	186	168	218	228	233	251	291	290	140	74	170	199	175
Temperature (field)	C		5	4.5	5	4							3.3	5	9.2		6.3
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L											136	64.8	35	85.2	92.9	94.4
Hardness (from dissolved)	mg/L	65	74	74	90	83	96	110	95	140	123	135	62.4	33.2	79	96.1	83.8
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L															45	41
Ammonia (N)	mg/L												0.06				
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L			2.3	3.4	1.7	0.8	0.8	0.7	<0.5		1	10.4	2.8	1.2	1.6	1.4
Aluminum (Al), total	mg/L	0.867	2.63	0.692	6.22	0.813	0.074	0.095	0.232	0.098	0.05	0.0123	0.801	0.534	0.74	0.0861	1.82
Antimony (Sb), total	mg/L	0.0004	0.0005	0.0003	0.0024	0.0004	0.0003	0.0002	0.0002	0.0002	0.0002	0.00024	0.00047	0.00036	0.0004	0.00028	0.00044
Arsenic (As), total	mg/L	0.005	0.0099	0.0038	0.0748	0.0055	0.0022	0.002	0.0028	0.0026	0.0019	0.0016	0.00589	0.00711	0.00911	0.00269	0.00719
Barium (Ba), total	mg/L	0.058	0.107	0.062	0.163	0.065	0.058	0.056	0.063	0.061	0.058	0.0602	0.0781	0.0504	0.0908	0.0589	0.166
Beryllium (Be), total	mg/L	<0.0001	0.0001	<0.0001	0.00028	<0.00004	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	0.00004	0.00003	0.00005	<0.00001	0.00012
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	0.0001	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	0.000018	0.00001	0.000014	<0.000005	0.000028
Boron (B), total	mg/L	<0.002	0.003	<0.002	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00016	0.00025	0.00025	0.00052	0.00021	0.00011	0.0001	0.00011	0.00007	0.00006	0.00008	0.000554	0.000557	0.000269	0.000108	0.000695
Calcium (Ca), total	mg/L	20.8	24	23.6	29.4	25.8	32.4	32	33.2	44.5	40	42.1	19.6	10.6	26.1	28.6	28.8
Chromium (Cr), total	mg/L	0.0023	0.0052	0.0018	0.0128	0.0017	0.0004	<0.0005	0.0009	0.0006	0.0004	0.0002	0.0016	0.0009	0.0011	0.0003	0.0034
Cobalt (Co), total	mg/L	0.0008	0.0039	0.0007	0.0107	0.00109	0.00014	0.0002	0.0004	0.0002	0.00012	0.000041	0.00148	0.00142	0.00247	0.000225	0.00331
Copper (Cu), total	mg/L	0.004	0.034	0.003	0.038	0.005	0.002	<0.001	0.002	<0.001	<0.001	0.00037	0.00679	0.00497	0.00715	0.00092	0.0129
Iron (Fe), total	mg/L	1.84	4.06	1.1	21.6	1.71	0.16	0.2	0.49	0.27	0.16	0.025	1.28	1.08	1.45	0.205	2.84
Lead (Pb), total	mg/L	0.0039	0.0076	0.0036	0.259	0.0052	0.0018	0.0017	0.0036	0.0018	0.0011	0.000576	0.0224	0.0161	0.0163	0.00152	0.0215
Lithium (Li), total	mg/L	0.002	0.004	0.002	0.009	0.002	0.002	0.002	0.002	0.002	0.002	0.0019	0.0018	0.001	0.0019	0.0015	0.0026
Magnesium (Mg), total	mg/L	3.8	4.5	4.3	7.21	5.08	5.92	5.3	4.8	7.57	7.79	7.55	3.83	2.05	4.88	5.22	5.47
Manganese (Mn), total	mg/L	0.063	0.23	0.041	0.409	0.049	0.0118	0.015	0.03	0.0177	0.0142	0.00625	0.113	0.118	0.126	0.0233	0.284
Mercury (Hg), total	mg/L											0.00001	0.00001	0.00001	<0.00001		<0.00001
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	0.00088	0.00022	0.00012	<0.001	<0.001	0.00019	0.00027	0.00023	0.00022	0.00014	0.00022	0.00023	0.00021
Nickel (Ni), total	mg/L	0.0039	0.0082	0.0025	0.02	0.003	<0.001	<0.0005	0.0009	<0.001	<0.001	0.00051	0.00358	0.00286	0.00426	0.00064	0.00496
Phosphorus (P), total	mg/L				0.32	0.044	<0.01			<0.01	0.014	0.008	0.1	0.112	0.139		0.172
Potassium (K), total	mg/L	<0.4	0.7	<0.4	1.17	0.2	0.1	<0.4	<0.4	0.2	0.2	0.21	0.47	0.16	0.21	0.15	0.27
Selenium (Se), total	mg/L	0.0005	0.0004	0.0004	<0.0006	0.0013	<0.0006	0.0008	0.0007	<0.0006	<0.0006	0.00118	0.00039	0.00026	0.00061	0.00065	0.0006
Silicon (Si), total	mg/L	3.34	6.12	2.98	11.2	3.93	3.12	3.23	3.3	3.48	3.1	3.61	2.69	1.92	3.41	2.79	4.97

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		20/06/2008	05/07/2008	14/08/2008	15/09/2008	02/10/2008	12/11/2008	20/12/2008	12/01/2009	02/02/2009	10/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009
Silver (Ag), total	mg/L	0.00051	0.00025	0.00006	0.0042	0.00011	<0.00001	0.00002	0.00006	<0.00001	<0.00001	<0.000005	0.000259	0.000073	0.000137	0.000008	0.00018
Sodium (Na), total	mg/L	0.6	0.7	0.6	0.9	0.74	0.87	2	2.2	1.02	1.03	1.05	0.6	0.28	0.71	0.82	0.7
Strontium (Sr), total	mg/L	0.062	0.08	0.076	0.085	0.063	0.091	0.094	0.089	0.102	0.103	0.107	0.0591	0.0335	0.0736	0.0823	0.08
Sulphur (S), total	mg/L	11.9	13.7	13.5				17	17.6	21.4	24.4	30	11	5	15	16	17
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	0.00012	0.00001	<0.00001		<0.00005	<0.00001	<0.00001	<0.000002	0.000018	0.000013	0.000017	<0.000002	0.000025
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0001	<0.0001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.0361	0.114	0.0265	0.1	0.0262	0.0027	0.0035	0.0122	0.0041	0.0022	<0.0005	0.0251	0.0156	0.0196	0.0026	0.0462
Uranium (U), total	mg/L	<0.0005	0.0005	<0.0005	0.0016	<0.0004	<0.0004	<0.0005	<0.0005	0.0006	0.0007	0.000848	0.000422	0.00035	0.000838	0.00034	0.000753
Vanadium (V), total	mg/L	0.0026	0.0073	0.002	0.0185	0.00217	0.00023	0.0005	0.0007	0.0003	0.0002	<0.0002	0.0023	0.0015	0.0022	0.0003	0.0062
Zinc (Zn), total	mg/L	0.027	0.038	0.03	0.144	0.034	0.026	0.027	0.023	0.016	0.017	0.017	0.0492	0.0371	0.0295	0.0113	0.0601
Zirconium (Zr), total	mg/L	<0.001	0.002	<0.001	0.0016	0.0003		<0.001	<0.001	<0.0001	<0.0001	<0.0001	0.0006	0.0002	0.0002	<0.0001	0.0007
Aluminum (Al), dissolved	mg/L	0.026	0.055	0.02	0.11	0.035	0.005	<0.005	<0.005	<0.005	<0.005	0.0027	0.113	0.0852	0.0552	0.0228	0.168
Antimony (Sb), dissolved	mg/L	0.0011	0.005	0.0009	0.0011	0.0009	0.0012	0.0002	<0.0002	0.0009	0.001	0.00023	0.0003	0.00024	0.00029	0.00028	0.00032
Arsenic (As), dissolved	mg/L	0.0016	0.0016	0.0018	0.0023	0.0017	0.0014	0.0014	0.0012	0.0013	0.0015	0.00131	0.00184	0.00175	0.00177	0.00184	0.00217
Barium (Ba), dissolved	mg/L	0.042	0.047	0.044	0.041	0.045	0.05	0.053	0.052	0.055	0.065	0.0589	0.0434	0.0249	0.0476	0.0544	0.0603
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	0.000024	<0.000005	<0.000005	0.000005
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.002	<0.002	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00011	0.00008	0.00017	0.00004	0.00013	0.00013	0.00009	0.00006	0.00005	0.00007	0.000065	0.000256	0.000145	0.000094	0.00011	0.000111
Calcium (Ca), dissolved	mg/L	20.1	22.6	22.7	27.8	25.3	29.4	33.6	29.4	43.7	37.3	41.5	19	10.1	24.3	29.6	25.5
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	<0.0005	0.0007	0.0006	<0.0004	<0.0005	<0.0005	<0.0004	<0.0004	0.0002	0.0004	0.0003	0.0002	0.0002	0.0005
Cobalt (Co), dissolved	mg/L	0.0001	0.0001	<0.0001	0.00032	0.0001	0.00002	<0.0001	<0.0001	<0.00002	0.00006	0.000016	0.000173	0.000105	0.000177	0.000089	0.0002
Copper (Cu), dissolved	mg/L	<0.001	0.001	0.001	0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.00035	0.00215	0.00132	0.00078	0.00076	0.00124
Iron (Fe), dissolved	mg/L	0.04	0.08	0.04	0.23	0.059	<0.01	0.02	<0.01	<0.01	<0.01	0.004	0.12	0.111	0.109	0.037	0.2
Lead (Pb), dissolved	mg/L	0.0003	0.0002	0.0004	0.0041	0.0006	0.0003	<0.0001	0.0001	0.0002	<0.0001	0.00006	0.000744	0.000685	0.00169	0.000969	0.00157
Lithium (Li), dissolved	mg/L	<0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.0012	0.0006	0.0013	0.0015	0.0012
Magnesium (Mg), dissolved	mg/L	3.6	4.1	4.1	4.91	4.77	5.59	5.5	5.3	7.6	7.31	7.67	3.62	1.93	4.44	5.37	4.88
Manganese (Mn), dissolved	mg/L	0.01	0.019	0.012	0.0117	0.0134	0.0022	<0.005	<0.005	0.0031	0.0042	0.00392	0.027	0.0115	0.0286	0.0168	0.0205
Mercury (Hg), dissolved	mg/L											<0.00001	<0.00001	<0.00001	<0.00001		<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	0.00016	0.00015	0.00009	<0.001	<0.001	0.00007	0.00021	0.00024	0.00023	0.00012	0.00022	0.00024	0.0002
Nickel (Ni), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	0.00044	0.00106	0.00077	0.00062	0.00054	0.00081
Phosphorus (P), dissolved	mg/L				<0.01	0.02	<0.01			<0.01	<0.01	0.005	0.015	0.007	0.007		
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	0.18	0.2	0.1	<0.4	<0.4	<0.1	0.2	0.21	0.4	0.13	0.25	0.2	0.15
Selenium (Se), dissolved	mg/L	0.0004	0.0004	0.0003	0.0021	<0.0006	0.0006	0.0008	0.0006	<0.0006	0.0011	0.00104	0.00038	0.00028	0.00059	0.0006	0.00055
Silicon (Si), dissolved	mg/L	1.97	2.24	2.2	2.64	2.61	2.81	3.2	2.68	3.28	2.86	3.31	1.96	1.36	2.49	3.02	2.77
Silver (Ag), dissolved	mg/L	0.00014	<0.00001	0.00001	0.00004	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.000005	0.000021	0.000031	0.000027	0.00001	0.000046
Sodium (Na), dissolved	mg/L	0.4	0.6	0.6	0.74	0.7	0.8	0.9	2.2	1.1	1	1.1	0.6	0.31	0.84	0.9	0.7
Strontium (Sr), dissolved	mg/L	0.057	0.07	0.067	0.074	0.07	0.088	0.09	0.082	0.098	0.115	0.107	0.0565	0.033	0.0704	0.0814	0.0752
Sulphur (S), dissolved	mg/L	11.6	13.7	13.2				17.4	16.8	22.5	23.4	27	11	4	14	16	17
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001		<0.00005	<0.00001	<0.00001	<0.000002	<0.000002	0.000003	0.000002	<0.000002	0.000002
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.0001	<0.0001	0.0003	<0.001	<0.001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	0.00003	0.00009	0.00003
Titanium (Ti), dissolved	mg/L	0.0007	0.0033	0.0014	0.0031	0.0007	0.0002	0.0006	0.0014	0.0005	0.0003	<0.0005	0.0026	0.0026	0.0016	0.0006	0.0049
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0005	<0.0005	0.0005	0.0007	0.000865	0.000229	0.000078	0.000295	0.000315	0.000241
Vanadium (V), dissolved	mg/L	<0.0001	0.0002	0.0001	0.00039	0.00014	<0.00004	0.0003	0.0002	<0.00004	0.00008	<0.0002	0.0003	0.0003	<0.0002	<0.0002	0.0003
Zinc (Zn), dissolved	mg/L	0.014	0.007	0.017	0.007	0.016	0.017	0.016	0.018	0.016	0.018	0.0172	0.0188	0.0137	0.0092	0.0101	0.0091
Zirconium (Zr), dissolved	mg/L				0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001	0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		06/10/2009	12/11/2009	02/12/2009	12/01/2010	10/02/2010	11/03/2010	08/04/2010	03/05/2010	08/06/2010	06/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	07/12/2010	12/01/2011
Discharge (Flow)	L/s	645.7							440.68	1675.405	967.45467	818.157667	483.2	415.336			
Total Suspended Solids	mg/L	130	3	5	10	4	2	2	31	12	18	15	5	4	<1	6	4
pH (field)	pH units	7.6	7.89	7.8	8.1	7.75	8.2	8.17	7.94	7.91	8.26	8.07	6.82	8.03	7.05	8.25	7.98
pH (lab)	pH units	7.9	8	7.8	8	8	8	8	7.9	7.7	7.82	7.88	7.86	7.64	7.78	7.68	7.51
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	191	215	232	237	245	249	239	185	138	167	194	209	218	242	236	246
Temperature (field)	C	1.9	0.4	0.5	0.5	1	0.5	0.2	3.2	5	6.5	9.1	3.7	1.1	0	0.3	0.2
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L	88.2	97.7	109	115	121	116	117	81.1	57	74.3	91.8	97.4	99.4	114	109	123
Hardness (from dissolved)	mg/L	94.5	101	109	120	128	113	119	84.9	59.9	74.9	95.3	93.3	103	124	112	115
Alkalinity, total	mg/L												48	49	55	53	52
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	44	48	53	59	58	63	65	48	30	41	45	48	53	68	69	69
Ammonia (N)	mg/L											<0.05	<0.005	0.009	0.056	0.12	<0.005
Nitrite (N)	mg/L												<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (N)	mg/L												0.1	0.17	0.22	0.23	0.26
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L	0.9	0.9	0.9	1.1	<0.5	0.6	1.2	4.1	1.5	2	1	1.2	<0.5	0.6	0.6	0.6
Aluminum (Al), total	mg/L	0.725	0.0274	0.0332	0.0632	0.0231	0.0168	0.0266	0.197	0.133	0.23	0.122	0.0793	0.0434	0.0121	0.034	0.0324
Antimony (Sb), total	mg/L	0.00037	0.00024	0.00023	0.00025	0.00019	0.00021	0.00022	0.0003	0.00025	0.0003	0.0003	0.00031	0.00028	0.00035	0.00038	0.00036
Arsenic (As), total	mg/L	0.00831	0.0012	0.00106	0.00126	0.00097	0.00091	0.00112	0.00206	0.002	0.00222	0.00174	0.00149	0.00123	0.00074	0.00102	0.00104
Barium (Ba), total	mg/L	0.099	0.0481	0.0505	0.049	0.0478	0.0484	0.0499	0.0484	0.0397	0.0503	0.0507	0.0521	0.049	0.0459	0.0479	0.0483
Beryllium (Be), total	mg/L	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	0.000018	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000291	0.000069	0.000059	0.000057	0.000054	0.000041	0.000049	0.000161	0.000113	0.000267	0.000122	0.000111	0.000082	0.00006	0.000047	0.000081
Calcium (Ca), total	mg/L	26.6	29.8	34.7	35.3	37.4	35.5	36	25.1	17.1	22.3	27.9	29.7	30.4	34.6	33.6	38.3
Chromium (Cr), total	mg/L	0.0014	0.0003	0.0003	0.0004	0.0003	0.0003	0.0004	0.0005	0.0005	0.0008	0.0006	0.0006	0.0003	0.0004	0.0002	0.0008
Cobalt (Co), total	mg/L	0.00129	0.000068	0.000064	0.000116	0.000052	0.000056	0.000074	0.000364	0.000177	0.000338	0.000163	0.000126	0.000077	0.000027	0.00009	0.000096
Copper (Cu), total	mg/L	0.0074	0.00046	0.00043	0.00066	0.00036	0.00031	0.00073	0.00225	0.00127	0.00195	0.00311	0.00079	0.0005	0.00028	0.00052	0.00072
Iron (Fe), total	mg/L	1.63	0.042	0.052	0.116	0.04	0.03	0.048	0.36	0.175	0.345	0.14	0.103	0.064	0.027	0.067	0.075
Lead (Pb), total	mg/L	0.00793	0.00075	0.000824	0.00134	0.000719	0.000502	0.000825	0.00375	0.00121	0.00256	0.000853	0.000686	0.000622	0.000313	0.00106	0.00196
Lithium (Li), total	mg/L	0.0018	0.0018	0.002	0.0018	0.0017	0.0017	0.0017	0.0019	0.0011	0.0015	0.0018	0.0017	0.0018	0.0019	0.0021	0.0018
Magnesium (Mg), total	mg/L	5.29	5.66	5.46	6.43	6.64	6.71	6.65	4.46	3.49	4.51	5.35	5.66	5.71	6.68	6.12	6.59
Manganese (Mn), total	mg/L	0.0922	0.00577	0.00706	0.00899	0.00481	0.00495	0.00799	0.0301	0.0125	0.0233	0.0116	0.00936	0.00742	0.00378	0.00699	0.0113
Mercury (Hg), total	mg/L		0.00002	<0.00001	0.00001	<0.00001	0.00001	<0.00001		<0.00001	<0.00001	0.00002	0.00001	<0.00001	<0.00001	0.00002	<0.00001
Molybdenum (Mo), total	mg/L	0.00025	0.00021	0.00022	0.0002	0.0002	0.00023	0.00023	0.00025	0.00017	0.0002	0.00022	0.00024	0.00023	0.0003	0.00025	0.0003
Nickel (Ni), total	mg/L	0.00285	0.00041	0.0004	0.00061	0.00032	0.00037	0.00056	0.00119	0.00075	0.00114	0.00064	0.00058	0.00049	0.00038	0.00049	0.00053
Phosphorus (P), total	mg/L		0.006	0.012	0.012	0.01	0.009	0.011		0.013	0.02	0.013	0.01		0.008	0.008	0.019
Potassium (K), total	mg/L	0.18	0.18	0.21	0.21	0.22	0.2	0.26	0.24	0.13	0.16	0.17	0.2	0.18	0.23	0.2	0.22
Selenium (Se), total	mg/L	0.00076	0.00086	0.00087	0.00096	0.00093	0.001	0.00106	0.00068	0.00042	0.0005	0.00066	0.00067	0.00083	0.00087	0.00083	0.00093
Silicon (Si), total	mg/L	3.48	3.06	2.9	3.44	3.56	2.74	2.8	3.01	2.08	2.59	2.91	2.99	2.83	3.06	3.04	3.63

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		06/10/2009	12/11/2009	02/12/2009	12/01/2010	10/02/2010	11/03/2010	08/04/2010	03/05/2010	08/06/2010	06/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	07/12/2010	12/01/2011
Silver (Ag), total	mg/L	0.000125	0.000006	<0.000005	0.000015	<0.000005	0.000008	<0.000005	0.00002	0.000006	0.000045	0.000023	0.000015	0.000015	<0.000005	<0.000005	0.00004
Sodium (Na), total	mg/L	0.77	0.85	0.77	1	1.01	1.07	1.1	0.74	0.51	0.62	0.77	0.85	0.85	1.04	0.94	1.11
Strontium (Sr), total	mg/L	0.0802	0.0811	0.0871	0.0853	0.0843	0.0898	0.0908	0.0717	0.0505	0.0692	0.0832	0.0832	0.087	0.0946	0.0948	0.0957
Sulphur (S), total	mg/L	16	17	22	20	23	19	21	15	11	14	16	20	21	21	22	21
Thallium (Tl), total	mg/L	0.000012	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	0.000003	0.000005	0.000002	0.000002	<0.000002	<0.000002	<0.000002	0.000003
Tin (Sn), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00005	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00019
Titanium (Ti), total	mg/L	0.0187	0.0007	0.0009	0.0025	0.001	<0.0005	<0.0005	0.0067	0.0033	0.0067	0.003	0.0024	0.0014	<0.0005	0.0008	0.0007
Uranium (U), total	mg/L	0.000755	0.00038	0.000444	0.000502	0.000506	0.0006	0.000621	0.000428	0.000131	0.000203	0.000294	0.000289	0.000442	0.000588	0.000591	0.000651
Vanadium (V), total	mg/L	0.0019	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0007	0.0003	0.0003	0.0002	<0.0002	<0.0002	0.0003
Zinc (Zn), total	mg/L	0.0289	0.0121	0.0105	0.0141	0.0127	0.0136	0.0149	0.0145	0.0109	0.0204	0.0112	0.0099	0.0085	0.0074	0.0076	0.0108
Zirconium (Zr), total	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
Aluminum (Al), dissolved	mg/L	0.105	0.0055	0.005	0.005	0.0061	0.0032	0.0055	0.0427	0.0434	0.0323	0.0255	0.0145	0.0053	0.0037	0.0044	0.004
Antimony (Sb), dissolved	mg/L	0.00027	0.00024	0.00023	0.00022	0.00021	0.00021	0.00021	0.00025	0.00025	0.00025	0.0003	0.00026	0.00024	0.00035	0.00037	0.00034
Arsenic (As), dissolved	mg/L	0.00154	0.00093	0.0008	0.00069	0.00072	0.00075	0.00078	0.00105	0.00151	0.00144	0.0015	0.00114	0.00088	0.00073	0.00072	0.00067
Barium (Ba), dissolved	mg/L	0.0607	0.0462	0.048	0.0467	0.0495	0.0475	0.0504	0.0412	0.035	0.0432	0.0479	0.0475	0.0486	0.0451	0.0459	0.046
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000015	0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000077	0.000066	0.000058	0.000045	0.000052	0.000033	0.000048	0.000105	0.00009	0.00012	0.000115	0.000081	0.000075	0.000056	0.000056	0.000047
Calcium (Ca), dissolved	mg/L	29.3	31.1	34.6	37.1	39.4	34.4	36.4	26.4	18.3	22.4	29.3	28.7	31.7	37.8	34.5	35.6
Chromium (Cr), dissolved	mg/L	0.0005	0.0004	0.0003	0.0003	0.0004	0.0003	0.0002	0.0003	0.0004	0.0004	0.0004	0.0005	0.0002	0.0004	0.0002	0.0006
Cobalt (Co), dissolved	mg/L	0.000157	0.000015	0.000016	0.000016	0.000013	0.000011	0.000016	0.000077	0.000046	0.00005	0.000045	0.000022	0.00002	0.000016	0.000017	0.000015
Copper (Cu), dissolved	mg/L	0.00089	0.00026	0.00032	0.00027	0.00031	0.00022	0.00022	0.00125	0.00078	0.00067	0.00077	0.00046	0.00044	0.0003	0.00029	0.00024
Iron (Fe), dissolved	mg/L	0.125	0.008	0.008	0.008	0.01	0.005	0.008	0.064	0.047	0.039	0.033	0.018	0.007	0.01	0.01	0.005
Lead (Pb), dissolved	mg/L	0.00043	0.000077	0.000083	0.000086	0.000106	0.00008	0.000078	0.000376	0.000234	0.000208	0.00037	0.000176	0.000121	0.000097	0.00155	0.000065
Lithium (Li), dissolved	mg/L	0.0014	0.0018	0.0018	0.0017	0.0017	0.0018	0.0018	0.0016	0.001	0.0013	0.0017	0.0016	0.0019	0.0019	0.0019	0.0019
Magnesium (Mg), dissolved	mg/L	5.17	5.67	5.4	6.69	7.1	6.54	6.77	4.6	3.44	4.59	5.38	5.24	5.84	7.18	6.31	6.24
Manganese (Mn), dissolved	mg/L	0.0223	0.0028	0.00471	0.00283	0.002	0.00289	0.00265	0.0109	0.00404	0.00641	0.00601	0.00435	0.00429	0.00322	0.0026	0.00227
Mercury (Hg), dissolved	mg/L	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	0.00002
Molybdenum (Mo), dissolved	mg/L	0.00026	0.0002	0.00022	0.00026	0.00022	0.00023	0.00024	0.00025	0.00018	0.00021	0.00024	0.00022	0.00023	0.0003	0.00026	0.00027
Nickel (Ni), dissolved	mg/L	0.00065	0.00038	0.00035	0.00035	0.00035	0.00035	0.0003	0.0006	0.00046	0.00048	0.00055	0.00038	0.00033	0.00037	0.00037	0.00031
Phosphorus (P), dissolved	mg/L	0.009	0.006	0.005	0.006	0.008	0.005	0.005		0.003	0.006	0.007	0.004		0.007	0.003	0.005
Potassium (K), dissolved	mg/L	0.17	0.2	0.22	0.23	0.23	0.19	0.21	0.24	0.12	0.15	0.18	0.18	0.19	0.26	0.19	0.2
Selenium (Se), dissolved	mg/L	0.00087	0.00091	0.00088	0.00098	0.00103	0.00105	0.00104	0.00064	0.00044	0.00051	0.00061	0.00067	0.00081	0.00088	0.00087	0.0009
Silicon (Si), dissolved	mg/L	3.05	3.19	2.79	3.32	3.67	3.13	3.37	2.86	1.82	2.4	3.43	2.81	3.13	3.45	3.03	3.04
Silver (Ag), dissolved	mg/L	0.000024	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	0.000011	0.000026
Sodium (Na), dissolved	mg/L	0.75	0.87	0.79	1.05	1.12	1.03	1.04	0.78	0.5	0.62	0.82	0.77	0.9	1.15	0.97	1.04
Strontium (Sr), dissolved	mg/L	0.0809	0.0814	0.0858	0.0878	0.0868	0.0884	0.0899	0.0729	0.0515	0.0679	0.0802	0.0798	0.0888	0.093	0.0908	0.0931
Sulphur (S), dissolved	mg/L	16	18	22	23	25	20	21	15	10	15	17	17	18	22	21	21
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	0.00004
Titanium (Ti), dissolved	mg/L	0.0026	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.000354	0.00037	0.000445	0.000493	0.000541	0.00059	0.000624	0.000383	0.000105	0.000163	0.000246	0.000268	0.000383	0.000581	0.000575	0.000592
Vanadium (V), dissolved	mg/L	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002
Zinc (Zn), dissolved	mg/L	0.0063	0.0108	0.011	0.0125	0.0136	0.0128	0.0127	0.0089	0.0085	0.0096	0.0108	0.008	0.0073	0.0077	0.0078	0.0076
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002

Data omitted from calculation of summary statistics.

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		08/02/2011	22/03/2011	19/04/2011	13/05/2011	21/06/2011	13/07/2011	17/08/2011	17/09/2011	23/09/2011	30/10/2011	20/11/2011	18/12/2011	18/12/2011	17/01/2012	13/02/2012	09/03/2012
Discharge (Flow)	L/s					1054.925	1075.31	1713.42	973.035	766.75	404			267.6	251.2		182
Total Suspended Solids	mg/L	3	4	1	2	70	29	41	34	140	3	<1.0	2.5	2.5	3.9	2.7	1.5
pH (field)	pH units	7.97	8.11		7.92	8.52	7.92	8.29	7.03	8.04	7.89	7.87		7.66	8.48	7.53	7.46
pH (lab)	pH units	7.7	7.7	7.83	7.64	7.66	7.67	7.98	7.8	7.91	7.72	7.75	7.7	7.65	7.63	7.88	7.98
Specific Conductance (field)	µS/cm						167		158	189	217.6	217		225.9	219.8	239.7	244.3
Specific Conductance (lab)	µS/cm	251	256	256	248	148	160	180	194	190	204	226	221	223	231	243	245
Temperature (field)	C	0	1.2	0.6	0.8	5.3	7.8	5.2	2.6	4	0.8	0.1		0	0	0.1	0
Dissolved Oxygen (field)	mg/L										10.86	14		13.15	11.9	14.5	13.38
Dissolved Oxygen (field)	%										76.2	95.9		90.1	82	99.5	91.5
ORP (field)	mV										277.2	156.1			351.2	183.5	59.8
Hardness (from total)	mg/L	118	127	127	116	69.4	78	82.2	87.5	89.6	97.3	110	110	103	108	109	115
Hardness (from dissolved)	mg/L	99.2	123	126	117	69.2	76.8	84.9	86.6	86.8	93.8	97.5	111	103	100	118	113
Alkalinity, total	mg/L	54	60	60	55	33	37	35	45	44	48	54	49.6	50.2	53.7	53.9	57
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	64	70	67	59	35	37	47	44.1	45	49.7	60.5	55.9	60.1	55.4	60.1	60.3
Ammonia (N)	mg/L	0.014	0.013	0.007	0.008	0.032	0.037	0.022	0.012	0.023	0.043		<0.0050	0.048	0.022	0.017	0.014
Nitrite (N)	mg/L	<0.005	<0.005	<0.005	<0.005	0.033	0.021	<0.5	0.005	0.018	<0.05	<0.005	<0.005	<0.005	<0.005	0.022	<0.05
Nitrate (N)	mg/L	0.33	0.27	0.21	0.23	<0.02	0.03	<2	0.11	0.1	<0.2	0.245	0.249	0.261	0.304	0.253	0.33
Total Kjeldahl Nitrogen	mg/L										0.3	0.208		0.039	0.029	0.102	<0.20
Dissolved Organic Carbon	mg/L	0.6	0.5	1.1	2.1	1.3	1.7	2.4	1.7	1	1.1	1.1	0.54	<0.50	0.72	0.5	<0.50
Aluminum (Al), total	mg/L	0.0208	0.0302	0.0182	0.0392	0.89	3.52	0.294	0.245	1.06	0.0497	0.0178	0.047	0.0214	0.0177	0.024	0.0232
Antimony (Sb), total	mg/L	0.0003	0.00024	0.00023	0.0003	0.00032	0.00074	0.00032	0.00025	0.00032	0.00029	0.00028	<0.0005	0.00022	0.00023	0.00023	0.00022
Arsenic (As), total	mg/L	0.00085	0.00098	0.00093	0.001	0.00358	0.0114	0.00249	0.00251	0.00423	0.00139	0.00102	0.0009	0.00098	0.00096	0.00091	0.00085
Barium (Ba), total	mg/L	0.0493	0.0517	0.0512	0.0483	0.0645	0.125	0.0594	0.0638	0.0841	0.0521	0.0449	0.047	0.0483	0.0503	0.0502	0.0509
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	0.00012	0.00001	0.00001	0.00006	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.00002	0.00006	<0.000005	<0.000005	0.000019	<0.000005	<0.000005	<0.001	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000044	0.000051	0.00005	0.000069	0.000193	0.000515	0.000216	0.000185	0.000279	0.000067	0.000007	0.00006	0.00006	0.000056	0.000044	0.000047
Calcium (Ca), total	mg/L	37	39.5	39.7	36.2	20.9	23	25.1	26.8	27.3	29.9	33.8	33.7	32	33.7	34.1	35.8
Chromium (Cr), total	mg/L	0.0004	0.0005	0.0004	0.0004	0.0024	0.007	0.0007	0.0004	0.0022	0.0002	0.0001	0.001	0.0001	<0.0001	0.0001	0.0001
Cobalt (Co), total	mg/L	0.000065	0.000123	0.000056	0.000052	0.00129	0.00463	0.00043	0.000585	0.00185	0.000075	0.000019	<0.0005	0.000042	0.000046	0.000041	0.000057
Copper (Cu), total	mg/L	0.00028	0.00045	0.00036	0.00075	0.006	0.0253	0.0025	0.00251	0.00895	0.00054	0.00039	0.0006	0.00042	0.00035	0.00093	0.00077
Iron (Fe), total	mg/L	0.037	0.067	0.034	0.058	1.48	6.31	0.563	0.296	1.5	0.055	0.016	0.068	0.033	0.025	0.028	0.035
Lead (Pb), total	mg/L	0.000525	0.00083	0.000529	0.000834	0.00509	0.0195	0.00655	0.00328	0.00778	0.000974	0.000047	0.0003	0.000324	0.000518	0.000378	0.000544
Lithium (Li), total	mg/L	0.0018	0.0017	0.0015	0.0016	0.0017	0.0055	0.0014	0.0017	0.0028	0.0016	0.0018	<0.005	0.0015	0.0015	0.0016	0.0017
Magnesium (Mg), total	mg/L	6.15	6.86	6.77	6.35	4.2	5	4.77	4.99	5.21	5.53	6.29	6.21	5.71	5.76	5.93	6.32
Manganese (Mn), total	mg/L	0.00566	0.0122	0.0064	0.0059	0.0684	0.205	0.0271	0.0363	0.0721	0.0055	0.00203	0.004	0.00334	0.00481	0.00374	0.00566
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00024	0.00025	0.00025	0.00026	0.00024	0.00045	0.00016	0.00017	0.00015	0.00022	0.00029	<0.001	0.00024	0.00022	0.00019	0.00021
Nickel (Ni), total	mg/L	0.00042	0.00043	0.00041	0.00045	0.0036	0.0121	0.00143	0.00128	0.00421	0.00035	0.00016	0.002	0.00028	0.00023	0.00037	0.00035
Phosphorus (P), total	mg/L	0.007	0.007	0.006	0.005	0.064	0.165	0.041	0.029	0.077	0.007	0.004	<0.01	0.005	0.007	0.006	0.008
Potassium (K), total	mg/L	0.2	0.2	0.2	0.23	<0.3	0.5	0.14	0.18	0.28	0.2	0.2	0.174	0.17	0.19	0.19	0.22
Selenium (Se), total	mg/L	0.00089	0.001	0.00107	0.00081	0.00047	0.00053	0.00056	0.00072	0.00063	0.00084	0.00112	0.0009	0.00103	0.00117	0.00103	0.00117
Silicon (Si), total	mg/L	3.16	3.47	3.45	3.38	3.03	6.86	2.8	3	4.2	3.1	3.7	3.31	3	3.5	3	3.4

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		08/02/2011	22/03/2011	19/04/2011	13/05/2011	21/06/2011	13/07/2011	17/08/2011	17/09/2011	23/09/2011	30/10/2011	20/11/2011	18/12/2011	18/12/2011	17/01/2012	13/02/2012	09/03/2012
Silver (Ag), total	mg/L	<0.000005	0.00001	<0.000005	0.000011	0.000105	0.00052	0.00006	0.000093	0.000261	0.000012	<0.000005	<0.00002	0.000008	0.000006	<0.000005	0.000006
Sodium (Na), total	mg/L	1.02	1.1	1.09	1.1	0.5	0.6	0.62	0.74	0.76	0.95	1.12	1.04	0.97	1.02	1.07	1.82
Strontium (Sr), total	mg/L	0.0942	0.0969	0.102	0.0879	0.0607	0.0721	0.0714	0.0795	0.0819	0.0894	0.0854	0.091	0.0887	0.0898	0.0918	0.0894
Sulphur (S), total	mg/L	19	23	20	22	<50	<50	18	17	16	19	21	17	18	22	18	21
Thallium (Tl), total	mg/L	<0.000002	<0.000002	<0.000002	0.000002	0.000021	0.000048	0.000005	0.000006	0.000016	<0.000002	<0.000002	<0.00005	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), total	mg/L	<0.00001	<0.00001	<0.00001	0.00001	<0.0002	<0.0002	<0.00001	0.00004	0.00011	0.00007	0.00005	<0.005	0.00002	<0.0002	<0.0002	<0.0002
Titanium (Ti), total	mg/L	0.0008	0.0007	<0.0005	0.0014	0.025	0.1	0.0087	0.0065	0.032	0.0013	<0.0005	<0.005	0.0008	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	0.000618	0.00074	0.000748	0.000701	0.00025	0.000723	0.000194	0.000361	0.00042	0.000395	0.000041	0.0005	0.000431	0.000456	0.000562	0.000491
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.0025	0.0089	0.0009	0.0008	0.0032	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.0076	0.0079	0.0073	0.0091	0.017	0.047	0.0186	0.0167	0.0229	0.0061	0.0025	0.007	0.0053	0.0055	0.0054	0.0065
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0007	<0.0001	0.0001	0.0009	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.005	0.0036	0.0063	0.0104	0.0515	0.134	0.025	0.0359	0.0507	0.0072	0.0091	0.0058	0.007	0.0044	0.0049	0.0011
Antimony (Sb), dissolved	mg/L	0.00026	0.00025	0.00022	0.00033	0.00026	0.00042	0.00027	0.00028	0.00026	0.00024	0.00028	<0.00050	0.0002	0.00022	0.00021	0.00021
Arsenic (As), dissolved	mg/L	0.00064	0.00069	0.00072	0.00077	0.00142	0.00192	0.00147	0.00142	0.00138	0.00108	0.00105	0.00083	0.00083	0.00073	0.00081	0.00077
Barium (Ba), dissolved	mg/L	0.0468	0.0513	0.0504	0.0526	0.0406	0.0413	0.0474	0.0488	0.0506	0.0419	0.0486	0.0474	0.048	0.0418	0.0482	0.0474
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00010	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0010	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000037	0.000053	0.00005	0.000065	0.000112	0.000121	0.000127	0.000105	0.000074	0.000049	0.000072	0.000048	0.000049	0.000052	0.000046	0.000042
Calcium (Ca), dissolved	mg/L	30.2	37.7	39.4	36.8	21.4	23.7	26.7	27.2	26.9	28.7	29.2	34.7	31.9	30.6	36.1	35.2
Chromium (Cr), dissolved	mg/L	0.0004	0.0008	0.0005	0.0004	0.0003	0.0006	0.0004	0.0001	0.0003	0.0002	0.0001	<0.0010	<0.0001	0.0001	<0.0001	<0.0001
Cobalt (Co), dissolved	mg/L	0.00001	0.000017	0.000012	0.000024	0.00008	0.000258	0.000054	0.000036	0.000083	0.000016	0.000024	<0.00050	0.000011	0.000013	0.000012	0.000009
Copper (Cu), dissolved	mg/L	0.00014	0.00035	0.00031	0.0006	0.00097	0.00218	0.00075	0.0006	0.00075	0.00035	0.00046	0.00034	0.0002	0.00031	0.00015	0.00023
Iron (Fe), dissolved	mg/L	0.004	0.005	0.006	0.014	0.062	0.162	0.043	0.042	0.067	0.012	0.01	0.0073	0.008	0.006	0.006	0.001
Lead (Pb), dissolved	mg/L	0.00005	0.000203	0.000136	0.000188	0.000343	0.00268	0.00098	0.000309	0.000411	0.000303	0.000084	<0.00020	0.00006	0.00004	0.00003	0.000021
Lithium (Li), dissolved	mg/L	0.0017	0.0017	0.0017	0.0016	0.001	0.0013	0.001	0.0015	0.0017	0.0015	0.0018	<0.0050	0.0015	0.0014	0.0016	0.0016
Magnesium (Mg), dissolved	mg/L	5.79	7.02	6.71	6.03	3.84	4.28	4.45	4.56	4.78	5.35	5.97	5.9	5.75	5.75	6.89	6.18
Manganese (Mn), dissolved	mg/L	0.00188	0.00535	0.00296	0.00751	0.0115	0.0196	0.00786	0.00445	0.00614	0.00317	0.00244	0.0019	0.0016	0.00259	0.0015	0.00219
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.000050	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	0.00023	0.00027	0.00027	0.00028	0.00032	0.00022	0.00018	0.00018	0.00024	0.00023	0.00024	<0.0010	0.00022	0.00021	0.00022	0.00021
Nickel (Ni), dissolved	mg/L	0.00033	0.00035	0.00036	0.00036	0.00066	0.00089	0.00048	0.00038	0.00049	0.00022	0.00023	<0.0010	0.00015	0.00021	0.00022	0.00019
Phosphorus (P), dissolved	mg/L	0.004	0.004	0.005	<0.002	0.005	0.014	0.003	0.005	0.007	0.003	<0.002	<0.01	0.005	0.004	0.007	0.005
Potassium (K), dissolved	mg/L	0.19	0.26	0.22	0.23	0.14	0.19	0.11	0.18	0.18	0.17	0.19	0.2	0.19	0.18	0.22	0.21
Selenium (Se), dissolved	mg/L	0.00087	0.00099	0.001	0.0009	0.00051	0.00052	0.0006	0.00074	0.00076	0.0008	0.00098	0.00094	0.00101	0.0011	0.00109	0.00106
Silicon (Si), dissolved	mg/L	2.31	3.15	3.34	3.25	2.13	2.7	2.6	2.7	2.8	2.9	2.8	3.29	3.1	3	3.3	3.3
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000015	0.000043	<0.000005	0.000013	0.000022	<0.000005	<0.000005	<0.000020	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	0.95	1.2	1.12	1.03	0.55	0.64	0.59	0.71	0.73	0.94	1.05	1.07	0.99	1.06	1.3	1.61
Strontium (Sr), dissolved	mg/L	0.0903	0.0986	0.0964	0.0955	0.0641	0.0688	0.0712	0.0829	0.0847	0.0802	0.0887	0.0888	0.0879	0.0823	0.0923	0.0875
Sulphur (S), dissolved	mg/L	17	21	21	19	12	15	17	16	16	17	17	19.9	19	21	22	20
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000050	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.00004	<0.00001	0.00012	0.00038	0.0001	0.00007	<0.0050	0.00005	<0.0002	<0.0002	<0.0002
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	0.0025	<0.0005	0.0008	0.0009	<0.0005	<0.0005	<0.0050	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.000566	0.000728	0.000742	0.000739	0.000143	0.000237	0.000143	0.000203	0.000262	0.000389	0.000413	0.00043	0.000425	0.000478	0.000577	0.00059
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0050	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0064	0.0088	0.0071	0.009	0.0056	0.0128	0.0111	0.008	0.0042	0.0052	0.0082	0.0063	0.0056	0.0058	0.0055	0.0053
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		07/04/2012	01/05/2012	31/05/2012	02/07/2012	08/07/2012	01/08/2012	21/09/2012	16/10/2012	18/11/2012	18/11/2012	06/12/2012	11/01/2013	09/02/2013	14/03/2013	04/04/2013	03/05/2013
Discharge (Flow)	L/s		202.2	1655.8	1957.63		884	795.1	565.65					561.28	2741.2	88.1	112
Total Suspended Solids	mg/L	<1.0	53.1	246	540	197	166	12.9	4.6	5.4	7.1	9.1	6.1	1.7	2.5	1.3	<1.0
pH (field)	pH units	7.69	8.20	7.78	7.79	7.9	7.51	7.73	7.67	6.84	6.84	6.76	7.42	7.54	8.76	7.62	6.74
pH (lab)	pH units	7.95	7.86	7.62	7.49	7.82	7.75	7.74	7.83	7.04	7.98	7.86	7.78	7.66	7.82	7.91	8.03
Specific Conductance (field)	µS/cm		249.4	97.86	164.2	181.5	213.2	219.5	226.9	239	239	267	266	258.7	113.7	274.3	277.1
Specific Conductance (lab)	µS/cm	254	252	123	154	173	194	200	201	221	223	241	249	246	249	247	253
Temperature (field)	C	0.1	1.4	4.1	5.2	6	6.4	3.7	1.1	0.3	0.3	0.02	0.05	0	0	0	0.2
Dissolved Oxygen (field)	mg/L		13.92		12.51	12.2	13.12	12.66	13.05	8.6	8.6		13.48	15.63	14.83	13.57	13.06
Dissolved Oxygen (field)	%		99.20		98.5	98	106.7	95.9	92.1	76	76		92.5	108.8	101.8	93.1	91.5
ORP (field)	mV	208.6	202.80		80.7	105.8	103.2	102.3	192.8			144.5		210.2	-24.4	124.2	-5.4
Hardness (from total)	mg/L	118	122	60.4	96.3	85.1	101	85.4	94.9	108	110	110	125	119	118	127	128
Hardness (from dissolved)	mg/L	116	120	50.9	67.4	74.3	94.7	88.2	93.1	108	111	108	119	118	121	126	128
Alkalinity, total	mg/L	57.2	54	28.8	32.7	37.3	42.5	40.6	46.2	51.2	53.1	57.1	55.5	56.1	58.6	56.5	64.7
Chloride	mg/L		2.4	1.1	1.1		0.66	0.67	0.58	<0.50	0.96	0.76	0.9	0.94	0.55	<0.50	<0.50
Fluoride	mg/L															0.085	0.081
Sulphate, dissolved	mg/L	60.5	60	25.6	35	39.5	49.8	51.8	50.1	56	57.9	64.4	62.2	67.3	71.3	66.2	65.7
Ammonia (N)	mg/L	0.012	0.01	0.053	0.034	0.016	0.034	0.014	0.015	0.013	0.017	0.071	0.011	0.0067	0.05		<0.0050
Nitrite (N)	mg/L	<0.005	0.052	<0.050	0.052	<0.050	<0.050	<0.050	<0.050	0.073	<0.050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010
Nitrate (N)	mg/L	0.309	2.63	<0.20	0.39	<0.20	<0.20	<0.20	<0.20	<0.20	0.42	0.273	0.323	0.266	0.238	0.244	0.247
Total Kjeldahl Nitrogen	mg/L	0.044	0.17	0.44	<0.20		0.34	<0.20	0.22	0.66		0.65	<0.020	<0.020	0.043	<0.050	<0.050
Dissolved Organic Carbon	mg/L	<0.50	2.12	3.63	2.21	0.57	0.94	0.97	0.58	0.62	<0.50	3.06	<0.50	0.67	0.97	0.63	0.78
Aluminum (Al), total	mg/L	0.0106	0.344	1	2.33	0.723	0.715	0.0995	0.0326	0.0525	0.0417	0.0707	0.0236	0.0217	0.0176	0.0479	0.0288
Antimony (Sb), total	mg/L	0.00027	0.000525	0.000358	0.000473	0.000368	0.000383	0.000256	0.000245	0.000255	0.000247	0.000302	0.000256	0.000242	0.000215	0.00021	0.00023
Arsenic (As), total	mg/L	0.00082	0.00268	0.00433	0.00913	0.00445	0.00362	0.00175	0.00148	0.0013	0.00119	0.0014	0.000925	0.0009	0.00101	0.00096	0.00089
Barium (Ba), total	mg/L	0.0485	0.0712	0.109	0.202	0.111	0.107	0.0552	0.0548	0.0548	0.0521	0.0584	0.0556	0.0507	0.0517	0.0517	0.0522
Beryllium (Be), total	mg/L	<0.00001	0.000025	0.000082	0.000175	0.000062	0.000058	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.000005	0.000006	0.0000059	0.0000595	0.0000262	0.000014	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000053	0.000229	0.000607	0.00113	0.000512	0.000399	0.000124	0.000081	0.000091	0.000074	0.000156	0.000057	0.000052	0.000058	0.000044	0.000046
Calcium (Ca), total	mg/L	36.3	37.6	17.4	27.8	26.1	30.4	26.2	30	33.6	34.2	33.7	39.7	36.9	36.4	39.0	40.2
Chromium (Cr), total	mg/L	<0.0001	0.00073	0.00198	0.00463	0.0014	0.00132	0.00015	0.00014	0.00041	0.00044	0.0003	<0.00010	<0.00010	0.00011	0.00019	0.00019
Cobalt (Co), total	mg/L	0.00002	0.000599	0.00212	0.00523	0.0018	0.00161	0.000138	0.000064	0.000096	0.00009	0.000155	0.000066	0.000044	0.000066	<0.00010	<0.00010
Copper (Cu), total	mg/L	0.00025	0.00362	0.00941	0.0247	0.00877	0.00762	0.000886	0.000747	0.000974	0.000967	0.00254	0.000376	0.000308	0.000412	0.00051	0.00061
Iron (Fe), total	mg/L	0.02	0.746	2.91	7.54	2.34	1.94	0.108	0.0571	0.106	0.0898	0.152	0.0438	0.0393	0.0473	0.085	0.033
Lead (Pb), total	mg/L	0.000453	0.00987	0.0114	0.0296	0.0114	0.00954	0.00133	0.000766	0.00282	0.00156	0.00911	0.000669	0.000505	0.00257	0.000339	0.000642
Lithium (Li), total	mg/L	0.0016	0.002	0.00215	0.00324	0.0019	0.00225	0.00134	0.00145	0.00148	0.00153	0.00161	0.00166	0.0015	0.00154	0.00123	0.00187
Magnesium (Mg), total	mg/L	6.57	6.87	4.14	6.53	4.85	5.98	4.83	4.88	5.95	6.07	6.26	6.36	6.39	6.49	7.07	6.72
Manganese (Mn), total	mg/L	0.00343	0.0473	0.158	0.414	0.18	0.108	0.00911	0.00663	0.0102	0.0081	0.0142	0.00669	0.00504	0.00893	0.00543	0.00407
Mercury (Hg), total	mg/L	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00026	0.000327	0.000219	0.000308	0.00019	0.000135	0.000165	0.000176	0.000213	0.000211	0.000236	0.000216	0.000237	0.000221	0.000234	0.000248
Nickel (Ni), total	mg/L	0.0003	0.00157	0.00589	0.0137	0.00443	0.00416	0.000535	0.00037	0.000604	0.000523	0.000747	0.000263	0.000299	0.00027	<0.00050	<0.00050
Phosphorus (P), total	mg/L	<0.002	0.0406	0.243	0.681	0.226	0.172	0.0107	0.0101	0.0101	0.0153	0.0188	0.0091	0.0049	0.0068	<0.050	<0.050
Potassium (K), total	mg/L	0.21	0.364	0.347	0.392	0.26	0.24	0.154	0.167	0.196	0.193	0.541	0.232	0.204	0.199	0.23	0.22
Selenium (Se), total	mg/L	0.00108	0.00109	0.000458	0.000586	0.00061	0.000681	0.00084	0.000869	0.000912	0.00111	0.000956	0.00124	0.00116	0.00123	0.00110	0.00110
Silicon (Si), total	mg/L	3.1	3.55	3	5.38	3.42	3.91	2.54	3.23	3.18	3.51	3.07	3.91	3.37	3.43	3.33	3.28

Station Name		KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41	KV-41
Sample Date		07/04/2012	01/05/2012	31/05/2012	02/07/2012	08/07/2012	01/08/2012	21/09/2012	16/10/2012	18/11/2012	18/11/2012	06/12/2012	11/01/2013	09/02/2013	14/03/2013	04/04/2013	03/05/2013
Silver (Ag), total	mg/L	<0.000005	0.000035	0.0000218	0.000312	0.0002	0.000162	0.000006	0.000007	0.000005	0.000005	0.000027	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010
Sodium (Na), total	mg/L	1.37	1.5	0.621	0.708	0.635	0.942	0.783	0.802	1.09	1.09	1.35	1.26	1.27	1.32	1.18	1.30
Strontium (Sr), total	mg/L	0.0946	0.0965	0.0606	0.0811	0.0761	0.0892	0.0832	0.086	0.0929	0.0877	0.0962	0.0989	0.0976	0.097	0.115	0.103
Sulphur (S), total	mg/L	21	22	<10	14	14	18	18	20	20.4	19.8	22.8	23.9	20.3	21.9	21.8	23.0
Thallium (Tl), total	mg/L	<0.000002	0.00001	0.0000274	0.0000503	0.0000206	0.000018	<0.0000020	<0.0000020	0.000004	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00082	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00021	<0.00010	0.00017
Titanium (Ti), total	mg/L	<0.0005	0.00768	0.0213	0.048	0.0212	0.0171	0.00229	0.00139	0.00162	0.00143	0.00211	0.00066	0.00057	0.00078	<0.010	<0.010
Uranium (U), total	mg/L	0.000627	0.000903	0.000418	0.000793	0.000354	0.0004	0.000224	0.000271	0.000396	0.000414	0.000534	0.000549	0.000587	0.000581	0.000659	0.000666
Vanadium (V), total	mg/L	<0.0002	0.00151	0.00376	0.0096	0.00289	0.00261	<0.00020	<0.00020	<0.00020	<0.00020	0.00024	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.0063	0.0175	0.042	0.0801	0.0359	0.0289	0.0106	0.00757	0.0115	0.0144	0.0176	0.00541	0.00567	0.00615	0.0058	0.0055
Zirconium (Zr), total	mg/L	<0.0001	0.00111	0.00043	0.00064	0.00031	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080
Aluminum (Al), dissolved	mg/L	0.0015	0.00461	0.0217	0.00745	0.00399	0.00563	0.00315	0.00218	0.00243	0.0021	0.00933	0.00127	0.00166	0.00162	0.0016	0.0016
Antimony (Sb), dissolved	mg/L	0.00027	0.000468	0.000361	0.000395	0.000296	0.00034	0.000289	0.000248	0.000222	0.000236	0.000243	0.000247	0.000224	0.000223	0.00020	0.00023
Arsenic (As), dissolved	mg/L	0.00069	0.000858	0.00184	0.00177	0.0016	0.0015	0.00145	0.00121	0.000912	0.000918	0.000814	0.000763	0.000748	0.000751	0.00072	0.00072
Barium (Ba), dissolved	mg/L	0.0493	0.0492	0.0353	0.0471	0.0451	0.0452	0.0522	0.0528	0.0509	0.0489	0.0523	0.052	0.0487	0.0506	0.0493	0.0498
Beryllium (Be), dissolved	mg/L	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.00005	0.000076	0.000149	0.0000357	0.0000531	0.000066	0.0001	0.000074	0.00007	0.000061	0.000099	0.000059	0.000046	0.00005	0.000041	0.000045
Calcium (Ca), dissolved	mg/L	35.7	37	15.1	20.9	22.8	29.2	27	29.2	33.9	34.4	33.3	36.9	36.9	37.3	39.2	40.6
Chromium (Cr), dissolved	mg/L	<0.0001	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	0.00011	0.00014	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000013	0.000057	0.0000812	0.0000889	0.0000412	0.000047	0.000018	0.000019	0.000014	0.000018	0.000029	0.000008	0.000005	0.000013	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.00023	0.000616	0.00101	0.000643	0.000415	0.00039	0.000342	0.000438	0.000349	0.000453	0.00159	0.000313	0.000236	0.00051	0.00028	0.00046
Iron (Fe), dissolved	mg/L	0.002	0.0093	0.0335	0.021	0.0076	0.0075	0.0065	0.0077	0.0057	0.0039	0.0065	0.0018	0.0016	0.0035	<0.010	<0.010
Lead (Pb), dissolved	mg/L	0.000145	0.000188	0.00042	0.000211	0.0000929	0.000085	0.000062	0.000148	0.000046	0.00008	0.000748	0.000026	0.000015	0.000082	<0.000050	0.000130
Lithium (Li), dissolved	mg/L	0.0017	0.00185	0.00111	0.00097	0.00111	0.00147	0.00131	0.00142	0.00143	0.00153	0.00156	0.00165	0.00142	0.00162	0.00123	0.00175
Magnesium (Mg), dissolved	mg/L	6.55	6.71	3.19	3.72	4.21	5.28	5.06	4.87	5.78	6.07	5.96	6.58	6.26	6.66	6.90	6.57
Manganese (Mn), dissolved	mg/L	0.00176	0.0139	0.0125	0.0141	0.00916	0.0144	0.00402	0.00399	0.00401	0.00394	0.00529	0.00246	0.00249	0.00425	0.00313	0.00267
Mercury (Hg), dissolved	mg/L	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00026	0.000349	0.000314	0.000313	0.000261	0.000264	0.000203	0.000198	0.000243	0.000224	0.00026	0.000245	0.000253	0.000235	0.000225	0.000238
Nickel (Ni), dissolved	mg/L	0.00021	0.000368	0.000716	0.000398	0.000307	0.000331	0.0003	0.000194	0.000232	0.000282	0.000334	0.000219	0.000298	0.000261	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	0.003	<0.0020	0.0064	0.0036	0.0065	0.0021	0.0021	0.0035	0.0055	0.0064	0.0077	0.0061	0.004	0.0058	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.22	0.319	0.22	0.127	0.136	0.168	0.15	0.154	0.183	0.191	0.382	0.229	0.197	0.25	0.23	0.22
Selenium (Se), dissolved	mg/L	0.00115	0.00108	0.00042	0.000486	0.000605	0.000721	0.000779	0.000737	0.00101	0.000892	0.00106	0.00102	0.00114	0.0012	0.00111	0.00112
Silicon (Si), dissolved	mg/L	3.1	2.94	1.74	2.22	2.34	2.98	2.65	3.11	3.33	3.58	2.92	3.56	3.41	3.52	3.19	3.18
Silver (Ag), dissolved	mg/L	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.39	1.49	0.59	0.59	0.639	0.94	0.82	0.809	1.07	1.12	1.23	1.29	1.24	1.39	1.15	1.32
Strontium (Sr), dissolved	mg/L	0.0937	0.0974	0.0551	0.0607	0.0689	0.0826	0.0842	0.085	0.0898	0.0867	0.0946	0.099	0.0971	0.0973	0.115	0.0961
Sulphur (S), dissolved	mg/L	23	22	<10	13	14	18	18	18	19.8	20.1	19.1	23.9	20	22.7	21.8	22.4
Thallium (Tl), dissolved	mg/L	<0.000002	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000006	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	<0.00020	<0.00020	0.00023	<0.00020	<0.00020	<0.00020	<0.00010	0.00023
Titanium (Ti), dissolved	mg/L	<0.0005	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000639	0.00088	0.0002	0.000168	0.00016	0.000236	0.000235	0.000267	0.000389	0.000411	0.00042	0.00054	0.000608	0.000581	0.000640	0.000654
Vanadium (V), dissolved	mg/L	<0.0002	<0.00020	<0.00020	0.00025	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.0159	0.00425	0.0103	0.0025	0.00446	0.00382	0.00793	0.00721	0.00628	0.00917	0.014	0.00535	0.00563	0.00578	0.0044	0.0046
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.00010	0.00043	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-41	KV-41	KV-41
Sample Date		08/06/2013	04/07/2013	11/08/2013
Discharge (Flow)	L/s	1900.65	709.583	511.48
Total Suspended Solids	mg/L	77.2	203	12.0
pH (field)	pH units	7.32	7.85	7.92
pH (lab)	pH units	7.75	7.79	7.89
Specific Conductance (field)	µS/cm	100.4	186.8	195.3
Specific Conductance (lab)	µS/cm	106	185	209
Temperature (field)	C	2.8	6.9	10.3
Dissolved Oxygen (field)	mg/L	14.32	10.99	11.3
Dissolved Oxygen (field)	%	100.4	91.2	101.5
ORP (field)	mV	72.1	82.6	192.3
Hardness (from total)	mg/L	50.0	86.6	100
Hardness (from dissolved)	mg/L	49.0	83.1	99.2
Alkalinity, total	mg/L	23.4	38.4	46.4
Chloride	mg/L	<0.50	<0.50	<0.50
Fluoride	mg/L	0.045	0.056	0.072
Sulphate, dissolved	mg/L	26.3	46.4	54.6
Ammonia (N)	mg/L		0.0093	
Nitrite (N)	mg/L	<0.0010	<0.0010	0.0010
Nitrate (N)	mg/L	0.0881	0.0203	0.0799
Total Kjeldahl Nitrogen	mg/L	0.135	0.093	0.081
Dissolved Organic Carbon	mg/L	4.07	1.44	0.68
Aluminum (Al), total	mg/L	0.617	2.31	0.229
Antimony (Sb), total	mg/L	0.00040	0.00094	0.00036
Arsenic (As), total	mg/L	0.00323	0.0229	0.00347
Barium (Ba), total	mg/L	0.0550	0.102	0.0668
Beryllium (Be), total	mg/L	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000353	0.000501	0.000121
Calcium (Ca), total	mg/L	15.0	25.8	30.8
Chromium (Cr), total	mg/L	0.00131	0.00424	0.00052
Cobalt (Co), total	mg/L	0.00081	0.00415	0.00036
Copper (Cu), total	mg/L	0.00458	0.0139	0.00169
Iron (Fe), total	mg/L	1.44	5.47	0.451
Lead (Pb), total	mg/L	0.0116	0.0441	0.00356
Lithium (Li), total	mg/L	0.00111	0.00352	0.00111
Magnesium (Mg), total	mg/L	3.04	5.42	5.61
Manganese (Mn), total	mg/L	0.0549	0.240	0.0266
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000202	0.000547	0.000232
Nickel (Ni), total	mg/L	0.00263	0.00934	0.00105
Phosphorus (P), total	mg/L	0.062	0.229	<0.050
Potassium (K), total	mg/L	0.33	0.51	0.24
Selenium (Se), total	mg/L	0.00038	0.00069	0.00065
Silicon (Si), total	mg/L	2.60	5.74	3.24

Station Name		KV-41	KV-41	KV-41
Sample Date		08/06/2013	04/07/2013	11/08/2013
Silver (Ag), total	mg/L	0.000035	0.000706	0.000036
Sodium (Na), total	mg/L	0.479	0.892	1.08
Strontium (Sr), total	mg/L	0.0431	0.0746	0.0792
Sulphur (S), total	mg/L	8.07	15.5	17.7
Thallium (Tl), total	mg/L	0.000037	0.000039	<0.000010
Tin (Sn), total	mg/L	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	0.021	0.080	<0.010
Uranium (U), total	mg/L	0.000163	0.000564	0.000273
Vanadium (V), total	mg/L	0.0020	0.0067	<0.0010
Zinc (Zn), total	mg/L	0.0315	0.0564	0.0122
Zirconium (Zr), total	mg/L	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.0228	0.0077	0.0042
Antimony (Sb), dissolved	mg/L	0.00030	0.00033	0.00033
Arsenic (As), dissolved	mg/L	0.00187	0.00220	0.00145
Barium (Ba), dissolved	mg/L	0.0346	0.0536	0.0562
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000156	0.000038	0.000068
Calcium (Ca), dissolved	mg/L	15.1	25.8	30.8
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	<0.00010	0.00013	<0.00010
Copper (Cu), dissolved	mg/L	0.00126	0.00055	0.00021
Iron (Fe), dissolved	mg/L	0.045	<0.010	<0.010
Lead (Pb), dissolved	mg/L	0.000547	0.000183	0.000092
Lithium (Li), dissolved	mg/L	<0.00050	0.00083	0.00111
Magnesium (Mg), dissolved	mg/L	2.78	4.51	5.40
Manganese (Mn), dissolved	mg/L	0.00586	0.0545	0.00916
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000168	0.000233	0.000216
Nickel (Ni), dissolved	mg/L	0.00067	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.20	0.17	0.19
Selenium (Se), dissolved	mg/L	0.00041	0.00059	0.00077
Silicon (Si), dissolved	mg/L	1.70	2.54	2.94
Silver (Ag), dissolved	mg/L	0.000017	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	0.470	0.796	0.995
Strontium (Sr), dissolved	mg/L	0.0398	0.0716	0.0891
Sulphur (S), dissolved	mg/L	8.27	15.9	17.5
Thallium (Tl), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000087	0.000210	0.000261
Vanadium (V), dissolved	mg/L	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.0159	0.0027	0.0049
Zirconium (Zr), dissolved	mg/L	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		15/07/2007	08/09/2007	18/05/2008	06/07/2008	02/10/2008	02/02/2009	31/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009	06/10/2009	10/02/2010	26/05/2010
Discharge (Flow)	L/s										1300.56	177.475		266.785	188.85		527.0095
Total Suspended Solids	mg/L			103	<3	6	5		<4	390	20	10	<4	5	7	4	11
pH (field)	pH units	8.37	8.23	7.34	7.2	7.32				7.68	7.4	8.14		7.49	7.55	8.27	8.33
pH (lab)	pH units	7.79	7.99	7.3	7.8	7.88	7.98		8.1	7.8	7.5	7.8	8.3	8	8	8.1	7.8
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	158	175	30	74	80	300	46200	320	120	39	150	214	129	170	293	74
Temperature (field)	C	6.5	3.4	0	5	2				3.7	4	5.2		5	1.8	0.5	2.4
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L								160	69.3	18.7	77.8	106	66.6	77.3	164	35.1
Hardness (from dissolved)	mg/L			19	33	40	193	191	160	53.8	17.7	73	103	61.3	92.4	149	36.9
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L												37	19	28	57	9.9
Ammonia (N)	mg/L						<0.01	0.01	0.02	0.12	<0.01	<0.01	<0.01	<0.01			
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L	0.1	0.068	1.64	0.087	0.059	0.02	0.088	0.0098	4.94	0.215	0.0551	0.0326	0.0686	0.0245	0.0207	0.145
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.00014	0.0011	0.00008	0.00012	0.00013	0.00021	0.0001	0.00011	0.00009
Arsenic (As), total	mg/L	0.0004	0.0006	0.0016	0.0003	0.0003	0.0004	0.0006	0.00039	0.011	0.00066	0.00048	0.00045	0.00104	0.00038	0.00046	0.00055
Barium (Ba), total	mg/L	0.037	0.039	0.039	0.03	0.033	0.044	0.051	0.0486	0.176	0.0217	0.0365	0.0422	0.0379	0.0364	0.0458	0.025
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	<0.00001	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.000005	<0.0001	<0.000005	<0.000005	<0.000005	0.000019	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	0.002	<0.002	<0.002	<0.002	<0.005	<0.005	0.005	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00002	0.00012	0.00011	0.00001	<0.00001	<0.00001	0.00019	0.000023	0.0007	0.00004	0.000025	0.000016	0.000045	0.000023	0.000019	0.00002
Calcium (Ca), total	mg/L	23.1	25.6	6.1	10.7	12.4	56.6	59.3	51.9	20	5.87	24.8	33.6	21	24	53.1	11
Chromium (Cr), total	mg/L	0.0005	0.0006	0.003	0.0006	0.0005	0.0004	0.0013	0.0003	0.01	0.0004	0.0001	0.0001	0.0005	0.0003	0.0006	0.0004
Cobalt (Co), total	mg/L	<0.0001	<0.0001	0.0012	<0.0001	0.00005	0.00004	0.00016	0.000012	0.0043	0.000229	0.000058	0.000044	0.000098	0.000036	0.000033	0.000148
Copper (Cu), total	mg/L	<0.001	<0.001	0.005	<0.001	0.001	<0.001	<0.001	0.00026	0.021	0.00159	0.0006	0.00058	0.00133	0.00048	0.00044	0.00188
Iron (Fe), total	mg/L	0.1	<0.1	2	0.09	0.07	0.03	0.19	0.009	7.11	0.23	0.06	0.046	0.161	0.028	0.031	0.164
Lead (Pb), total	mg/L	0.0006	0.0004	0.0026	0.0003	0.0005	0.0002	0.0027	0.000134	0.0467	0.00189	0.00103	0.00046	0.00169	0.000427	0.000502	0.00116
Lithium (Li), total	mg/L	0.003	0.003	0.003	<0.001	<0.001	0.003	0.003	0.0033	<0.01	0.0008	0.0019	0.0026	0.0018	0.002	0.0029	0.0013
Magnesium (Mg), total	mg/L	4	4	1.3	1.6	2.06	7.97	9.55	7.47	4	0.97	3.87	5.25	3.42	4.23	7.62	1.88
Manganese (Mn), total	mg/L	<0.005	<0.005	0.079	<0.005	0.0022	0.0011	0.024	0.00063	0.227	0.0159	0.00387	0.00246	0.00731	0.00176	0.00198	0.00701
Mercury (Hg), total	mg/L								<0.00001	<0.0002	0.00002	0.00001		<0.00001		<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.00008	0.00003	0.00036	0.00028	<0.001	0.00008	0.00018	0.00025	0.0002	0.0002	0.0003	0.00013
Nickel (Ni), total	mg/L	0.0007	0.001	0.0039	0.0009	<0.001	<0.001	0.001	0.00026	0.0116	0.00105	0.00038	0.00038	0.00119	0.00034	0.00033	0.00087
Phosphorus (P), total	mg/L					<0.01	<0.01	0.021	0.008		0.022	0.015		0.017		0.013	0.015
Potassium (K), total	mg/L	<0.4	<0.4	0.5	<0.4	<0.1	0.1	0.2	0.17	1	0.15	0.14	0.15	0.16	0.09	0.17	0.14
Selenium (Se), total	mg/L	0.0007	0.0005	<0.0002	0.0002	<0.0006	<0.0006	0.0009	0.00095	<0.0008	0.00018	0.00063	0.00062	0.00057	0.00081	0.00088	0.00028
Silicon (Si), total	mg/L	2.61	2.59	2.8	1.94	2.48	3.04	3.35	3.09	9.09	1.32	2.81	2.63	3	2.76	3.72	1.74

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		15/07/2007	08/09/2007	18/05/2008	06/07/2008	02/10/2008	02/02/2009	31/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009	06/10/2009	10/02/2010	26/05/2010
Silver (Ag), total	mg/L	<0.0001	<0.0001	0.00005	<0.00001	<0.00001	<0.00001	0.00001	0.000008	0.0006	0.000018	0.000006	0.000007	0.000015	<0.000005	<0.000005	0.000009
Sodium (Na), total	mg/L	0.5	0.6	<0.4	0.4	0.54	0.75	1.06	0.75	<1	0.23	0.57	0.7	0.67	0.64	0.9	0.33
Strontium (Sr), total	mg/L	0.068	0.075	0.03	0.035	0.035	0.123	0.135	0.128	0.063	0.0187	0.0618	0.0827	0.06	0.0688	0.11	0.0344
Sulphur (S), total	mg/L	8.3	9.6	0.5	3.8		19	29.1	23	<60	<3	10	14	8	9	24	<10
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.000002	0.0001	0.000004	0.000002	<0.000002	0.000002	<0.000002	<0.000002	0.000003
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.00001	<0.0002	<0.00001	<0.00001	0.00001	0.00006	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.0511	0.0028	0.0488	0.0033	0.0018	0.0012	0.0041	<0.0005	0.163	0.005	0.0013	0.0012	0.0034	<0.0005	<0.0005	0.0028
Uranium (U), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	0.0012	0.0017	0.00156	0.00074	0.00013	0.000289	0.000543	0.000274	0.000469	0.00128	0.000153
Vanadium (V), total	mg/L	0.0004	0.0005	0.0037	0.0003	0.00018	0.0001	0.00032	<0.0002	0.014	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
Zinc (Zn), total	mg/L	0.004	0.005	0.014	0.003	0.007	0.002	0.028	0.0017	0.065	0.004	0.0024	0.0028	0.0116	0.0017	0.0049	0.0026
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	0.002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
Aluminum (Al), dissolved	mg/L	0.012	0.011	0.252	0.032	0.014	<0.005	0.063	0.0055	0.234	0.0824	0.0145	0.0069	0.0148	0.0076	0.0081	0.0668
Antimony (Sb), dissolved	mg/L	<0.0002	0.001		0.0008	0.0007	<0.0002	0.0017	0.00014	<0.0004	0.00008	0.00012	0.00015	0.00011	0.00009	0.0001	0.00009
Arsenic (As), dissolved	mg/L	0.0003	0.0004	0.0004	0.0003	0.0002	0.0003	0.0007	0.00039	0.0009	0.00035	0.00036	0.00035	0.00034	0.00034	0.00036	0.00037
Barium (Ba), dissolved	mg/L	0.037	0.037	0.013	0.03	0.03	0.049	0.046	0.0499	0.0403	0.0159	0.0339	0.0409	0.0331	0.0367	0.0439	0.0216
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	<0.00001	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005		<0.0001	<0.0001	<0.000005	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00001	0.00002	0.00004	0.00002	0.00004	<0.00001	0.00019	0.000042	<0.0001	0.000029	0.000018	0.000017	0.000012	0.000016	0.000015	0.000015
Calcium (Ca), dissolved	mg/L	24.1	27.8	5.8	10.4	12.5	62.4	60.5	51.9	17	5.51	23.2	33.2	19.3	29.4	48.2	11.4
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0004	0.0016	0.0003	<0.002	0.0003	0.0001	0.0001	0.0003	0.0003	0.0005	0.0003
Cobalt (Co), dissolved	mg/L	<0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.00002	0.0002	0.000013	0.0002	0.000044	0.000019	0.000015	0.000013	0.000012	0.000016	0.000036
Copper (Cu), dissolved	mg/L	<0.001	<0.001	0.003	0.001	<0.001	<0.001	<0.001	0.00067	0.002	0.00134	0.00042	0.00032	0.00042	0.00036	0.00035	0.00129
Iron (Fe), dissolved	mg/L	<0.01	<0.01	0.17	0.06	0.017	<0.01	0.14	0.007	0.253	0.055	0.015	0.004	0.014	0.007	0.014	0.055
Lead (Pb), dissolved	mg/L	0.0001	0.0003	0.0004	0.0008	0.0004	<0.0001	0.003	0.000272	0.0014	0.000397	0.000494	0.000063	0.000156	0.000087	0.000165	0.000283
Lithium (Li), dissolved	mg/L	0.002	0.003	0.001	<0.001	<0.001	0.003	0.003	0.0034	<0.01	0.0005	0.0018	0.0026	0.0017	0.0018	0.0028	0.0012
Magnesium (Mg), dissolved	mg/L	3.8	4.2	1	1.7	2.09	9.05	9.78	7.45	3	0.94	3.7	5.02	3.22	4.61	7	2.03
Manganese (Mn), dissolved	mg/L	<0.005	<0.005	<0.005	<0.005	0.0009	0.0002	0.0224	0.0015	0.012	0.00185	0.00113	0.00027	0.00039	0.00045	0.0007	0.00082
Mercury (Hg), dissolved	mg/L								<0.00001	<0.0002	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	0.00007	0.00015	0.00028	0.0003	<0.001	0.00008	0.00017	0.00024	0.00019	0.00023	0.00029	0.00014
Nickel (Ni), dissolved	mg/L	<0.0005	<0.0005	0.0022	<0.0005	<0.001	<0.001	<0.001	0.0003	0.0011	0.00074	0.00032	0.00021	0.00029	0.00025	0.00022	0.00069
Phosphorus (P), dissolved	mg/L					<0.01	<0.01	0.03	0.009		0.012	0.005			0.005	0.009	0.008
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.1	0.1	0.2	0.18	<1	0.13	0.14	0.14	0.1	0.11	0.15	0.13
Selenium (Se), dissolved	mg/L	0.0007	0.0005	<0.0002	0.0002	<0.0006	0.0006	0.0011	0.00099	<0.0008	0.00018	0.0006	0.00061	0.00053	0.00081	0.00084	0.00027
Silicon (Si), dissolved	mg/L	2.55	2.68	0.89	1.97	2.38	3.36	3.01	3.14	2.12	1.11	2.53	2.92	2.81	3	3.31	1.82
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000005	<0.0001	0.000016	0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	0.6	0.6	<0.4	0.5	0.6	0.9	1.4	0.78	<1	0.24	0.58	0.63	0.56	0.63	0.84	0.34
Strontium (Sr), dissolved	mg/L	0.068	0.077	0.027	0.032	0.033	0.129	0.125	0.126	0.045	0.0183	0.0618	0.0832	0.0591	0.0762	0.108	0.0344
Sulphur (S), dissolved	mg/L	8.6	10.2	0.6	3.7		23.5	29.6	28	<60	<3	7	13	7	12	21	<10
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.000002	<0.00004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	0.00002	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), dissolved	mg/L	0.0437	0.0008	0.0019	0.0014	0.0004	0.0003	0.0027	<0.0005	0.01	0.0011	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	0.0012
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	0.0012	0.0017	0.00152	0.00026	0.000075	0.000281	0.000556	0.000253	0.000528	0.00121	0.000133
Vanadium (V), dissolved	mg/L	0.0002	0.0002	0.0003	0.0001	0.00005	0.00006	0.00023	<0.0002	<0.004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.002	0.002	0.008	0.004	0.006	0.002	0.015	0.0042	0.004	0.0028	0.0026	0.0014	0.002	0.0012	0.003	0.0017
Zirconium (Zr), dissolved	mg/L					<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		06/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	09/12/2010	12/01/2011	10/02/2011	23/03/2011	20/04/2011	28/05/2011	21/06/2011	19/07/2011	18/08/2011	25/09/2011	25/10/2011
Discharge (Flow)	L/s	221.428067			597.44								246.37		271.9	227.9375	115
Total Suspended Solids	mg/L	9	10	10	3	9	2	3	2	3	4	12	2	33	3	2	1
pH (field)	pH units	8.2	8.33	7.16	8.06	7.14	8.61	8.66	7.81	8.04		7.72	8.57	8.12	8.78	8.38	8.45
pH (lab)	pH units	7.86	7.95	7.75	7.86	7.98	7.76	7.73	7.96	7.44	7.78	7.51	7.78	7.36	7.69	7.85	8.02
Specific Conductance (field)	µS/cm													91	123	178	252.2
Specific Conductance (lab)	µS/cm	144	173	185	206	244	257	276	289	303	305	58	128	92	127	178	219
Temperature (field)	C	5.8	7.2	4.3	0.9	0	0.1	0	0.2	0.1	0.4	2.3	5.3	4.2	4.2	2.6	0.8
Dissolved Oxygen (field)	mg/L																11.27
Dissolved Oxygen (field)	%																78.6
ORP (field)	mV																263.1
Hardness (from total)	mg/L	69.4	85.4	88.2	104	129	127	140	134	168	160	27.4	66.2	41.5	62.4	86	109
Hardness (from dissolved)	mg/L	66.8	88.3	87.6	98.8	116	117	141	146	159	164	27.4	62	46.5	55.7	80.7	106
Alkalinity, total	mg/L			61	66	75	85	83	86	98	89	18	42	31	43	59	70
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	24	29	28	40	51	57	57	60	71	63	12	21	13	19	24.2	41
Ammonia (N)	mg/L		0.06								0.013	0.012	0.008	0.033	0.028		
Nitrite (N)	mg/L										<0.005	<0.005		0.035	<0.5		<0.005
Nitrate (N)	mg/L										0.15	0.06		0.11	<2		0.15
Total Kjeldahl Nitrogen	mg/L																0.35
Dissolved Organic Carbon	mg/L		2.3	2	0.8	1	1	0.5	0.8	0.6	1	5.1	2.1	4.6	2.2	1.2	0.9
Aluminum (Al), total	mg/L	0.0643	0.0565	0.0286	0.0257	0.0371	0.0239	0.0169	0.0118	0.0548	0.0217	0.162	0.0388	0.823	0.05	0.0209	0.0139
Antimony (Sb), total	mg/L	0.00013	0.00014	0.00012	0.0001	0.00011	0.00011	0.0001	0.00009	0.00015	0.00014	0.00009	0.00013	0.00098	<0.0005	0.00013	0.00011
Arsenic (As), total	mg/L	0.00052	0.00052	0.00046	0.00043	0.00047	0.00039	0.00042	0.00035	0.00055	0.00045	0.00052	0.00044	0.00306	0.0005	0.00046	0.00043
Barium (Ba), total	mg/L	0.0352	0.0397	0.0379	0.0395	0.044	0.0406	0.0425	0.042	0.051	0.0453	0.0237	0.0324	0.0416	0.032	0.0381	0.0413
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.0002	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	0.000009	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00003	<0.001	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00005	0.000026	0.000027	0.000018	0.000038	0.000018	0.000024	0.000021	0.000056	0.000045	0.000039	0.000023	0.000512	0.0002	0.00004	0.000034
Calcium (Ca), total	mg/L	21.8	26.5	27.5	33.1	41.5	40.2	44.6	43	54.8	53	8.58	21.1	12.5	19	27.4	34.6
Chromium (Cr), total	mg/L	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0006	0.0003	0.0008	0.0009	0.0006	0.0003	0.0019	<0.002	0.0002	<0.0001
Cobalt (Co), total	mg/L	0.000102	0.000074	0.000057	0.000033	0.000066	0.000029	0.00002	0.000019	0.000101	0.000041	0.000136	0.000043	0.00075	<0.0005	0.00003	0.000018
Copper (Cu), total	mg/L	0.00091	0.0008	0.00076	0.00034	0.00067	0.00025	0.00028	0.00027	0.00058	0.00048	0.00145	0.00066	0.0045	0.001	0.00046	0.0003
Iron (Fe), total	mg/L	0.112	0.082	0.035	0.038	0.065	0.033	0.022	0.017	0.103	0.047	0.157	0.048	1.3	0.08	0.031	0.016
Lead (Pb), total	mg/L	0.00147	0.00124	0.000745	0.000458	0.000832	0.000348	0.000371	0.000381	0.00161	0.00334	0.00237	0.00182	0.101	0.0105	0.00265	0.000811
Lithium (Li), total	mg/L	0.002	0.0024	0.0023	0.0024	0.0026	0.0027	0.0028	0.0027	0.003	0.0027	0.0009	0.0017	0.002	<0.01	0.0022	0.0024
Magnesium (Mg), total	mg/L	3.65	4.7	4.72	5.11	6.13	6.4	6.83	6.57	7.63	6.7	1.44	3.27	2.5	3	4.25	5.62
Manganese (Mn), total	mg/L	0.00551	0.00487	0.00204	0.00212	0.00731	0.00155	0.00112	0.00094	0.00646	0.00511	0.00675	0.00231	0.0456	0.006	0.00199	0.0008
Mercury (Hg), total	mg/L	<0.00001	0.00001	<0.00001	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0002	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00019	0.00022	0.00026	0.00025	0.00027	0.00027	0.00029	0.00028	0.00034	0.00035	0.00009	0.00018	0.00023	<0.001	0.00024	0.00025
Nickel (Ni), total	mg/L	0.00056	0.00047	0.00038	0.00034	0.00053	0.00026	0.00024	0.00022	0.00045	0.00034	0.00089	0.0003	0.0025	0.001	0.00027	0.00021
Phosphorus (P), total	mg/L	0.014	0.011	0.012		0.01	0.011	0.01	0.006	0.02	0.009	0.018	0.007	0.04	<0.04	0.006	0.008
Potassium (K), total	mg/L	0.12	0.14	0.16	0.11	0.14	0.14	0.14	0.14	0.19	0.16	0.19	0.15	<0.3	<1	0.11	0.12
Selenium (Se), total	mg/L	0.00055	0.00072	0.00071	0.00076	0.00079	0.00077	0.00085	0.00082	0.00087	0.00088	0.00029	0.00056	0.00033	<0.0008	0.00073	0.00091
Silicon (Si), total	mg/L	2.73	2.87	2.91	3.08	3.38	3.05	3.02	2.39	3.55	3.31	1.69	2.62	3.2	3	2.9	3.1

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		06/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	09/12/2010	12/01/2011	10/02/2011	23/03/2011	20/04/2011	28/05/2011	21/06/2011	19/07/2011	18/08/2011	25/09/2011	25/10/2011
Silver (Ag), total	mg/L	0.000011	0.000014	0.000007	0.000007	0.00001	<0.000005	0.000012	<0.000005	0.000014	0.00001	0.000026	0.000013	0.000878	<0.0001	0.00002	<0.000005
Sodium (Na), total	mg/L	0.56	0.66	0.77	0.65	0.76	0.77	0.8	0.74	0.91	0.8	0.27	0.54	0.5	<1	0.64	0.76
Strontium (Sr), total	mg/L	0.061	0.0759	0.0745	0.0862	0.0953	0.099	0.109	0.106	0.127	0.12	0.0268	0.0586	0.0454	0.06	0.077	0.0902
Sulphur (S), total	mg/L	<10	<10	14	13	15	18	19	19	23	19	<10	<10	<50	<60	10	14
Thallium (Tl), total	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	<0.000002	0.000002	0.000004	0.000034	<0.00005	<0.000002	<0.000002
Tin (Sn), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	0.00009	<0.00001	<0.00001	<0.00001	0.00001	0.00006	<0.00001	<0.0002	<0.005	0.00014	0.00004
Titanium (Ti), total	mg/L	0.002	0.0016	0.0009	0.0011	0.001	0.0006	<0.0005	<0.0005	0.001	<0.0005	0.0048	0.0006	0.026	<0.01	0.0006	0.0005
Uranium (U), total	mg/L	0.000279	0.000478	0.000509	0.000659	0.000881	0.00101	0.00118	0.00116	0.0015	0.00143	0.000107	0.000261	0.000192	0.0003	0.000501	0.000741
Vanadium (V), total	mg/L	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0004	<0.0002	0.002	<0.005	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.004	0.004	0.0028	0.0017	0.0057	0.0017	0.0016	0.0014	0.0038	0.0053	0.0029	0.0017	0.041	<0.01	0.0029	0.0021
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0005	<0.002	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.0123	0.0148	0.0115	0.0062	0.0047	0.006	0.0047	0.0038	0.0048	0.0046	0.0803	0.0143	0.0687	0.01	0.0061	0.0035
Antimony (Sb), dissolved	mg/L	0.00011	0.00012	0.00013	0.00009	0.00011	0.0001	0.0001	0.00011	0.00013	0.00012	0.00007	0.00011	0.00018	<0.0005	0.00013	0.00011
Arsenic (As), dissolved	mg/L	0.00036	0.00042	0.0004	0.00037	0.00035	0.00037	0.00038	0.00038	0.0004	0.00035	0.00036	0.00036	0.00056	<0.0004	0.00038	0.00033
Barium (Ba), dissolved	mg/L	0.0339	0.0384	0.0368	0.0393	0.0409	0.0418	0.0416	0.0484	0.0489	0.0448	0.0196	0.0304	0.0269	0.029	0.0382	0.0396
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0002	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.001	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000079	0.000025	0.000033	0.000026	0.000016	0.000017	0.000023	0.000023	0.000045	0.000038	0.000021	0.000016	0.000047	<0.0001	0.000031	0.000032
Calcium (Ca), dissolved	mg/L	20.6	27.9	27.6	31.2	36.3	36.7	45.7	47.4	51.3	54.2	8.59	19.7	14.7	17	26	33.7
Chromium (Cr), dissolved	mg/L	0.0004	0.0005	0.0007	0.0003	0.0004	0.0003	0.0006	0.0005	0.0007	0.0005	0.0004	0.0002	0.0004	<0.002	0.0003	<0.0001
Cobalt (Co), dissolved	mg/L	0.000019	0.000021	0.000019	0.000007	0.000012	0.000006	0.000006	0.000009	0.000014	0.000008	0.000046	0.000011	0.000052	<0.0005	0.000012	0.000006
Copper (Cu), dissolved	mg/L	0.00062	0.0014	0.00141	0.0007	0.00025	0.0002	0.00019	0.0002	0.00027	0.00054	0.00126	0.00053	0.00118	<0.001	0.00033	0.00028
Iron (Fe), dissolved	mg/L	0.011	0.02	0.016	0.006	0.006	0.004	0.004	0.004	0.004	0.004	0.056	0.01	0.083	<0.02	0.006	0.001
Lead (Pb), dissolved	mg/L	0.000265	0.000418	0.001	0.000162	0.000049	0.00063	0.000099	0.000071	0.000183	0.000354	0.000357	0.000237	0.00798	0.0018	0.000709	0.000333
Lithium (Li), dissolved	mg/L	0.0019	0.0024	0.0022	0.0025	0.0026	0.0028	0.0027	0.0029	0.0029	0.0028	0.0009	0.0016	0.0012	<0.01	0.0023	0.0025
Magnesium (Mg), dissolved	mg/L	3.76	4.56	4.55	5.09	6.25	6.08	6.46	6.75	7.6	6.9	1.46	3.11	2.41	3	3.86	5.3
Manganese (Mn), dissolved	mg/L	0.00117	0.00188	0.00142	0.00123	0.00027	0.00062	0.00042	0.00028	0.00176	0.00189	0.00096	0.00023	0.00302	0.001	0.00041	0.00013
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001		0.00001	0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0002	<0.00001	
Molybdenum (Mo), dissolved	mg/L	0.00018	0.00024	0.00024	0.00023	0.00033	0.00029	0.0003	0.00032	0.00034	0.00033	0.00011	0.00023	0.00015	<0.001	0.00023	0.0002
Nickel (Ni), dissolved	mg/L	0.00036	0.00038	0.00063	0.00025	0.00023	0.00023	0.00021	0.00028	0.00022	0.00028	0.00073	0.0003	0.00061	<0.001	0.00024	0.00017
Phosphorus (P), dissolved	mg/L	0.006	0.007	0.011		0.006	0.006	0.006	0.007	0.008	0.01	0.008	0.003	0.006	<0.04	0.006	0.007
Potassium (K), dissolved	mg/L	0.12	0.14	0.23	0.2	0.12	0.12	0.13	0.15	0.2	0.21	0.17	0.13	0.09	<1	0.11	0.11
Selenium (Se), dissolved	mg/L	0.00048	0.00071	0.00064	0.00077	0.00073	0.00079	0.00084	0.00084	0.00091	0.00088	0.00026	0.0005	0.00039	<0.0008	0.00086	0.0009
Silicon (Si), dissolved	mg/L	2.56	3.41	2.83	3.05	2.92	2.66	3.12	2.53	3.02	3.44	1.59	2.36	2.64	2	2.7	3
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	0.000008	<0.000005	<0.000005	<0.000005	0.000014	<0.000005	<0.000005	<0.000005	0.000016	<0.000005	0.000023	<0.0001	0.000007	<0.000005
Sodium (Na), dissolved	mg/L	0.58	0.7	0.7	0.75	0.75	0.72	0.77	0.77	0.92	0.85	0.28	0.53	0.5	<1	0.56	0.72
Strontium (Sr), dissolved	mg/L	0.0609	0.0744	0.0742	0.0854	0.0989	0.101	0.106	0.121	0.127	0.12	0.0265	0.0566	0.043	0.055	0.0783	0.087
Sulphur (S), dissolved	mg/L	<10	<10	10	14	17	18	18	19	23	20	<10	<10	<10	<60	11	15
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	<0.00005	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.005	0.0001	0.00004
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0011	<0.0005	0.0011	<0.01	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.000293	0.00043	0.000464	0.000609	0.000895	0.00101	0.00117	0.00132	0.00153	0.00147	0.000105	0.000212	0.000129	0.0002	0.000517	0.000648
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.005	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0053	0.0061	0.0046	0.003	0.002	0.0015	0.0015	0.0014	0.0029	0.0026	0.0018	0.0011	0.0041	<0.01	0.0018	0.0019
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.002	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		20/11/2011	18/12/2011	17/01/2012	13/02/2012	12/03/2012	08/04/2012	08/05/2012	04/06/2012	04/07/2012	01/08/2012	02/09/2012	16/10/2012	20/11/2012	11/12/2012	15/01/2013	09/02/2013
Discharge (Flow)	L/s		52.6	45.7	26.5	33.7		83.3	735.36	283.14	283	224.3	163.7675			45	38.3
Total Suspended Solids	mg/L	1.7	1.5	2.5	<1.0	1.6	2	14.2	20.2	2.5	1.2	1.6	2.6	3.8	1.6	1.4	1.2
pH (field)	pH units	8.05	7.89	7.87	7.9	7.81	8.35	8.34	7.65	8.13	7.95	7.37	7.76	8	7.68	7.27	7.74
pH (lab)	pH units	7.9	7.77	7.87	8.09	8.1	8.07	7.98	7.49	7.77	7.68	8.07	7.91	7.51	8.04	7.8	7.95
Specific Conductance (field)	µS/cm	233.9	260.3	260.2	287.5		331.3	201.50	71.7	133	179.3	210.3	206.7	227	295	270	312.6
Specific Conductance (lab)	µS/cm	244	257	273	286	298	306	233	66.1	124	164	182	183	235	274	271	301
Temperature (field)	C	0	0	0	0	-0.1	0.1	0.60	2.1	5.5	5.5	4.3	0.7	0	0.08	0.15	0.1
Dissolved Oxygen (field)	mg/L	14.11	13.63	11.9	13.96	14.96		14.02	14.8	12.47	13.71	13.02	12.9	13	15.73		14.86
Dissolved Oxygen (field)	%	96.8	93.5	81	95.5			97.70	108	98.9	108.9	100.2	90.1	102	107.5		104.6
ORP (field)	mV	121.9		355.2	86.6	88	106.6	70.70	290.9	53.9	111.2	128.5	180.6	355.1			230.5
Hardness (from total)	mg/L	127	127	137	135	150	141	120	31.9	67.1	89.1	84.5	89	117	136	154	148
Hardness (from dissolved)	mg/L	132	126	123	147	144	151	109	29.2	54.7	81.5	86.3	90	121	129	159	149
Alkalinity, total	mg/L	76.4	75.1	80.7	86.7	87.6	91.3	66.8		40.3	53.2	59	58.9	74.9	84.8	85.1	89.2
Chloride	mg/L							1.5	0.59	0.66	1.2	0.6	<0.50	<0.50	1.2	<0.50	0.94
Fluoride	mg/L																
Sulphate, dissolved	mg/L	45.6	52.3	51.5	56	62.9	67.2	46.1	7.87	19.1	24.6	29.4	30.8	45.1	57.2	72.3	66.3
Ammonia (N)	mg/L																
Nitrite (N)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	0.0074	<0.050	<0.050	<0.050	<0.050	<0.050	0.075	0.005	<0.0050	<0.0050
Nitrate (N)	mg/L	0.177	0.167	0.187	0.173	0.29	0.174	0.249	<0.20	<0.20	<0.20	<0.20	<0.20	0.24	0.238	<0.020	0.171
Total Kjeldahl Nitrogen	mg/L	0.197	0.036	0.071	0.079	<0.20	0.04		0.28	0.21	<0.20	<0.20	0.22	<0.20	0.044	0.193	<0.020
Dissolved Organic Carbon	mg/L	1.04	0.74	1.21	1.26	0.95	<0.50	4.22	4.02	1.7	1.67	1.27	<0.50	0.5	0.91	<0.50	<0.50
Aluminum (Al), total	mg/L	0.0151	0.0107	0.0112	0.0082	0.0106	0.0081	0.215	0.124	0.0295	0.0226	0.0208	0.0184	0.0194	0.0183	0.00877	0.0101
Antimony (Sb), total	mg/L	0.00012	0.00012	0.00013	0.00012	0.00014	0.00012	0.00142	0.000112	0.000162	0.00014	0.00014	0.000112	0.000125	0.000139	0.00012	0.000148
Arsenic (As), total	mg/L	0.00041	0.00044	0.00049	0.0004	0.00046	0.00045	0.00415	0.000591	0.000466	0.000436	0.000429	0.00044	0.000445	0.000412	0.000389	0.000463
Barium (Ba), total	mg/L	0.0445	0.0445	0.0486	0.0493	0.047	0.0476	0.0518	0.0222	0.0304	0.0402	0.037	0.0363	0.0441	0.05	0.0532	0.0487
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000016	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000029	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.000045	0.000036	0.000041	0.000035	0.000038	0.000051	0.000695	0.0000479	0.0000544	0.000057	0.000066	0.000053	0.000067	0.00007	0.00006	0.00006
Calcium (Ca), total	mg/L	40.2	40.7	44.6	43.9	48.4	45.7	38.8	9.93	21.7	29.1	26.5	28.2	37.6	43.3	50.3	48.3
Chromium (Cr), total	mg/L	0.0001	<0.0001	0.0011	<0.0001	0.0001	<0.0001	0.00077	0.00024	0.00011	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	0.0001
Cobalt (Co), total	mg/L	0.000021	0.000019	0.000099	0.00001	0.000015	0.00001	0.000274	0.000124	0.0000385	0.000029	0.000029	0.000029	0.000028	0.000028	0.000011	0.00001
Copper (Cu), total	mg/L	0.00074	0.00036	0.00033	0.00023	0.00037	0.00025	0.00329	0.00143	0.000612	0.000433	0.000398	0.000399	0.000443	0.000347	0.00103	0.000317
Iron (Fe), total	mg/L	0.019	0.014	0.017	0.008	0.017	0.008	0.443	0.158	0.0379	0.0379	0.0266	0.0229	0.0346	0.0279	0.0089	0.014
Lead (Pb), total	mg/L	0.00134	0.000656	0.00111	0.000385	0.000977	0.000808	0.19	0.00675	0.00364	0.00341	0.00356	0.00206	0.00205	0.00453	0.0011	0.00143
Lithium (Li), total	mg/L	0.0026	0.0026	0.0028	0.0029	0.0029	0.0028	0.0024	0.00108	0.0016	0.00209	0.00205	0.00204	0.00248	0.00275	0.00289	0.00281
Magnesium (Mg), total	mg/L	6.43	6.16	6.2	6.26	7.18	6.64	5.57	1.72	3.13	4.01	4.45	4.51	5.73	6.76	6.79	6.74
Manganese (Mn), total	mg/L	0.00211	0.00079	0.00156	0.00048	0.00155	0.00092	0.0576	0.00769	0.00283	0.00182	0.00198	0.00225	0.002	0.00249	0.000967	0.00121
Mercury (Hg), total	mg/L	<0.000020	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00022	0.00026	0.00027	0.00026	0.00029	0.00032	0.000303	0.00012	0.00119	0.000197	0.000233	0.000174	0.000212	0.000211	0.00027	0.00027
Nickel (Ni), total	mg/L	0.00027	0.00019	0.00021	0.00016	0.00019	0.00023	0.00121	0.000829	0.000322	0.000255	0.000233	0.000178	0.0002	0.00025	0.000202	0.000202
Phosphorus (P), total	mg/L	0.004	0.007	0.009	0.007	0.013	0.006	0.0204	0.0187	0.0075	0.0033	0.0074	0.009	0.0158	0.0084	0.0066	0.0074
Potassium (K), total	mg/L	0.14	0.13	0.15	0.14	0.2	0.16	0.282	0.14	0.123	0.106	0.104	0.107	0.134	0.168	0.189	0.17
Selenium (Se), total	mg/L	0.00099	0.00094	0.00093	0.00095	0.001	0.001	0.00065	0.000313	0.000616	0.000857	0.000783	0.000777	0.001	0.00107	0.000991	0.00101
Silicon (Si), total	mg/L	3.3	3	3.3	2.9	3.2	3	3.3	1.9	3.3	3.27	2.63	3.07	3	3.13	3.71	3.33

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		20/11/2011	18/12/2011	17/01/2012	13/02/2012	12/03/2012	08/04/2012	08/05/2012	04/06/2012	04/07/2012	01/08/2012	02/09/2012	16/10/2012	20/11/2012	11/12/2012	15/01/2013	09/02/2013
Silver (Ag), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000217	0.000035	0.0000109	<0.0000050	0.000013	0.000006	0.000005	0.00001	<0.0000050	<0.0000050
Sodium (Na), total	mg/L	0.81	0.76	0.78	0.73	0.85	0.87	0.928	0.361	0.605	0.648	0.683	0.665	0.749	0.826	0.803	1.13
Strontium (Sr), total	mg/L	0.0954	0.104	0.109	0.112	0.114	0.115	0.0948	0.0312	0.0525	0.0784	0.0797	0.0757	0.0979	0.108	0.122	0.117
Sulphur (S), total	mg/L	16	17	22	18	23	20	16	<10	<10	<10	<10	11	17.7	20.1	23.9	21.4
Thallium (Tl), total	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000168	0.000003	0.0000022	<0.0000020	<0.0000020	0.000002	0.000002	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), total	mg/L	0.0001	0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00521	0.00275	0.00063	<0.00050	0.00062	0.00054	<0.00050	0.0006	<0.00050	<0.00050
Uranium (U), total	mg/L	0.000849	0.000907	0.00104	0.00121	0.00103	0.00131	0.000793	0.000107	0.0002	0.000398	0.000437	0.000471	0.000804	0.00105	0.00112	0.00109
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	0.00038	<0.00020	<0.00020	0.00021	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	0.003	0.0026	0.0036	0.002	0.0027	0.0027	0.0552	0.00387	0.00385	0.0033	0.00381	0.00435	0.00424	0.00456	0.00362	0.00373
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00029	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	0.005	0.0041	0.0035	0.003	0.002	0.0023	0.0284	0.0404	0.00735	0.00676	0.00478	0.00337	0.00265	0.00231	0.00214	0.00265
Antimony (Sb), dissolved	mg/L	0.00013	0.00011	0.00011	0.00012	0.00012	0.00012	0.000667	0.000075	0.000143	0.000125	0.000129	0.00011	0.000106	0.000111	0.000108	0.000117
Arsenic (As), dissolved	mg/L	0.00044	0.00042	0.00042	0.00039	0.00045	0.00039	0.00139	0.000355	0.000326	0.000385	0.00045	0.000359	0.000352	0.000376	0.000368	0.000349
Barium (Ba), dissolved	mg/L	0.0523	0.0444	0.0402	0.0471	0.0448	0.0487	0.0397	0.0193	0.0312	0.038	0.0346	0.0358	0.0428	0.0484	0.0516	0.0487
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.000048	0.000035	0.00004	0.000037	0.000034	0.00004	0.000132	0.0000205	0.0000444	0.000043	0.00005	0.00005	0.000065	0.000056	0.000063	0.000055
Calcium (Ca), dissolved	mg/L	41.7	40.2	39.4	47.3	47.1	49.8	35.1	8.82	17.4	25.9	27.3	28.6	39	41.3	52.1	48.7
Chromium (Cr), dissolved	mg/L	0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.00033	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000012	0.000008	0.000032	0.000006	<0.000005	0.000005	0.000064	0.000037	0.0000186	0.000012	0.000009	0.000011	0.000006	0.000009	0.000007	<0.0000050
Copper (Cu), dissolved	mg/L	0.00035	0.00015	0.00036	0.00028	0.00017	0.00075	0.00174	0.00139	0.000477	0.000425	0.00039	0.00073	0.000302	0.000475	0.000385	0.000195
Iron (Fe), dissolved	mg/L	0.003	0.003	0.002	0.002	<0.001	0.001	0.038	0.022	0.0042	0.0036	0.0096	0.0032	0.0011	<0.0010	<0.0010	<0.0010
Lead (Pb), dissolved	mg/L	0.000335	0.000229	0.000207	0.00017	0.000181	0.000191	0.015	0.0011	0.00136	0.0012	0.00116	0.000852	0.000659	0.000768	0.000496	0.000436
Lithium (Li), dissolved	mg/L	0.0031	0.0025	0.0026	0.0029	0.0028	0.0029	0.00223	0.00099	0.00152	0.00207	0.00205	0.00198	0.00245	0.00291	0.00288	0.00267
Magnesium (Mg), dissolved	mg/L	6.85	6.11	5.96	7.05	6.48	6.55	5.18	1.75	2.74	4.11	4.41	4.51	5.75	6.29	6.99	6.77
Manganese (Mn), dissolved	mg/L	0.00038	0.0003	0.00047	0.00013	0.00011	0.0002	0.00918	0.000573	0.00074	0.000214	0.00017	0.000277	0.000276	0.000396	0.000318	0.000258
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00033	0.00026	0.00025	0.00029	0.00026	0.00029	0.000284	0.000091	0.000159	0.000228	0.000217	0.000208	0.000223	0.000237	0.00029	0.000229
Nickel (Ni), dissolved	mg/L	0.00022	0.00016	0.00018	0.00017	0.00015	0.00017	0.00062	0.000569	0.000278	0.000237	0.000197	0.000271	0.0002	0.000159	0.000212	0.000242
Phosphorus (P), dissolved	mg/L	0.007	0.006	0.008	0.009	0.006	0.007	0.0103	0.0026	0.0038	<0.0020	0.0043	0.0042	0.0059	0.0049	0.007	0.0088
Potassium (K), dissolved	mg/L	0.15	0.13	0.15	0.16	0.14	0.16	0.254	0.136	0.107	0.1	0.106	0.101	0.129	0.148	0.181	0.168
Selenium (Se), dissolved	mg/L	0.00118	0.00091	0.00097	0.00094	0.00096	0.00097	0.000754	0.000289	0.000572	0.000719	0.000646	0.000787	0.000901	0.000844	0.000898	0.000945
Silicon (Si), dissolved	mg/L	3.2	3.1	2.9	3.3	3.1	3.2	3.03	1.49	2.36	2.96	2.78	3.02	3.23	2.85	3.77	3.4
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000017	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	0.91	0.74	0.76	0.85	0.76	0.86	0.918	0.37	0.525	0.662	0.704	0.659	0.747	0.782	0.814	0.942
Strontium (Sr), dissolved	mg/L	0.115	0.105	0.102	0.115	0.113	0.113	0.0907	0.029	0.0522	0.074	0.0748	0.0758	0.0958	0.108	0.12	0.121
Sulphur (S), dissolved	mg/L	18	18	19	20	20	22	15	<10	<10	<10	11	11	15.6	17.9	24.4	22.2
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), dissolved	mg/L	0.00006	0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00076	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.00104	0.000896	0.001	0.00127	0.00136	0.00129	0.00081	0.000105	0.000186	0.000387	0.000425	0.000494	0.000803	0.00086	0.00115	0.00112
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00025	<0.00020	<0.00020	<0.00020	0.00021	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.0035	0.0036	0.0033	0.0031	0.0024	0.0022	0.0117	0.0018	0.00313	0.00321	0.00312	0.00363	0.00341	0.00395	0.00432	0.00349
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Data omitted from calculation of summary statistics.

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		14/03/2013	04/04/2013	02/05/2013	08/06/2013	12/07/2013	07/08/2013
Discharge (Flow)	L/s	70.59	28.4	27.5	575.46		
Total Suspended Solids	mg/L	1.3	1.2	2.4	6.6	1.0	1.0
pH (field)	pH units	7.83	7.82	7.45	7.33	8.37	8.18
pH (lab)	pH units	7.93	7.99	8.06	7.69	8.02	7.97
Specific Conductance (field)	µS/cm	138	335.4	340.7	70.4	155.3	208.8
Specific Conductance (lab)	µS/cm	306	305	321	74.7	176	204
Temperature (field)	C	0	0	0.1	2.3	5	7.7
Dissolved Oxygen (field)	mg/L	14.73	13.37	13.38	14.23	12.88	12.62
Dissolved Oxygen (field)	%	102.2	92.9	94.4	106.4	102.9	107.7
ORP (field)	mV	104.3	120.9	47	97.4	136.6	154.4
Hardness (from total)	mg/L	156	161	168	35.9	88.3	99.6
Hardness (from dissolved)	mg/L	154	166	168	36.3	88.3	98.0
Alkalinity, total	mg/L	89.7	93.2	103	22.7	56.9	63.1
Chloride	mg/L	0.85	<0.50	1.16	<0.50	<0.50	<0.50
Fluoride	mg/L		0.090	0.069	0.047	0.059	0.076
Sulphate, dissolved	mg/L	66.4	67.3	66.0	11.6	30.4	37.1
Ammonia (N)	mg/L						
Nitrite (N)	mg/L	<0.0050	<0.0010	0.0025	<0.0010	<0.0010	0.0011
Nitrate (N)	mg/L	0.159	0.157	0.160	0.0800	<0.0050	0.0499
Total Kjeldahl Nitrogen	mg/L	0.202	<0.050	0.237	0.199	0.078	0.068
Dissolved Organic Carbon	mg/L	0.79	0.94	2.66	5.85	1.92	0.92
Aluminum (Al), total	mg/L	0.00927	0.0268	0.0272	0.213	0.0333	0.0327
Antimony (Sb), total	mg/L	0.00012	0.00023	0.00027	0.00019	0.00028	0.00033
Arsenic (As), total	mg/L	0.000443	0.00063	0.00059	0.00074	0.00050	0.00062
Barium (Ba), total	mg/L	0.0488	0.0470	0.0493	0.0265	0.0360	0.0413
Beryllium (Be), total	mg/L	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000056	0.000089	0.000102	0.000056	0.000075	0.000140
Calcium (Ca), total	mg/L	50.9	52.1	55.3	11.3	28.4	32.1
Chromium (Cr), total	mg/L	<0.00010	0.00024	0.00196	0.00046	0.00017	0.00017
Cobalt (Co), total	mg/L	0.00001	<0.00010	<0.00010	0.00015	<0.00010	<0.00010
Copper (Cu), total	mg/L	0.000686	0.00137	0.00301	0.00213	0.00100	0.00063
Iron (Fe), total	mg/L	0.016	0.053	0.046	0.262	0.035	0.046
Lead (Pb), total	mg/L	0.00369	0.00642	0.00285	0.00767	0.00499	0.00877
Lithium (Li), total	mg/L	0.00286	0.00269	0.00269	0.00091	0.00153	0.00221
Magnesium (Mg), total	mg/L	7.12	7.59	7.36	1.86	4.25	4.73
Manganese (Mn), total	mg/L	0.00243	0.00893	0.00737	0.00699	0.00158	0.00317
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00024	0.000287	0.000308	0.000122	0.000230	0.000266
Nickel (Ni), total	mg/L	0.000238	<0.00050	0.00088	0.00116	<0.00050	<0.00050
Phosphorus (P), total	mg/L	0.0086	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	0.185	0.27	0.44	0.23	0.18	0.17
Selenium (Se), total	mg/L	0.000953	0.00088	0.00092	0.00036	0.00059	0.00058
Silicon (Si), total	mg/L	3.49	3.25	3.36	1.82	2.62	2.79

Station Name		KV-65	KV-65	KV-65	KV-65	KV-65	KV-65
Sample Date		14/03/2013	04/04/2013	02/05/2013	08/06/2013	12/07/2013	07/08/2013
Silver (Ag), total	mg/L	<0.0000050	0.000068	0.000032	0.000071	<0.000010	0.000029
Sodium (Na), total	mg/L	0.865	0.821	1.12	0.351	0.619	0.658
Strontium (Sr), total	mg/L	0.122	0.143	0.126	0.0338	0.0727	0.0853
Sulphur (S), total	mg/L	21.4	21.9	22.8	3.87	10.4	12.2
Thallium (Tl), total	mg/L	0.000002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00010	0.00020	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), total	mg/L	0.00125	0.00135	0.00136	0.000153	0.000389	0.000508
Vanadium (V), total	mg/L	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.00488	0.0097	0.0201	0.0057	0.0060	0.0082
Zirconium (Zr), total	mg/L	0.00061		<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00329	0.0039	0.0053	0.0549	0.0060	0.0065
Antimony (Sb), dissolved	mg/L	0.00013	0.00013	0.00024	0.00011	0.00023	0.00028
Arsenic (As), dissolved	mg/L	0.000443	0.00044	0.00045	0.00038	0.00040	0.00050
Barium (Ba), dissolved	mg/L	0.0479	0.0488	0.0479	0.0231	0.0381	0.0407
Beryllium (Be), dissolved	mg/L	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.00006	0.000051	0.000096	0.000030	0.000051	0.000100
Calcium (Ca), dissolved	mg/L	48.8	53.7	55.3	11.5	28.6	31.7
Chromium (Cr), dissolved	mg/L	0.00018	<0.00010	0.00161	0.00015	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000009	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.00104	0.00067	0.00300	0.00154	0.00046	0.00051
Iron (Fe), dissolved	mg/L	0.0054	<0.010	<0.010	0.036	<0.010	<0.010
Lead (Pb), dissolved	mg/L	0.000693	0.000589	0.00135	0.00115	0.00279	0.00374
Lithium (Li), dissolved	mg/L	0.00292	0.00295	0.00256	0.00082	0.00182	0.00234
Magnesium (Mg), dissolved	mg/L	6.97	7.68	7.31	1.86	4.10	4.60
Manganese (Mn), dissolved	mg/L	0.00161	0.00336	0.00580	0.000885	0.000266	0.000323
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000263	0.000298	0.000298	0.000110	0.000218	0.000236
Nickel (Ni), dissolved	mg/L	0.000227	<0.00050	0.00078	0.00087	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	0.0085	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.284	0.19	0.45	0.21	0.14	0.15
Selenium (Se), dissolved	mg/L	0.00103	0.00093	0.00094	0.00038	0.00055	0.00059
Silicon (Si), dissolved	mg/L	3.38	3.25	3.26	1.55	2.54	2.74
Silver (Ag), dissolved	mg/L	<0.0000050	<0.000010	<0.000010	0.000018	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	0.953	0.820	1.12	0.349	0.602	0.644
Strontium (Sr), dissolved	mg/L	0.122	0.123	0.120	0.0325	0.0688	0.0831
Sulphur (S), dissolved	mg/L	22.1	22.0	22.5	3.83	10.2	11.9
Thallium (Tl), dissolved	mg/L	0.000002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	0.00013	0.00028	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00128	0.00135	0.00130	0.000139	0.000375	0.000481
Vanadium (V), dissolved	mg/L	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.00713	0.0036	0.0190	0.0020	0.0028	0.0050
Zirconium (Zr), dissolved	mg/L	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76
Sample Date		18/05/2008	02/02/2009	31/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009	06/10/2009	10/02/2010	06/07/2010	06/10/2010	10/02/2011	25/05/2011	14/07/2011
Discharge (Flow)	L/s						1280.67	117.79		241.59	154		147.892185				459.375
Total Suspended Solids	mg/L	220	16		<4	330	25	3	<4	530	7	8	23	6	2	37	17
pH (field)	pH units					7.48	7.32	8.19		7.54	7.68	8.19	8.33	8.08	7.8	7.77	7.85
pH (lab)	pH units	7.38	7.91		8.1	7.8	7.5	8.1	8.1	7.9	7.9	8.2	7.89	7.87	7.93	7.42	7.63
Specific Conductance (field)	µS/cm																107
Specific Conductance (lab)	µS/cm	81	326	44500	360	130	40	160	230	137	178	316	156	212	289	51	107
Temperature (field)	C					4	4	7.7		5.3	2	0.5	6.5	1	0.1	3.2	5.7
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L				179	74.2	19.7	79.7	112	76.3	83.1	168	71.9	102	126	25.5	53.9
Hardness (from dissolved)	mg/L	41.2	202	167	180	57.3	18.6	78.4	116	66.1	91.3	162	71.8	102	135	25.1	52.9
Alkalinity, total	mg/L													66	85	13	36
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L								42	22		68		44	59	8.8	15
Ammonia (N)	mg/L		<0.01	0.01	0.03	0.11	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.05				
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L													0.9	0.8	9.2	4.1
Aluminum (Al), total	mg/L	4.54	0.03	0.041	0.0102	7.03	0.239	0.0312	0.0178	0.871	0.0336	0.0269	0.121	0.0272	0.0118	0.29	0.113
Antimony (Sb), total	mg/L	0.0004	<0.0002	0.0002	0.00016	0.0016	0.00009	0.00013	0.00015	0.00027	0.00011	0.00012	0.00036	0.00011	0.00009	0.0001	0.0002
Arsenic (As), total	mg/L	0.0046	0.0004	0.0005	0.00045	0.0146	0.00078	0.00041	0.00045	0.00369	0.00041	0.00051	0.00156	0.00045	0.00036	0.0008	0.00071
Barium (Ba), total	mg/L	0.102	0.051	0.056	0.049	0.185	0.0237	0.0343	0.042	0.0819	0.0368	0.0452	0.0387	0.0397	0.0416	0.0281	0.0321
Beryllium (Be), total	mg/L	<0.0001	<0.00004	<0.00004	<0.00001	0.0002	0.00001	<0.00001	<0.00001	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001
Bismuth (Bi), total	mg/L	<0.0005	<0.0001	<0.0001	<0.000005	<0.0001	0.00001	<0.000005	<0.000005	0.000021	<0.000005	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	0.003	0.016	<0.005	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00023	0.00004	0.0001	0.000088	0.0009	0.000063	0.000033	0.000031	0.000544	0.000045	0.000074	0.000342	0.000065	0.00002	0.000115	0.0001
Calcium (Ca), total	mg/L	14	60.7	52.9	58.2	21	6.19	25.4	35.8	24.2	25.7	54.8	22.5	32	40.7	7.92	16.9
Chromium (Cr), total	mg/L	0.0084	0.0005	0.0015	0.0003	0.014	0.0004	0.0001	0.0001	0.0016	0.0003	0.0003	0.0006	0.0004	0.0004	0.0007	0.0005
Cobalt (Co), total	mg/L	0.0027	0.00004	0.00006	0.000016	0.0051	0.000282	0.000037	0.000029	0.00169	0.00005	0.00004	0.000224	0.000044	0.000013	0.000312	0.000191
Copper (Cu), total	mg/L	0.012	<0.001	0.002	0.00045	0.024	0.00193	0.00049	0.00046	0.00616	0.00049	0.00049	0.00151	0.00041	0.00017	0.00244	0.0016
Iron (Fe), total	mg/L	5	0.04	0.08	0.014	10.7	0.263	0.029	0.022	1.29	0.045	0.042	0.233	0.031	0.014	0.315	0.133
Lead (Pb), total	mg/L	0.0145	0.0004	0.0014	0.000366	0.0447	0.00243	0.000485	0.000384	0.0147	0.000715	0.000723	0.00897	0.000564	0.000362	0.00353	0.0127
Lithium (Li), total	mg/L	0.006	0.016	0.003	0.0033	<0.01	0.0007	0.0018	0.0025	0.0026	0.002	0.0028	0.002	0.0025	0.0025	0.001	0.0015
Magnesium (Mg), total	mg/L	3.2	8.35	8.34	8.18	5	1.03	3.94	5.48	3.87	4.6	7.58	3.84	5.37	5.89	1.39	2.85
Manganese (Mn), total	mg/L	0.124	0.0022	0.0066	0.00187	0.231	0.0227	0.0016	0.00151	0.14	0.00334	0.00407	0.0249	0.00392	0.00079	0.0186	0.0144
Mercury (Hg), total	mg/L				<0.00001	<0.0002	0.00001	<0.00001		<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	0.00006	0.00028	0.00027	<0.001	0.00007	0.00017	0.00025	0.00021	0.00021	0.00028	0.0002	0.00024	0.00026	0.0001	0.00017
Nickel (Ni), total	mg/L	0.0084	<0.001	<0.001	0.00034	0.0155	0.00118	0.00028	0.0003	0.00334	0.00039	0.00032	0.00073	0.0003	0.00019	0.00137	0.00072
Phosphorus (P), total	mg/L		<0.01	<0.01	0.009		0.04	0.006		0.451		0.021	0.021		0.003	0.038	0.024
Potassium (K), total	mg/L	1.2	0.2	0.2	0.18	1	0.15	0.13	0.15	0.19	0.09	0.16	0.13	0.12	0.12	0.28	0.1
Selenium (Se), total	mg/L	<0.0002	<0.0006	0.0008	0.00098	<0.0008	0.00018	0.00059	0.00063	0.00057	0.00082	0.00082	0.0005	0.00076	0.00074	0.00026	0.00041
Silicon (Si), total	mg/L	8.54	3	3.3	3.17	11.7	1.42	2.68	2.62	3.92	2.78	3.5	2.67	2.79	2.48	1.61	2.8

Station Name		KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76
Sample Date		18/05/2008	02/02/2009	31/03/2009	15/04/2009	06/05/2009	05/06/2009	05/07/2009	11/08/2009	08/09/2009	06/10/2009	10/02/2010	06/07/2010	06/10/2010	10/02/2011	25/05/2011	14/07/2011
Silver (Ag), total	mg/L	0.00025	<0.00001	<0.00001	<0.000005	0.0008	0.000021	0.000006	<0.000005	0.000143	0.000008	<0.000005	0.000291	0.000006	<0.000005	0.00004	0.000039
Sodium (Na), total	mg/L	0.5	0.76	1.2	0.78	<1	0.23	0.57	0.67	0.61	0.66	0.81	0.56	0.69	0.66	0.24	0.51
Strontium (Sr), total	mg/L	0.051	0.119	0.127	0.135	0.066	0.0192	0.0642	0.0866	0.0669	0.0729	0.115	0.0641	0.0869	0.102	0.0256	0.0498
Sulphur (S), total	mg/L	5	22.1	22.1	29	<60	<3	10	16	9	9	27	<10	15	16	<10	<10
Thallium (Tl), total	mg/L	<0.00005	<0.00001	<0.00001	<0.000002	0.00012	0.000004	<0.000002	<0.000002	0.000014	<0.000002	<0.000002	0.000005	<0.000002	<0.000002	0.000004	0.000006
Tin (Sn), total	mg/L	<0.001	<0.0001	0.0002	<0.00001	0.0002	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.188	0.0015	0.002	<0.0005	0.287	0.0067	0.001	0.0007	0.0251	0.0006	0.0008	0.0036	<0.0005	<0.0005	0.0074	0.0029
Uranium (U), total	mg/L	<0.0005	0.0014	0.0015	0.00194	0.00076	0.000135	0.000312	0.000672	0.000569	0.000519	0.00145	0.000356	0.000671	0.00115	0.000145	0.000188
Vanadium (V), total	mg/L	0.0118	0.00015	0.00011	<0.0002	0.019	0.0005	<0.0002	<0.0002	0.0024	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	0.0007	0.0003
Zinc (Zn), total	mg/L	0.035	0.006	0.019	0.0067	0.098	0.0061	0.003	0.0032	0.0397	0.0052	0.006	0.0167	0.005	0.0015	0.0069	0.0071
Zirconium (Zr), total	mg/L	0.004	<0.0001	<0.0001	<0.0001	0.003	0.0001	0.0002	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0001
Aluminum (Al), dissolved	mg/L	0.26	<0.005	0.017	0.0061	0.215	0.0842	0.0131	0.0115	0.0435	0.0091	0.0051	0.0134	0.0075	0.0044	0.114	0.0319
Antimony (Sb), dissolved	mg/L		0.001	0.0014	0.00016	<0.0004	0.00009	0.00013	0.00016	0.00014	0.00009	0.00012	0.00012	0.0001	0.00011	0.00012	0.00014
Arsenic (As), dissolved	mg/L	0.0006	0.0003	0.0004	0.00044	0.001	0.00044	0.00039	0.00045	0.00047	0.00037	0.00039	0.00043	0.00041	0.0003	0.00044	0.00042
Barium (Ba), dissolved	mg/L	0.029	0.049	0.043	0.0499	0.0401	0.0164	0.0334	0.0424	0.0375	0.0367	0.0454	0.0348	0.0387	0.0474	0.0202	0.0289
Beryllium (Be), dissolved	mg/L	<0.0001	<0.00004	<0.00004	<0.00001	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0001	<0.0001	<0.000005	<0.0001	0.00001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.004	<0.004	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00008	0.00003	0.00009	0.000082	0.0002	0.000092	0.000039	0.000034	0.000071	0.000045	0.000051	0.000121	0.000061	0.000025	0.000062	0.00004
Calcium (Ca), dissolved	mg/L	12.7	65.7	53	58.3	18	5.85	25	37.3	20.8	29	52.3	22.5	32.2	43.9	7.8	16.6
Chromium (Cr), dissolved	mg/L	0.0007	0.0004	0.0023	0.0003	<0.002	0.0004	0.0001	0.0001	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0003
Cobalt (Co), dissolved	mg/L	0.0003	0.00003	0.00008	0.000015	0.0002	0.000051	0.000016	0.000012	0.000045	0.000014	0.00001	0.000021	0.000017	0.000008	0.00007	0.000045
Copper (Cu), dissolved	mg/L	0.004	<0.001	<0.001	0.0015	0.003	0.00128	0.00044	0.00063	0.00054	0.00036	0.0003	0.00061	0.00033	0.00015	0.0017	0.00087
Iron (Fe), dissolved	mg/L	0.26	<0.01	0.04	0.011	0.241	0.062	0.011	0.01	0.055	0.008	0.007	0.012	0.008	0.004	0.088	0.031
Lead (Pb), dissolved	mg/L	0.0016	0.0002	0.0014	0.00037	0.0014	0.0015	0.000322	0.00026	0.000397	0.000093	0.000143	0.000222	0.000195	0.000051	0.000935	0.00162
Lithium (Li), dissolved	mg/L	0.001	0.003	0.003	0.0033	<0.01	0.0005	0.0019	0.0025	0.0017	0.0018	0.0028	0.0018	0.0026	0.0029	0.0008	0.0014
Magnesium (Mg), dissolved	mg/L	2.3	9.33	8.39	8.25	3	0.97	3.86	5.51	3.43	4.59	7.49	3.81	5.34	6.11	1.36	2.77
Manganese (Mn), dissolved	mg/L	0.014	0.0006	0.0058	0.00151	0.012	0.00507	0.00107	0.00113	0.00232	0.00076	0.00245	0.00111	0.00177	0.00021	0.00386	0.00134
Mercury (Hg), dissolved	mg/L				<0.00001	<0.0002	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	0.00014	0.00025	0.00031	<0.001	0.00011	0.00018	0.00027	0.00021	0.00022	0.00029	0.0002	0.00024	0.00033	0.0001	0.00018
Nickel (Ni), dissolved	mg/L	0.0024	<0.001	<0.001	0.00033	0.0012	0.00081	0.00029	0.00032	0.0004	0.0003	0.00024	0.0004	0.00029	0.00023	0.00098	0.00045
Phosphorus (P), dissolved	mg/L		<0.01	<0.01	0.008		0.005	0.002			0.005	0.01	0.005		0.004	0.011	0.004
Potassium (K), dissolved	mg/L	<0.4	0.2	0.3	0.19	<1	0.14	0.14	0.16	0.11	0.11	0.15	0.12	0.12	0.13	0.25	0.1
Selenium (Se), dissolved	mg/L	<0.0002	<0.0006	0.0011	0.001	<0.0008	0.0002	0.0006	0.00063	0.00051	0.0008	0.00081	0.00049	0.00075	0.00086	0.00024	0.00039
Silicon (Si), dissolved	mg/L	1.49	3.26	2.89	3.12	2.15	1.16	2.47	2.86	2.82	3.01	3.25	2.6	2.82	2.24	1.37	2.67
Silver (Ag), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.000005	<0.0001	0.000099	<0.000005	<0.000005	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000019	<0.000005
Sodium (Na), dissolved	mg/L	<0.4	0.9	1.6	0.84	<1	0.27	0.57	0.68	0.58	0.63	0.79	0.56	0.7	0.69	0.25	0.49
Strontium (Sr), dissolved	mg/L	0.038	0.129	0.119	0.133	0.047	0.0192	0.0652	0.0882	0.0609	0.0749	0.115	0.0627	0.0883	0.12	0.0248	0.0492
Sulphur (S), dissolved	mg/L	4.9	27.1	22.3	30	<60	<3	10	16	7	12	26	<10	15	17	<10	<10
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00001	<0.00001	<0.000002	<0.00004	0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.001	<0.0001	0.0001	0.00003	<0.0002	0.00005	<0.00001	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00002	<0.00001
Titanium (Ti), dissolved	mg/L	0.0047	0.0005	0.001	<0.0005	0.011	0.0015	<0.0005	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0022	<0.0005
Uranium (U), dissolved	mg/L	<0.0005	0.0014	0.0015	0.00189	0.00027	0.000074	0.000329	0.00069	0.000285	0.000524	0.00144	0.000318	0.000671	0.00131	0.000109	0.000184
Vanadium (V), dissolved	mg/L	0.0005	0.00004	0.00014	<0.0002	<0.004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.011	0.005	0.016	0.0072	0.014	0.0072	0.0038	0.004	0.0052	0.0039	0.0055	0.0056	0.0048	0.0013	0.0047	0.003
Zirconium (Zr), dissolved	mg/L		<0.0001	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76
Sample Date		25/10/2011	22/11/2011	14/12/2011	13/02/2012	13/03/2012	08/05/2012	05/06/2012	10/07/2012	07/08/2012	25/09/2012	21/10/2012	11/12/2012	15/01/2013	12/02/2013	12/03/2013	09/04/2013
Discharge (Flow)	L/s	39	23.4				40.8	899.1	208.5	62	105.5			22	22.4	34.7	
Total Suspended Solids	mg/L	2			1.6		337		1390			6.2			9		
pH (field)	pH units	8.66	8.31	8.18	7.85	7.97	8.17	7.62	7.97	8.11	8.02	7.26	6.78	7.38	7.93		7.8
pH (lab)	pH units	7.97			8.1		7.97		7.82			7.96			7.96		
Specific Conductance (field)	µS/cm	259	136.3	282.4	372	377	283.40	660	163.1	195.8	184.7	157.6	348	299	303.3	194.4	300.4
Specific Conductance (lab)	µS/cm	236			370		315		141			209			330		
Temperature (field)	C	1.5	-0.1	0	-0.1	-0.1	0.60	2.3	5.3	5.5	3		0.05	0.06	0	0	0
Dissolved Oxygen (field)	mg/L	11	13.03	12.46	14.99		13.77	14	12.17	12.7	13.11		14.8	14.43	14.86	11.52	14.02
Dissolved Oxygen (field)	%	78	89	85.2	103		95.80	102	96	101	97.2		96.2	99.1	104.8	79.7	106
ORP (field)	mV	270.4			174.1	73.9	88.60	263.8	103.3	190.9	36.1	-19			177.9	-32.5	82.2
Hardness (from total)	mg/L	121			178		201		123			99.9			168		
Hardness (from dissolved)	mg/L	113			183		155		56.7			99.4			168		
Alkalinity, total	mg/L	70			89.3		66.9					64.2			89.2		
Chloride	mg/L						7.5		1.6			1			0.75		
Fluoride	mg/L																
Sulphate, dissolved	mg/L	48.8			101		76.6					45.3			84.8		
Ammonia (N)	mg/L	0.018			0.018		0.082		0.076			0.016			0.0087		
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L	0.7			0.73		2.8		2.91			0.87			<0.50		
Aluminum (Al), total	mg/L	0.0225			0.0095		9.96		3.87			0.0234			0.0143		
Antimony (Sb), total	mg/L	0.00015			0.00017		0.0022		0.00208			0.000138			0.000155		
Arsenic (As), total	mg/L	0.0006			0.0006		0.0216		0.0317			0.00051			0.000522		
Barium (Ba), total	mg/L	0.043			0.0477		0.319		0.418			0.0385			0.05		
Beryllium (Be), total	mg/L	<0.00001			<0.00001		0.000346		0.000421			<0.000010			<0.000010		
Bismuth (Bi), total	mg/L	<0.000005			<0.000005		0.0002		0.000124			<0.0000050			<0.0000050		
Boron (B), total	mg/L	<0.05			<0.05		<0.25		<0.050			<0.050			<0.050		
Cadmium (Cd), total	mg/L	0.000087			0.00018		0.00173		0.0109			0.000126			0.000165		
Calcium (Ca), total	mg/L	38.7			58.1		56.8		35.6			32.3			55.1		
Chromium (Cr), total	mg/L	0.0001			<0.0001		0.0179		0.00744			<0.00010			<0.00010		
Cobalt (Co), total	mg/L	0.00003			0.00002		0.0101		0.0138			0.000039			0.000028		
Copper (Cu), total	mg/L	0.00059			0.00028		0.0448		0.0655			0.000538			0.0003		
Iron (Fe), total	mg/L	0.027			0.014		21.8		10.3			0.0437			0.0213		
Lead (Pb), total	mg/L	0.000876			0.000342		0.082		0.587			0.00202			0.00058		
Lithium (Li), total	mg/L	0.0024			0.0027		0.0163		0.00694			0.00212			0.00266		
Magnesium (Mg), total	mg/L	5.98			8.05		14.4		8.36			4.69			7.38		
Manganese (Mn), total	mg/L	0.00176			0.00148		0.516		1.56			0.00453			0.00186		
Mercury (Hg), total	mg/L	<0.00001			<0.00001		<0.000010		<0.000010			<0.000010			<0.000010		
Molybdenum (Mo), total	mg/L	0.00023			0.00024		0.00185		0.000192			0.000205			0.000237		
Nickel (Ni), total	mg/L	0.00027			0.00025		0.03		0.026			0.000254			0.000321		
Phosphorus (P), total	mg/L	0.009			0.009		0.788		2.03			0.009			0.0163		
Potassium (K), total	mg/L	0.13			0.16		1.7		0.413			0.131			0.181		
Selenium (Se), total	mg/L	0.00091			0.00096		0.00115		0.000666			0.000859			0.0011		
Silicon (Si), total	mg/L	3.2			2.9		15.9		6.19			3.13			3.43		

Station Name		KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76	KV-76
Sample Date		25/10/2011	22/11/2011	14/12/2011	13/02/2012	13/03/2012	08/05/2012	05/06/2012	10/07/2012	07/08/2012	25/09/2012	21/10/2012	11/12/2012	15/01/2013	12/02/2013	12/03/2013	09/04/2013
Silver (Ag), total	mg/L	0.000007			<0.000005		0.00107		0.00316			0.000014			<0.0000050		
Sodium (Na), total	mg/L	0.77			0.8		2.2		0.807			0.651			0.802		
Strontium (Sr), total	mg/L	0.0934			0.13		0.152		0.117			0.0808			0.126		
Sulphur (S), total	mg/L	18			31		<250		<10			13			28.5		
Thallium (Tl), total	mg/L	<0.000002			<0.000002		0.0002		0.000199			<0.0000020			<0.0000020		
Tin (Sn), total	mg/L	0.00006			<0.0002		<0.0010		<0.00020			<0.00020			<0.00020		
Titanium (Ti), total	mg/L	0.0005			<0.0005		0.266		0.0343			0.00083			<0.00050		
Uranium (U), total	mg/L	0.000858			0.00196		0.00161		0.00154			0.000605			0.00138		
Vanadium (V), total	mg/L	<0.0002			<0.0002		0.0266		0.0158			<0.00020			<0.00020		
Zinc (Zn), total	mg/L	0.0067			0.0119		0.165		0.658			0.00842			0.0115		
Zirconium (Zr), total	mg/L	<0.0001			<0.0001		0.00301		0.00062			<0.00010			<0.00010		
Aluminum (Al), dissolved	mg/L	0.0034			0.0025		0.015		0.00847			0.00273			0.00254		
Antimony (Sb), dissolved	mg/L	0.00015			0.00017		0.00088		0.000457			0.000163			0.000144		
Arsenic (As), dissolved	mg/L	0.00047			0.00058		0.00113		0.00097			0.000396			0.000491		
Barium (Ba), dissolved	mg/L	0.04			0.0509		0.0301		0.029			0.0375			0.0459		
Beryllium (Be), dissolved	mg/L	<0.00001			<0.00001		<0.000010		<0.000010			<0.000010			<0.000010		
Bismuth (Bi), dissolved	mg/L	<0.000005			<0.000005		<0.0000050		<0.0000050			<0.0000050			<0.0000050		
Boron (B), dissolved	mg/L	<0.05			<0.05		<0.050		<0.050			<0.050			<0.050		
Cadmium (Cd), dissolved	mg/L	0.000081			0.000176		0.000155		0.000561			0.000113			0.00014		
Calcium (Ca), dissolved	mg/L	36			60.3		48.2		17.9			32			54.5		
Chromium (Cr), dissolved	mg/L	<0.0001			<0.0001		0.0002		<0.00010			<0.00010			<0.00010		
Cobalt (Co), dissolved	mg/L	0.000008			0.000007		0.000104		0.000041			0.000005			0.000006		
Copper (Cu), dissolved	mg/L	0.00029			0.00014		0.00184		0.00109			0.000445			0.000191		
Iron (Fe), dissolved	mg/L	0.001			0.003		0.0303		0.0169			0.0043			0.0015		
Lead (Pb), dissolved	mg/L	0.000129			0.00009		0.00372		0.00151			0.00049			0.000087		
Lithium (Li), dissolved	mg/L	0.0025			0.0029		0.00436		0.00188			0.00208			0.00281		
Magnesium (Mg), dissolved	mg/L	5.74			7.95		8.56		2.91			4.75			7.61		
Manganese (Mn), dissolved	mg/L	0.00016			0.00036		0.0319		0.0117			0.000244			0.000322		
Mercury (Hg), dissolved	mg/L				<0.00001		<0.000010		<0.000010			<0.000010			<0.000010		
Molybdenum (Mo), dissolved	mg/L	0.00022			0.00028		0.000568		0.000237			0.000248			0.000251		
Nickel (Ni), dissolved	mg/L	0.00017			0.00021		0.000808		0.000353			0.00019			0.000244		
Phosphorus (P), dissolved	mg/L	0.007			0.01		0.0115		0.0058			0.0101			0.005		
Potassium (K), dissolved	mg/L	0.12			0.18		0.485		0.161			0.128			0.179		
Selenium (Se), dissolved	mg/L	0.00093			0.00088		0.000693		0.000484			0.000829			0.000936		
Silicon (Si), dissolved	mg/L	2.9			3.2		2.7		2.24			3.05			3.41		
Silver (Ag), dissolved	mg/L	<0.000005			<0.000005		0.000008		0.0000122			<0.0000050			<0.0000050		
Sodium (Na), dissolved	mg/L	0.73			0.79		2.04		0.711			0.687			0.818		
Strontium (Sr), dissolved	mg/L	0.0898			0.129		0.128		0.059			0.0815			0.124		
Sulphur (S), dissolved	mg/L	19			37		29		<10			13			27		
Thallium (Tl), dissolved	mg/L	<0.000002			<0.000002		0.000002		<0.0000020			<0.0000020			<0.0000020		
Tin (Sn), dissolved	mg/L	0.00003			<0.0002		<0.00020		<0.00020			<0.00020			<0.00020		
Titanium (Ti), dissolved	mg/L	<0.0005			<0.0005		<0.00050		<0.00050			<0.00050			<0.00050		
Uranium (U), dissolved	mg/L	0.000786			0.0017		0.00119		0.000196			0.000617			0.00134		
Vanadium (V), dissolved	mg/L	<0.0002			<0.0002		<0.00020		<0.00020			<0.00020			<0.00020		
Zinc (Zn), dissolved	mg/L	0.0062			0.0112		0.0145		0.0206			0.00818			0.0104		
Zirconium (Zr), dissolved	mg/L	<0.0001			<0.0001		<0.00010		<0.00010			<0.00010			<0.00010		

Data omitted from calculation of summary statistics.

Station Name		KV-76	KV-76	KV-76	KV-76
Sample Date		07/05/2013	04/06/2013	03/07/2013	07/08/2013
Discharge (Flow)	L/s		809.151	25.5825	
Total Suspended Solids	mg/L	<1.0		2.8	
pH (field)	pH units	7.64	7.43	7.53	7.88
pH (lab)	pH units	8.07		7.83	
Specific Conductance (field)	µS/cm	320.8	52	197.8	224.4
Specific Conductance (lab)	µS/cm	350		181	
Temperature (field)	C	0	1.9	5.5	7.4
Dissolved Oxygen (field)	mg/L	13.19	13.6	12.07	12.79
Dissolved Oxygen (field)	%	91.4	100.8	97.8	108
ORP (field)	mV	120.1	90.7	75.6	161.1
Hardness (from total)	mg/L	187		90.6	
Hardness (from dissolved)	mg/L	190		93.0	
Alkalinity, total	mg/L	98.5		53.5	
Chloride	mg/L	2.64		<0.50	
Fluoride	mg/L	0.079		0.055	
Sulphate, dissolved	mg/L	82.4		35.5	
Ammonia (N)	mg/L	<0.0050		<0.0050	
Nitrite (N)	mg/L	<0.0010		<0.0010	
Nitrate (N)	mg/L	0.198		0.0589	
Total Kjeldahl Nitrogen	mg/L				
Dissolved Organic Carbon	mg/L	1.08		1.92	
Aluminum (Al), total	mg/L	0.0648		0.0894	
Antimony (Sb), total	mg/L	0.00047		0.00045	
Arsenic (As), total	mg/L	0.00088		0.00086	
Barium (Ba), total	mg/L	0.0550		0.0404	
Beryllium (Be), total	mg/L	<0.00010		<0.00010	
Bismuth (Bi), total	mg/L	<0.00050		<0.00050	
Boron (B), total	mg/L	<0.010		<0.010	
Cadmium (Cd), total	mg/L	0.000259		0.000223	
Calcium (Ca), total	mg/L	61.7		29.4	
Chromium (Cr), total	mg/L	0.00029		0.00027	
Cobalt (Co), total	mg/L	<0.00010		<0.00010	
Copper (Cu), total	mg/L	0.00098		0.00127	
Iron (Fe), total	mg/L	0.101		0.134	
Lead (Pb), total	mg/L	0.00995		0.00363	
Lithium (Li), total	mg/L	0.00300		0.00167	
Magnesium (Mg), total	mg/L	8.01		4.19	
Manganese (Mn), total	mg/L	0.00637		0.00449	
Mercury (Hg), total	mg/L	<0.000010		<0.000010	
Molybdenum (Mo), total	mg/L	0.000416		0.000246	
Nickel (Ni), total	mg/L	<0.00050		0.00051	
Phosphorus (P), total	mg/L	<0.050		<0.050	
Potassium (K), total	mg/L	0.25		0.22	
Selenium (Se), total	mg/L	0.00087		0.00056	
Silicon (Si), total	mg/L	3.43		2.72	

Station Name		KV-76	KV-76	KV-76	KV-76
Sample Date		07/05/2013	04/06/2013	03/07/2013	07/08/2013
Silver (Ag), total	mg/L	0.000042		0.000031	
Sodium (Na), total	mg/L	1.35		0.616	
Strontium (Sr), total	mg/L	0.143		0.0709	
Sulphur (S), total	mg/L	28.4		12.7	
Thallium (Tl), total	mg/L	<0.000010		<0.000010	
Tin (Sn), total	mg/L	<0.00010		<0.00010	
Titanium (Ti), total	mg/L	<0.010		<0.010	
Uranium (U), total	mg/L	0.00191		0.000425	
Vanadium (V), total	mg/L	<0.0010		<0.0010	
Zinc (Zn), total	mg/L	0.0172		0.0151	
Zirconium (Zr), total	mg/L	<0.00080		<0.00080	
Aluminum (Al), dissolved	mg/L	0.0027		0.0070	
Antimony (Sb), dissolved	mg/L	0.00036		0.00042	
Arsenic (As), dissolved	mg/L	0.00060		0.00061	
Barium (Ba), dissolved	mg/L	0.0530		0.0380	
Beryllium (Be), dissolved	mg/L	<0.00010		<0.00010	
Bismuth (Bi), dissolved	mg/L	<0.00050		<0.00050	
Boron (B), dissolved	mg/L	<0.010		<0.010	
Cadmium (Cd), dissolved	mg/L	0.000222		0.000200	
Calcium (Ca), dissolved	mg/L	62.9		30.4	
Chromium (Cr), dissolved	mg/L	0.00011		<0.00010	
Cobalt (Co), dissolved	mg/L	<0.00010		<0.00010	
Copper (Cu), dissolved	mg/L	0.00069		0.00079	
Iron (Fe), dissolved	mg/L	<0.010		0.024	
Lead (Pb), dissolved	mg/L	0.00311		0.00103	
Lithium (Li), dissolved	mg/L	0.00274		0.00187	
Magnesium (Mg), dissolved	mg/L	7.93		4.13	
Manganese (Mn), dissolved	mg/L	0.00158		0.000366	
Mercury (Hg), dissolved	mg/L	<0.000010		<0.000010	
Molybdenum (Mo), dissolved	mg/L	0.000381		0.000234	
Nickel (Ni), dissolved	mg/L	<0.00050		<0.00050	
Phosphorus (P), dissolved	mg/L	<0.050		<0.050	
Potassium (K), dissolved	mg/L	0.25		0.20	
Selenium (Se), dissolved	mg/L	0.00090		0.00057	
Silicon (Si), dissolved	mg/L	3.26		2.57	
Silver (Ag), dissolved	mg/L	<0.000010		<0.000010	
Sodium (Na), dissolved	mg/L	1.31		0.610	
Strontium (Sr), dissolved	mg/L	0.134		0.0725	
Sulphur (S), dissolved	mg/L	27.7		12.4	
Thallium (Tl), dissolved	mg/L	<0.000010		<0.000010	
Tin (Sn), dissolved	mg/L	0.00013		<0.00010	
Titanium (Ti), dissolved	mg/L	<0.010		<0.010	
Uranium (U), dissolved	mg/L	0.00177		0.000418	
Vanadium (V), dissolved	mg/L	<0.0010		<0.0010	
Zinc (Zn), dissolved	mg/L	0.0133		0.0124	
Zirconium (Zr), dissolved	mg/L	<0.00080		<0.00080	

Data omitted from calculation of summary statistics.

Station Name		KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77
Sample Date		13/03/2008	17/05/2008	03/10/2008	02/02/2009	06/05/2009	05/07/2009	06/10/2009	07/10/2010	10/02/2011	28/05/2011	19/07/2011	25/10/2011	13/02/2012	04/05/2012	04/07/2012	16/10/2012
Discharge (Flow)	L/s												24	12.4		189.39	70.30625
Total Suspended Solids	mg/L	7	<3	6	7	340	1	<1	2	2	11	15	<1	1	3.9	1.3	<1.0
pH (field)	pH units		7.48	7.31		7.46	7.65	7.47	8.2	7.69	7.77	7.88	7.97	7.73		7.95	7.47
pH (lab)	pH units	7.47	7.66	7.57	7.9	7.7	7.9	7.7	7.71	7.93	7.41	7.34	7.85	7.9	7.96	7.64	7.83
Specific Conductance (field)	µS/cm											54	165.4	231		83.3	137.8
Specific Conductance (lab)	µS/cm	576	462	500	226	96	96	113	141	290	57	55	154	232	219	78.3	121
Temperature (field)	C		5.5	4		2.3	7	1.6	0.3	0.3	2	4	0.1	0.1		4.5	0.4
Dissolved Oxygen (field)	mg/L												12.03	13.1		12.67	13.08
Dissolved Oxygen (field)	%												82.4	90		98.2	90.3
ORP (field)	mV												275.8	82.2		45.1	195.1
Hardness (from total)	mg/L					58.5	47.2	49.3	588	131	28	26.1	70.9	109	108	38.8	56.5
Hardness (from dissolved)	mg/L	303	246	330	129	43.8	46.3	54.2	67.4	141	27.1	26.4	71.3	115	105	31.5	57
Alkalinity, total	mg/L								40	86	20	18		58.9	55.7	25.2	34.6
Chloride	mg/L														<0.50	0.55	<0.50
Fluoride	mg/L																
Sulphate, dissolved	mg/L								29	59		7.7	29.2	51.8	51.2	12.7	23.2
Ammonia (N)	mg/L																
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L								1.1	0.9	6.6	3.3	<0.5	0.85	2.24	1.34	<0.50
Aluminum (Al), total	mg/L	1.03	0.045	0.021	0.026	6.04	0.0326	0.0132	0.0519	0.0111	0.159	0.186	0.0105	0.0086	0.0474	0.0293	0.0119
Antimony (Sb), total	mg/L	0.0035	<0.0002	<0.0002	<0.0002	0.001	0.00009	0.00008	0.00149	0.00009	0.00009	0.0001	0.0001	0.00011	0.000111	0.000087	0.000078
Arsenic (As), total	mg/L	0.154	0.0028	0.002	0.0003	0.0098	0.00028	0.00021	0.00996	0.00037	0.0005	0.00073	0.0003	0.00026	0.000357	0.000284	0.00023
Barium (Ba), total	mg/L	0.123	0.048	0.06	0.062	0.185	0.0377	0.0389	0.00346	0.0416	0.0237	0.0331	0.0461	0.0672	0.0672	0.0317	0.0453
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.00004	<0.00004	0.0002	<0.00001	<0.00001	0.00002	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	0.003	<0.002	<0.005	<0.005	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.00989	0.00113	0.00135	<0.00001	0.0006	0.000007	0.00001	0.0916	0.000021	0.000039	0.000043	0.000012	0.00002	0.000026	0.0000195	0.000011
Calcium (Ca), total	mg/L	86.4	73	101	40.4	16	15	15.1	195	41.8	8.79	8.18	21.7	34.6	34.4	12.4	18.2
Chromium (Cr), total	mg/L	0.0032	<0.0005	0.0004	0.0004	0.01	0.0001	0.0003	0.0004	0.0004	0.0005	0.0005	<0.0001	0.0002	0.00012	<0.00010	<0.00010
Cobalt (Co), total	mg/L	0.0015	0.0008	0.00025	0.00003	0.0048	0.000026	0.00002	0.00929	0.000017	0.000146	0.000166	0.000011	0.000014	0.000052	0.0000611	0.000016
Copper (Cu), total	mg/L	0.008	0.001	0.001	<0.001	0.022	0.00027	0.00024	0.00919	0.00017	0.00151	0.00142	0.00027	0.00039	0.000812	0.000421	0.000592
Iron (Fe), total	mg/L	3.5	0.2	0.12	0.03	8.35	0.024	0.012	1.36	0.014	0.155	0.176	0.01	0.009	0.0689	0.0324	0.0163
Lead (Pb), total	mg/L	0.151	0.0006	0.0006	0.0002	0.0594	0.000292	0.000129	0.00596	0.000309	0.00221	0.00461	0.000126	0.000317	0.000968	0.00076	0.000166
Lithium (Li), total	mg/L	0.008	0.006	0.006	0.001	<0.01	0.0007	0.0009	0.0284	0.0026	0.001	0.0006	0.001	0.0015	0.00112	0.00071	0.00089
Magnesium (Mg), total	mg/L	18.8	12.3	19	6.48	4	2.38	2.83	24.5	6.39	1.47	1.38	4.04	5.57	5.34	1.94	2.69
Manganese (Mn), total	mg/L	0.71	0.598	0.0948	0.0013	0.287	0.00144	0.00048	12.5	0.00079	0.00677	0.0133	0.00057	0.00093	0.00479	0.00374	0.000837
Mercury (Hg), total	mg/L					<0.0002	<0.00001		0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	<0.001	<0.001	0.00016	0.00008	<0.001	0.00009	0.00011	0.00093	0.00027	0.0001	0.00007	0.00014	0.00018	0.000222	0.000092	0.000107
Nickel (Ni), total	mg/L	0.0047	0.0021	0.002	<0.001	0.0123	0.00032	0.00038	0.0705	0.00025	0.0009	0.00083	0.00023	0.00028	0.000498	0.000393	0.00026
Phosphorus (P), total	mg/L			<0.01	<0.01		0.006			0.005	0.019	0.015	0.006	0.006	0.0106	0.0089	0.0049
Potassium (K), total	mg/L	0.5	0.5	0.4	<0.1	1	0.08	0.05	0.51	0.14	0.19	0.07	0.08	0.17	0.262	0.075	0.074
Selenium (Se), total	mg/L	0.0016	0.0006	0.0008	<0.0006	<0.0008	0.00038	0.00051	0.00071	0.00081	0.00029	0.00024	0.00065	0.00069	0.000603	0.000353	0.000544
Silicon (Si), total	mg/L	4.43	2.1	3.15	2.72	10.7	2.3	2.48	2.63	2.56	1.76	2.42	2.6	2.7	2.67	2.83	2.75

Station Name		KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77	KV-77
Sample Date		13/03/2008	17/05/2008	03/10/2008	02/02/2009	06/05/2009	05/07/2009	06/10/2009	07/10/2010	10/02/2011	28/05/2011	19/07/2011	25/10/2011	13/02/2012	04/05/2012	04/07/2012	16/10/2012
Silver (Ag), total	mg/L	0.00148	<0.00001	<0.00001	<0.00001	0.0007	<0.000005	0.000007	0.000142	<0.000005	0.000024	0.000031	<0.000005	<0.000005	0.000012	<0.0000050	<0.0000050
Sodium (Na), total	mg/L	1.5	0.8	1.34	0.63	<1	0.51	0.56	1.05	0.71	0.28	0.43	0.63	0.72	0.58	0.52	0.5
Strontium (Sr), total	mg/L	0.195	0.132	0.174	0.093	0.051	0.0409	0.0451	0.245	0.102	0.0272	0.0271	0.0593	0.0845	0.0814	0.0327	0.0509
Sulphur (S), total	mg/L	60.2	53.7		15.8	<60	7	7	183	18	<10	<10	11	18	17	<10	<10
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00001	<0.00001	0.00012	<0.000002	<0.000002	0.000538	<0.000002	0.000003	0.000003	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), total	mg/L	<0.001	<0.001	<0.0001	<0.0001	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	0.00011	<0.00001	0.00004	<0.0002	<0.00020	<0.00020	<0.00020
Titanium (Ti), total	mg/L	0.0382	0.0018	0.0008	0.0012	0.227	<0.0005	<0.0005	<0.0005	<0.0005	0.0037	0.0043	<0.0005	0.0011	0.00196	<0.00050	<0.00050
Uranium (U), total	mg/L	0.0069	0.0027	0.0031	0.0006	0.00063	0.000112	0.000187	0.00837	0.00115	0.000107	0.000082	0.000313	0.000719	0.000756	0.0000685	0.000183
Vanadium (V), total	mg/L	0.0029	0.0002	0.00006	0.00012	0.015	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.0004	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	0.603	0.132	0.162	0.003	0.067	0.0009	0.0004	9.42	0.0013	0.003	0.0033	0.0005	0.0019	0.00213	0.00145	0.00067
Zirconium (Zr), total	mg/L	<0.001	<0.001	0.0008	0.0002	0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	<0.02	0.035	<0.005	<0.005	0.23	0.0159	0.0212	0.0143	0.004	0.0789	0.0652	0.0038	0.0031	0.00604	0.0107	0.00368
Antimony (Sb), dissolved	mg/L	<0.001		0.0008	0.001	<0.0004	0.00009	0.00011	0.00009	0.0001	0.00011	0.00007	0.00009	0.0001	0.000102	0.000076	0.000088
Arsenic (As), dissolved	mg/L	0.002	0.0023	0.0015	0.0002	0.0008	0.00026	0.00024	0.00032	0.00036	0.00035	0.00033	0.00026	0.0003	0.000254	0.000217	0.00022
Barium (Ba), dissolved	mg/L	0.079	0.051	0.054	0.066	0.0392	0.0363	0.0395	0.0452	0.0442	0.0196	0.0279	0.0462	0.0659	0.0643	0.031	0.0449
Beryllium (Be), dissolved	mg/L	<0.0005	<0.0001	<0.00004	<0.00004	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.002	<0.0005		<0.0001	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.01	<0.002	<0.004	<0.004	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.0012	0.00116	0.00142	<0.00001	<0.0001	0.000018	0.000048	0.000252	0.000022	0.000025	0.000019	0.000014	0.000024	0.000021	0.0000133	0.000009
Calcium (Ca), dissolved	mg/L	88.8	76.2	100	40.6	14	14.7	17	21.3	45.2	8.5	8.32	22.1	35.9	33.6	9.79	18.1
Chromium (Cr), dissolved	mg/L	<0.002	0.0005	0.0006	<0.0004	<0.002	<0.0001	0.0003	0.0003	0.0004	0.0004	0.0004	<0.0001	<0.0001	<0.00010	0.00011	0.00011
Cobalt (Co), dissolved	mg/L	<0.0005	0.0007	0.00028	<0.00002	0.0002	0.000014	0.000023	0.000025	0.000008	0.000048	0.000044	0.000006	0.000015	0.000015	0.0000218	0.000007
Copper (Cu), dissolved	mg/L	<0.005	0.001	<0.001	<0.001	0.002	0.00027	0.00033	0.0003	0.00014	0.00134	0.00081	0.00034	0.00029	0.000681	0.000377	0.000369
Iron (Fe), dissolved	mg/L	0.02	0.16	0.046	<0.01	0.277	0.014	0.02	0.011	0.003	0.059	0.063	0.001	0.002	0.0086	0.0087	0.0028
Lead (Pb), dissolved	mg/L	<0.0005	0.0004	0.0002	0.0001	0.0053	0.000306	0.00736	0.000412	0.000142	0.000759	0.000551	0.000035	0.000084	0.000114	0.00062	0.0012
Lithium (Li), dissolved	mg/L	<0.005	0.005	0.006	<0.001	<0.01	0.0007	0.0008	0.0011	0.0026	0.0009	0.0005	0.0011	0.0013	0.00119	0.00065	0.00096
Magnesium (Mg), dissolved	mg/L	19.6	13.4	19.1	6.71	2	2.31	2.87	3.45	6.76	1.42	1.36	3.9	6.27	5.08	1.72	2.84
Manganese (Mn), dissolved	mg/L	0.017	0.558	0.0938	0.0003	0.01	0.00121	0.00419	0.0266	0.00021	0.00158	0.00132	0.00036	0.00088	0.00347	0.000724	0.000249
Mercury (Hg), dissolved	mg/L					<0.0002	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001		<0.00001	<0.000010	<0.000010	0.00001
Molybdenum (Mo), dissolved	mg/L	<0.005	<0.001	0.00014	0.00006	<0.001	0.00008	0.00013	0.00016	0.0003	0.0001	0.00007	0.00014	0.00019	0.000236	0.000076	0.000126
Nickel (Ni), dissolved	mg/L	<0.002	0.002	0.002	<0.001	0.0012	0.00034	0.00032	0.00037	0.00022	0.00076	0.00054	0.00029	0.00028	0.000375	0.000294	0.000176
Phosphorus (P), dissolved	mg/L			<0.01	<0.01		0.003	0.003		0.008	0.009	0.005	0.008	0.008	0.0073	0.0026	0.0038
Potassium (K), dissolved	mg/L	<0.4	0.4	0.3	0.1	<1	0.08	0.07	0.08	0.14	0.16	0.06	0.08	0.17	0.253	0.065	0.073
Selenium (Se), dissolved	mg/L	0.002	0.0007	<0.0006	<0.0006	<0.0008	0.00039	0.00054	0.00049	0.0008	0.00028	0.00025	0.00064	0.0007	0.000709	0.000353	0.000554
Silicon (Si), dissolved	mg/L	3.42	2.24	3.1	2.66	2.01	2.29	2.98	2.71	2.47	1.57	2.32	2.6	2.7	2.56	2	2.76
Silver (Ag), dissolved	mg/L	<0.00005	<0.00001	<0.00001	<0.00001	<0.0001	0.000006	0.000009	0.000007	<0.000005	0.000023	0.000008	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1.5	0.9	1.3	0.7	<1	0.51	0.54	0.57	0.77	0.27	0.44	0.63	0.8	0.58	0.443	0.532
Strontium (Sr), dissolved	mg/L	0.18	0.14	0.17	0.09	0.036	0.0412	0.0477	0.0594	0.114	0.0272	0.026	0.0593	0.0872	0.0796	0.0317	0.0512
Sulphur (S), dissolved	mg/L	60.3	55.9		17.5	<60	6	8	<10	20	<10	<10	12	21	18	<10	<10
Thallium (Tl), dissolved	mg/L	<0.0002	<0.00005	<0.00001	<0.00001	<0.00004	<0.000002	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), dissolved	mg/L	<0.005	<0.001	<0.0001	<0.0001	<0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0002	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	0.003	0.0017	0.0005	0.0003	0.021	<0.0005	<0.0005	0.0013	<0.0005	0.001	0.0012	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.0054	0.0029	0.003	0.0006	0.00027	0.000115	0.000189	0.000272	0.00123	0.000111	0.000063	0.000302	0.00073	0.000635	0.0000661	0.000186
Vanadium (V), dissolved	mg/L	<0.0005	0.0002	0.00007	0.00005	<0.004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.15	0.14	0.194	0.001	0.003	0.0017	0.0017	0.0191	0.0015	0.0023	0.0013	0.0011	0.0032	0.00384	0.00134	0.00097
Zirconium (Zr), dissolved	mg/L			<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010

Data omitted from calculation of summary statistics.

Station Name		KV-77	KV-77	KV-77
Sample Date		10/02/2013	10/05/2013	12/07/2013
Discharge (Flow)	L/s	10.26		
Total Suspended Solids	mg/L	1.7	6.2	1.2
pH (field)	pH units		8.07	8.05
pH (lab)	pH units	7.89	7.77	7.72
Specific Conductance (field)	µS/cm	238.9	211.9	95.8
Specific Conductance (lab)	µS/cm	242	251	108
Temperature (field)	C	0	0.1	4.7
Dissolved Oxygen (field)	mg/L	16.61	12.43	12.18
Dissolved Oxygen (field)	%	119.8	87.3	97
ORP (field)	mV	176.1	85.2	135.6
Hardness (from total)	mg/L	117	128	50.4
Hardness (from dissolved)	mg/L	120	133	50.3
Alkalinity, total	mg/L	63.6	73.9	30.0
Chloride	mg/L	0.58	<0.50	
Fluoride	mg/L		0.053	
Sulphate, dissolved	mg/L	58.4	58.4	19.7
Ammonia (N)	mg/L			
Nitrite (N)	mg/L		<0.0010	
Nitrate (N)	mg/L		0.131	
Total Kjeldahl Nitrogen	mg/L			
Dissolved Organic Carbon	mg/L	<0.50	1.21	1.38
Aluminum (Al), total	mg/L	0.0144	0.413	0.0386
Antimony (Sb), total	mg/L	0.000134	0.00017	0.00013
Arsenic (As), total	mg/L	0.000246	0.00096	0.00034
Barium (Ba), total	mg/L	0.0773	0.0814	0.0362
Beryllium (Be), total	mg/L	<0.000010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000031	0.000038	0.000011
Calcium (Ca), total	mg/L	37.4	41.5	16.0
Chromium (Cr), total	mg/L	0.00011	0.00081	0.00015
Cobalt (Co), total	mg/L	0.000017	0.00021	<0.00010
Copper (Cu), total	mg/L	0.00032	0.00166	0.00064
Iron (Fe), total	mg/L	0.0219	0.523	0.042
Lead (Pb), total	mg/L	0.00113	0.00236	0.000292
Lithium (Li), total	mg/L	0.00126	0.00156	<0.00050
Magnesium (Mg), total	mg/L	5.7	5.83	2.55
Manganese (Mn), total	mg/L	0.00306	0.0117	0.00124
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000212	0.000245	0.000139
Nickel (Ni), total	mg/L	0.000343	0.00094	<0.00050
Phosphorus (P), total	mg/L	0.008	<0.050	<0.050
Potassium (K), total	mg/L	0.166	0.29	0.10
Selenium (Se), total	mg/L	0.000793	0.00059	0.00031
Silicon (Si), total	mg/L	2.98	3.39	2.21

Station Name		KV-77	KV-77	KV-77
Sample Date		10/02/2013	10/05/2013	12/07/2013
Silver (Ag), total	mg/L	<0.0000050	0.000040	<0.000010
Sodium (Na), total	mg/L	0.803	0.625	0.511
Strontium (Sr), total	mg/L	0.0924	0.0874	0.0455
Sulphur (S), total	mg/L	19.9	19.0	6.71
Thallium (Tl), total	mg/L	<0.0000020	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00010	<0.00010
Titanium (Ti), total	mg/L	<0.00050	0.014	<0.010
Uranium (U), total	mg/L	0.000584	0.000757	0.000141
Vanadium (V), total	mg/L	<0.00020	0.0012	<0.0010
Zinc (Zn), total	mg/L	0.00254	0.0053	<0.0030
Zirconium (Zr), total	mg/L	<0.00010	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00216	0.0022	0.0072
Antimony (Sb), dissolved	mg/L	0.000118	0.00011	0.00010
Arsenic (As), dissolved	mg/L	0.000294	0.00022	0.00029
Barium (Ba), dissolved	mg/L	0.0725	0.0743	0.0367
Beryllium (Be), dissolved	mg/L	<0.000010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000023	0.000023	<0.000010
Calcium (Ca), dissolved	mg/L	38	43.3	16.0
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	<0.0000050	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.000213	0.00048	0.00035
Iron (Fe), dissolved	mg/L	<0.0010	<0.010	<0.010
Lead (Pb), dissolved	mg/L	0.000059	<0.000050	<0.000050
Lithium (Li), dissolved	mg/L	0.00122	0.00140	<0.00050
Magnesium (Mg), dissolved	mg/L	6.01	5.98	2.49
Manganese (Mn), dissolved	mg/L	0.000486	0.000713	0.000103
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000226	0.000232	0.000124
Nickel (Ni), dissolved	mg/L	0.000373	<0.00050	<0.00050
Phosphorus (P), dissolved	mg/L	0.0046	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.164	0.22	<0.10
Selenium (Se), dissolved	mg/L	0.000791	0.00062	0.00032
Silicon (Si), dissolved	mg/L	3	2.72	2.16
Silver (Ag), dissolved	mg/L	<0.0000050	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	0.839	0.627	0.491
Strontium (Sr), dissolved	mg/L	0.0921	0.0927	0.0413
Sulphur (S), dissolved	mg/L	19.6	19.6	6.65
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00055	0.000751	0.000130
Vanadium (V), dissolved	mg/L	<0.00020	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.00149	<0.0010	<0.0010
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81
Sample Date		07/10/2010	26/05/2011	12/07/2011	30/10/2011	12/02/2012	03/05/2012	03/07/2012	16/10/2012	12/02/2013	14/04/2013	03/05/2013	04/06/2013	06/07/2013	11/08/2013
Discharge (Flow)	L/s					125.5	240.1	1374.83	564.585	142	192.9	119.1	3089.315	757.25	425.38
Total Suspended Solids	mg/L	3	33	82	3	2.9	27	264	8.5	1.7	1.0	<1.0	24.4	75.4	4.2
pH (field)	pH units	8.29	8.43	8.23	8.06	7.93		7.8	7.79	7.81	7.96	7.71	7.57	7.75	7.94
pH (lab)	pH units	7.82	7.38	7.81	7.71	7.92	7.83	7.62	7.88	7.84	7.94	8.05	7.57	7.81	7.77
Specific Conductance (field)	µS/cm			165	226.6	249.3		177.8	236.9	230.6	167.6	281.5	85.8	158.1	201.9
Specific Conductance (lab)	µS/cm	227	82	169	217	247	242	167	207	255	252	260	77.2	188	216
Temperature (field)	C	0.6	2.1	8.5	1.7	0.1	1.0	6	1.4	0.1	0.1	0.2	2.7	8.2	11.3
Dissolved Oxygen (field)	mg/L				10	14.19		12.84	12.93	14.52	13.18	14.79	13.45	11.66	11.14
Dissolved Oxygen (field)	%				71.7	97.4		104.1	92.2	101.1	89.8	102.1	100.2	99.4	101.8
ORP (field)	mV				280	43.6		81.5	133.5	73.3	116.5	96.2	60.5	113.3	187.9
Hardness (from total)	mg/L	105	36.2	78.7	107	117	118	93.7	98	121	129	130	38.8	87.9	107
Hardness (from dissolved)	mg/L	113	36.9	79.5	97.6	120	114	74	104	121	130	132	36.3	85.7	102
Alkalinity, total	mg/L	54	20	41	51	54.3	56.3	35.1	47.5	58.5	56.4	67.9	17.9	41.8	49.4
Chloride	mg/L						2	1.1	<0.50	<0.50	<0.50	0.76	<0.50	<0.50	<0.50
Fluoride	mg/L										0.078	0.081	0.040	0.060	0.074
Sulphate, dissolved	mg/L	53	23	38	53.1	61.4	56.5	41.4	53.4	67.6	64.9	67.0	18.3	46.3	55.8
Ammonia (N)	mg/L														
Nitrite (N)	mg/L										<0.0010	<0.0010	<0.0010	<0.0010	0.0016
Nitrate (N)	mg/L										0.251	0.246	0.0522	0.0108	0.0566
Total Kjeldahl Nitrogen	mg/L										0.069		0.211		0.082
Dissolved Organic Carbon	mg/L	1.1	5.9	2.3	1.1	<0.50	4.21	1.8	<0.50	<0.50	0.73	0.86	3.94	1.62	0.97
Aluminum (Al), total	mg/L	0.0335	0.402	3.56	0.152	0.0495	0.266	1.56	0.0594	0.0429	0.0463	0.0517	0.535	1.42	0.145
Antimony (Sb), total	mg/L	0.00022	0.00038	0.00074	0.00028	0.00023	0.00048	0.000457	0.000245	0.000205	0.00027	0.00032	0.00049	0.00059	0.00039
Arsenic (As), total	mg/L	0.00105	0.0035	0.0119	0.00136	0.00095	0.00224	0.00626	0.00157	0.000905	0.00100	0.00111	0.00451	0.00885	0.00266
Barium (Ba), total	mg/L	0.0485	0.0354	0.12	0.0504	0.0507	0.0564	0.146	0.0545	0.0505	0.0552	0.0501	0.0368	0.0783	0.0607
Beryllium (Be), total	mg/L	<0.00001	0.00001	0.00012	<0.00001	<0.00001	0.000015	0.000113	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.000005	<0.00002	0.00006	<0.000005	<0.000005	<0.0000050	0.0000612	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000075	0.00037	0.000423	0.000161	0.00011	0.000231	0.000757	0.0001	0.00009	0.000088	0.000123	0.000374	0.000236	0.000111
Calcium (Ca), total	mg/L	31.6	11	22.8	32.6	36	36	27.7	30.7	37.4	39.9	40.7	11.6	26.4	32.8
Chromium (Cr), total	mg/L	0.0004	0.0009	0.0068	0.0001	0.0001	0.00045	0.00298	0.00019	0.00013	0.00033	0.00025	0.00100	0.00247	0.00035
Cobalt (Co), total	mg/L	0.000067	0.00052	0.00451	0.00111	0.000434	0.000721	0.00372	0.000261	0.000305	0.00018	0.00016	0.00046	0.00156	0.00029
Copper (Cu), total	mg/L	0.00063	0.0032	0.0241	0.00155	0.00114	0.00309	0.0156	0.000876	0.000656	0.00081	0.00110	0.00421	0.00611	0.00143
Iron (Fe), total	mg/L	0.054	0.784	5.86	0.069	0.044	0.409	4.66	0.0972	0.0466	0.064	0.085	0.913	2.62	0.291
Lead (Pb), total	mg/L	0.000489	0.0067	0.015	0.000394	0.000679	0.0196	0.0181	0.00116	0.00101	0.00297	0.00773	0.00824	0.0146	0.00299
Lithium (Li), total	mg/L	0.0018	0.001	0.0057	0.0022	0.002	0.00203	0.00285	0.00159	0.0017	0.00145	0.00120	<0.00050	0.00236	0.00133
Magnesium (Mg), total	mg/L	6.33	2.1	5.3	6.18	6.59	6.86	5.96	5.21	6.62	7.16	6.82	2.40	5.37	6.07
Manganese (Mn), total	mg/L	0.00715	0.0419	0.176	0.0179	0.00938	0.0369	0.246	0.0111	0.00892	0.00731	0.00845	0.0304	0.0909	0.0205
Mercury (Hg), total	mg/L	<0.00001	<0.00001	0.00003	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00025	0.00025	0.00049	0.00022	0.00022	0.00025	0.000288	0.000182	0.000195	0.000237	0.000254	0.000177	0.000385	0.000255
Nickel (Ni), total	mg/L	0.00047	0.002	0.0126	0.00361	0.00276	0.00264	0.00987	0.00128	0.00145	0.00119	0.00113	0.00222	0.00435	0.00119
Phosphorus (P), total	mg/L		0.037	0.144	0.004	0.006	0.0278	0.411	0.0164	0.0097	<0.050	<0.050	<0.050	0.078	<0.050
Potassium (K), total	mg/L	0.18	<0.3	0.5	0.2	0.2	0.401	0.318	0.183	0.221	0.25	0.23	0.37	0.45	0.24
Selenium (Se), total	mg/L	0.00079	0.00031	0.00051	0.00092	0.00107	0.00083	0.000597	0.000877	0.00114	0.00112	0.00109	0.00031	0.00061	0.00068
Silicon (Si), total	mg/L	2.7	1.8	6.56	3.2	3.1	3.11	4.5	3.13	3.48	3.29	3.21	2.13	4.63	3.22

Station Name		KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81	KV-81
Sample Date		07/10/2010	26/05/2011	12/07/2011	30/10/2011	12/02/2012	03/05/2012	03/07/2012	16/10/2012	12/02/2013	14/04/2013	03/05/2013	04/06/2013	06/07/2013	11/08/2013
Silver (Ag), total	mg/L	0.000012	0.000124	0.000492	0.00001	0.00001	0.000053	0.000253	0.000008	<0.0000050	0.000021	0.000042	0.000132	0.000289	0.000026
Sodium (Na), total	mg/L	0.88	0.3	0.6	0.96	1.15	1.32	0.719	0.799	1.27	1.26	1.31	0.391	0.799	1.04
Strontium (Sr), total	mg/L	0.0946	0.0372	0.0757	0.0923	0.0974	0.102	0.0799	0.0898	0.101	0.105	0.101	0.0348	0.0781	0.100
Sulphur (S), total	mg/L	19	<50	<50	20	21	23	14	21	25.4	21.7	22.7	6.26	15.1	18.7
Thallium (Tl), total	mg/L	0.000002	0.000008	0.00005	<0.000002	<0.000002	0.000007	0.0000383	0.000002	<0.0000020	<0.000010	<0.000010	<0.000010	0.000022	<0.000010
Tin (Sn), total	mg/L	<0.00001	<0.0002	<0.0002	0.00006	<0.0002	<0.00020	<0.00020	0.00024	<0.00020	<0.00010	<0.00010	0.00080	<0.00010	<0.00010
Titanium (Ti), total	mg/L	0.0007	0.012	0.11	0.0008	<0.0005	0.0113	0.039	0.00456	0.00076	<0.010	<0.010	0.016	0.058	<0.010
Uranium (U), total	mg/L	0.000497	0.000176	0.000749	0.000476	0.000632	0.00075	0.000584	0.000336	0.000552	0.000657	0.000676	0.000129	0.000415	0.000354
Vanadium (V), total	mg/L	<0.0002	0.0011	0.0085	<0.0002	<0.0002	0.00077	0.00575	<0.00020	<0.00020	<0.0010	<0.0010	0.0014	0.0042	<0.0010
Zinc (Zn), total	mg/L	0.0073	0.031	0.04	0.0189	0.0173	0.0208	0.0621	0.0103	0.0123	0.0122	0.0132	0.0349	0.0276	0.0126
Zirconium (Zr), total	mg/L	<0.0001	0.0002	0.0008	<0.0001	<0.0001	0.00031	0.00043	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.005	0.0564	0.0896	0.081	0.0247	0.0298	0.045	0.0174	0.0226	0.0106	0.0079	0.0342	0.0130	0.0081
Antimony (Sb), dissolved	mg/L	0.00029	0.00021	0.0003	0.00027	0.00022	0.000417	0.000349	0.000233	0.000229	0.00025	0.00022	0.00025	0.00034	0.00034
Arsenic (As), dissolved	mg/L	0.00098	0.00158	0.00153	0.00108	0.00081	0.000931	0.0016	0.00119	0.000756	0.00083	0.00085	0.00165	0.00179	0.00144
Barium (Ba), dissolved	mg/L	0.0478	0.0261	0.0385	0.0462	0.0503	0.0453	0.0445	0.0518	0.0477	0.0527	0.0503	0.0257	0.0470	0.0548
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000065	0.000371	0.000078	0.000164	0.000109	0.000123	0.0000795	0.000091	0.000089	0.000078	0.000088	0.000220	0.000067	0.000081
Calcium (Ca), dissolved	mg/L	34.3	11	24.2	28.9	37.7	34.8	22.6	33.1	37.5	40.4	41.6	11.0	26.3	31.3
Chromium (Cr), dissolved	mg/L	0.0005	0.0004	0.0004	0.0001	0.0001	0.00012	<0.00010	0.0001	<0.00010	0.00028	<0.00010	0.00013	0.00021	<0.00010
Cobalt (Co), dissolved	mg/L	0.000028	0.00007	0.000167	0.00109	0.000387	0.000362	0.000425	0.000193	0.000288	0.00015	0.00012	<0.00010	0.00013	<0.00010
Copper (Cu), dissolved	mg/L	0.00044	0.00148	0.00102	0.00113	0.00049	0.00118	0.00109	0.000654	0.000478	0.00081	0.00061	0.00168	0.00110	0.00035
Iron (Fe), dissolved	mg/L	0.025	0.063	0.086	0.019	0.006	0.0304	0.0198	0.0092	0.0086	<0.010	<0.010	0.050	0.133	<0.010
Lead (Pb), dissolved	mg/L	0.000317	0.000497	0.00069	0.000043	0.000023	0.00086	0.000138	0.000134	0.00006	0.000428	0.000880	0.000889	0.000933	0.000072
Lithium (Li), dissolved	mg/L	0.002	0.0006	0.0014	0.0021	0.0019	0.00192	0.00127	0.00163	0.00181	0.00142	0.00115	<0.00050	0.00069	0.00107
Magnesium (Mg), dissolved	mg/L	6.59	2.31	4.62	6.17	6.41	6.63	4.27	5.18	6.69	7.07	6.91	2.13	4.84	5.72
Manganese (Mn), dissolved	mg/L	0.00628	0.00684	0.0123	0.0155	0.00762	0.0163	0.0145	0.00603	0.00608	0.00471	0.00452	0.00552	0.0249	0.00858
Mercury (Hg), dissolved	mg/L		<0.00001	0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00027	0.00013	0.00024	0.00024	0.00024	0.000271	0.000271	0.000191	0.000227	0.000254	0.000225	0.000122	0.000267	0.000210
Nickel (Ni), dissolved	mg/L	0.00051	0.00097	0.00072	0.00368	0.00263	0.00181	0.00164	0.00111	0.00148	0.00109	0.00099	0.00082	0.00077	0.00065
Phosphorus (P), dissolved	mg/L		0.009	0.007	<0.002	0.006	0.0047	<0.0020	0.0026	0.0045	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.19	0.24	0.15	0.18	0.22	0.35	0.135	0.164	0.211	0.32	0.22	0.26	0.18	0.19
Selenium (Se), dissolved	mg/L	0.00076	0.0003	0.00054	0.00086	0.00105	0.000973	0.000521	0.00097	0.00124	0.00116	0.00112	0.00026	0.00061	0.00072
Silicon (Si), dissolved	mg/L	3.09	1.44	2.65	2.8	3.5	2.79	2.28	3.39	3.47	3.22	3.15	1.33	2.47	2.91
Silver (Ag), dissolved	mg/L	<0.000005	0.000016	0.00003	<0.000005	<0.000005	0.000014	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	0.89	0.35	0.62	0.97	1.12	1.29	0.651	0.781	1.32	1.48	1.36	0.349	0.752	0.994
Strontium (Sr), dissolved	mg/L	0.1	0.0354	0.0734	0.0949	0.0976	0.1	0.0665	0.0892	0.0981	0.0993	0.0856	0.0330	0.0754	0.0884
Sulphur (S), dissolved	mg/L	21	<10	14	19	24	20	14	20	24.2	21.5	22.6	6.02	15.0	17.7
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00001	0.00001	<0.00001	0.00003	<0.0002	<0.00020	0.00079	<0.00020	<0.00020	<0.00010	0.00013	0.00022	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.0005	0.001	0.0019	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000574	0.000096	0.000304	0.000528	0.000551	0.000715	0.000226	0.000333	0.000552	0.000675	0.000600	0.000081	0.000257	0.000307
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	0.00027	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.0077	0.0307	0.0041	0.0182	0.0157	0.00947	0.00609	0.00899	0.0114	0.0112	0.0096	0.0224	0.0059	0.0061
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010		<0.00080	<0.00080	<0.00080	<0.00080

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		19/02/2004	23/03/2004	24/04/2004	17/06/2004	21/07/2004	29/07/2004	25/08/2004	21/09/2004	22/10/2004	29/11/2004	25/01/2005	27/02/2005	22/03/2005	22/04/2005	26/05/2005	30/06/2005	20/07/2005
Discharge (Flow)	L/s						85								48		73.7	93
Total Suspended Solids	mg/L	<2	<2	<3	<2	1	5	<2	1	<1	<2	<1	<2	<2	<2	17	36	80
pH (field)	pH units		7.94	7.51	7.9	8	7.61	7.8	8.1	8.12	8.12	7.15	7.12	8.75	8.3	8.4	8.4	8.3
pH (lab)	pH units	7.2	7.44	7.54	7.8	8	7.92	7.8	8.03	7.82	7.4	7.47	7.6	7.3	7.38	7.6	7.84	
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	774	850	846	720	759	756	825	773	797	835	888	930	922	910	559	752	690
Temperature (field)	C	0.1	0.1	0.2		12.4	11.7	7.2		0.2	0.2	0.2	0.1	0	0.4	12.1		10.5
Dissolved Oxygen (field)	mg/L						8.4											
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L																	
Hardness (from dissolved)	mg/L	679	497	511	360	452	419	410	426	477	451		496	543	482	283	384	367
Alkalinity, total	mg/L	143	143	144	120	117	114	126	128	132	141	512	157	171	160	88	105	130
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L	429	343	349	281		281	338	271	287	315							
Ammonia (N)	mg/L						<0.05											0.01
Nitrite (N)	mg/L						<0.05											<0.03
Nitrate (N)	mg/L						<0.1											0.07
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	
Aluminum (Al), total	mg/L	<0.01	<0.01	<0.01	0.02	0.026	0.058	<0.01	<0.005	<0.005	0.006	<0.005	<0.05	0.02	0.01	0.384	0.452	0.179
Antimony (Sb), total	mg/L	<0.02	<0.02	<0.02	<0.02	0.0007	0.0008	<0.02	0.0003	0.0002	0.0006	<0.0002	0.005	0.0002	0.0002	0.001	0.0025	0.0013
Arsenic (As), total	mg/L	<0.04	<0.04	<0.04	<0.04	0.0056	0.0082	<0.04	0.0025	0.0022	0.0016	0.0027	0.0038	0.0033	0.0028	0.0118	0.0261	0.0153
Barium (Ba), total	mg/L	0.084	0.0522	0.0647	0.0532	0.065	0.061	0.0622	0.059	0.067	0.071	0.078	0.075	0.074	0.065	0.06	0.076	0.065
Beryllium (Be), total	mg/L	<0.0006	0.0033	<0.0006	<0.0006	<0.0001	<0.0001	<0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L	<0.02	0.29	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	0.0096	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L					0.004	0.031		0.002	0.002	<0.002	<0.002	<0.02	0.004	<0.002	0.003	0.002	0.005
Cadmium (Cd), total	mg/L	<0.0006	0.0011	0.0011	0.0034	0.00512	0.00417	0.0034	0.00206	0.00161	0.00138	0.00063	0.00071	0.00064	0.00078	0.00333	0.00527	0.00365
Calcium (Ca), total	mg/L	230	147	78.5	112	129	129	132	129	141	138	153	156	154	146	88.6	114	104
Chromium (Cr), total	mg/L	<0.001	<0.001	<0.001	0.002	0.001	0.0006	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	0.002	<0.0005	0.0009	0.0009	0.0007
Cobalt (Co), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.0003	0.0006	<0.001	0.0001	0.0002	0.0004	0.0006	<0.001	0.0006	0.0003	0.0008	0.0008	0.0003
Copper (Cu), total	mg/L	0.002	0.01	<0.001	0.013	<0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.010	0.052	<0.001	0.003	0.003	0.002
Iron (Fe), total	mg/L	0.187	0.293	0.239	0.108	0.2	0.3	0.109	<0.1	0.1	<0.1	0.2	0.2	0.3	0.2	1.3	1.6	0.7
Lead (Pb), total	mg/L	0.033	<0.01	<0.01	0.022	0.0075	0.0193	<0.01	0.0011	0.0014	0.0024	0.0032	0.009	0.0035	0.0055	0.0552	0.12	0.0586
Lithium (Li), total	mg/L	0.016	0.014	0.012	0.014	0.015	0.016	0.012	0.012	0.013	0.009	0.013	0.013	0.014	0.014	0.007	0.01	0.01
Magnesium (Mg), total	mg/L	36.9	25.3	14.5	20.3	25.4	24.3	22.7	25	27.5	25.4	27.8	27.5	26.1	25.7	15.2	22.6	21.5
Manganese (Mn), total	mg/L	1.53	1.18	1.01	0.468	0.666	0.542	0.346	0.237	0.292	0.839	2.04	1.67	1.77	1.22	0.673	0.891	0.428
Mercury (Hg), total	mg/L																	
Molybdenum (Mo), total	mg/L	<0.01	<0.01	<0.01	<0.01	<0.001	0.002	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L	0.006	0.004	<0.002	0.008	0.0054	0.0058	<0.002	0.0024	0.0083	0.0036	0.0052	0.0088	0.0072	0.004	0.006	0.0053	0.0033
Phosphorus (P), total	mg/L	<0.06	0.06	<0.06	<0.06			0.08										
Potassium (K), total	mg/L	<1	<1	<1	<1	<0.4	<0.4	1.6	<0.4	<0.4	<0.4	0.7	0.8	0.6		<0.4	<0.4	<0.4
Selenium (Se), total	mg/L	<0.1	<0.1	<0.1	<0.1	0.0008	0.0007	<0.1	0.001	0.001	0.001	0.0006	<0.002	0.0009	0.0008	0.0007	0.0007	0.0008
Silicon (Si), total	mg/L	5.1	4.4	4.3	1.5	2.5	2.48	2.5	2.66	3.42	3.43	4.18	4.42	4.6	4.2	3.28	2.42	2.6

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		19/02/2004	23/03/2004	24/04/2004	17/06/2004	21/07/2004	29/07/2004	25/08/2004	21/09/2004	22/10/2004	29/11/2004	25/01/2005	27/02/2005	22/03/2005	22/04/2005	26/05/2005	30/06/2005	20/07/2005
Silver (Ag), total	mg/L	<0.002	<0.002	<0.002	<0.002	0.0003	0.0003	<0.002	<0.0001	<0.0001	0.0006	0.0001	<0.001	0.0018	<0.0001	0.0004	0.0013	0.0005
Sodium (Na), total	mg/L	1.94	1.38	0.87	1.34	1.4	1.4	1.15	1.5	1.7	1.7	1.5	1.6	1	2	1	1.2	1.2
Strontium (Sr), total	mg/L	0.272	0.252	0.255	0.183	0.237	0.23	0.273	0.238	0.248	0.248	0.23	0.264	0.272	0.254	0.157	0.229	0.212
Sulphur (S), total	mg/L	144	126	116	88.9	116	95.3	91.4	87.2	97.4	95.2	107	111	109	105	60	85.2	78.2
Thallium (Tl), total	mg/L					<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L	<0.004	<0.004	0.006	<0.004	0.006	0.0078	0.093	0.0051	0.0067	0.0065	0.0062	0.0063	0.005	0.0062	0.0155	0.0172	0.0081
Uranium (U), total	mg/L	<0.07	<0.07	<0.07	0.09	0.006	0.0057	<0.07	0.0064	0.0065	0.0063	0.0068	0.007	0.0072	0.0067	0.0038	0.0055	0.0059
Vanadium (V), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.0001	0.0002	<0.001	<0.0001	0.0006	0.0002	<0.0001	<0.001	0.0001	<0.0001	0.0015	0.0014	0.0006
Zinc (Zn), total	mg/L	0.164	0.177	0.171	0.35	0.678	0.52	0.396	0.291	0.27	0.255	0.164	0.143	0.185	0.149	0.38	0.438	0.389
Zirconium (Zr), total	mg/L	<0.006	<0.006	<0.006	<0.006	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001	<0.001	<0.010	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L	<0.01	<0.01	<0.01	0.01	<0.005	<0.005	<0.01	<0.005	<0.005	0.006	<0.005	<0.050	<0.005	0.008	0.23	<0.005	0.052
Antimony (Sb), dissolved	mg/L	<0.02	<0.02	<0.02	<0.02	0.0007	0.0006	<0.02	0.0003	<0.0002	0.0002	<0.0002	<0.0020	<0.0002	0.0002	<0.002	0.0006	0.0008
Arsenic (As), dissolved	mg/L	<0.04	<0.04	<0.04	<0.04	0.0043	0.0053	<0.04	0.0023	0.0014	0.0011	0.0016	<0.002	0.0023	0.0033	0.01	0.0039	0.0123
Barium (Ba), dissolved	mg/L	0.0803	0.0517	0.064	0.0527	0.062	0.053	0.057	0.061	0.071	0.069	0.075	0.074	0.074	0.066	0.06	0.063	0.063
Beryllium (Be), dissolved	mg/L	<0.0006	0.0011	<0.0006	<0.0006	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.02	0.03	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	0.007	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Boron (B), dissolved	mg/L					0.003	0.003	0.0025	0.002	<0.002	<0.002	<0.002	<0.02	0.002	<0.002	<0.02	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L	<0.0006	0.0011	0.0009	0.0034	0.00429	0.00279	128	0.002	0.0013	0.00107	0.00031	0.00043	0.00042	0.00069	0.00338	0.00146	0.00327
Calcium (Ca), dissolved	mg/L	213	145	77.7	111	137	128		129	146	138	159	155	172	149	88.2	117	110
Chromium (Cr), dissolved	mg/L	<0.001	<0.001	<0.001	0.002	0.0009	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0050	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	0.0003	0.0003	<0.001	<0.0001	0.0002	0.0003	0.0006	<0.001	0.0004	<0.0001	<0.001	0.0002	0.0003
Copper (Cu), dissolved	mg/L	<0.001	<0.001	<0.001	0.013	<0.001	<0.001	0.002	0.006	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001	0.001
Iron (Fe), dissolved	mg/L	<0.002	0.021	0.018	0.096	0.02	0.07	0.05	0.04	0.02	0.03	2.12	<0.01	0.04	0.16	1.01	0.03	0.07
Lead (Pb), dissolved	mg/L	0.033	<0.01	<0.01	0.011	0.0005	0.0018	<0.01	0.0002	0.0001	0.0002	<0.0001	<0.001	0.0003	0.0049	0.055	0.0029	0.0488
Lithium (Li), dissolved	mg/L	0.015	0.014	0.012	0.012	0.012	0.013	0.011	0.011	0.011	0.009	0.012	0.012	0.01	0.012	<0.01	0.011	0.007
Magnesium (Mg), dissolved	mg/L	35.4	25	14.4	20.1	26.8	24.2	21.8	25.3	27.2	25.7	1.6	26.6	27.8	26.4	15.2	22.4	22.5
Manganese (Mn), dissolved	mg/L	1.46	1.17	0.969	0.463	0.671	0.455	0.28	0.234	0.301	0.815	334	1.63	1.89	1.25	0.677	0.271	0.338
Mercury (Hg), dissolved	mg/L																	
Molybdenum (Mo), dissolved	mg/L	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	0.005	0.004	<0.002	0.005	0.004	0.0046	<0.002	0.0024	<0.0005	0.0023	0.0035	<0.0050	0.003	0.002	<0.005	0.0031	0.0019
Phosphorus (P), dissolved	mg/L	<0.06	0.06	<0.06	<0.06			0.15										
Potassium (K), dissolved	mg/L	<1	<1	<1	<1	<0.4	<0.4	<1	<0.4	<0.4	0.5	0.02	0.4	0.5	0.5	<0.4	<0.4	<0.4
Selenium (Se), dissolved	mg/L	<0.1	<0.1	<0.1	<0.1	0.0008	0.0006	<0.1	0.0011	0.0009	0.0009	0.0003	<0.002	0.0008	0.0009	<0.002	0.0008	0.0008
Silicon (Si), dissolved	mg/L	4.8	4.3	4.1	1.4	2.68	2.48	2.5	2.76	3.81	3.5	4.65	4.46	4.9	4.6	2.69	1.57	2.28
Silver (Ag), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L	1.89	1.36	0.86	1.33	1.4	1.3	1.06	1.5	1.6	1.8	0.7	1.6	1	1	1	0.9	1.3
Strontium (Sr), dissolved	mg/L	0.258	0.25	0.252	0.182	0.226	0.217	0.238	0.23	0.23	0.225	0.239	0.249	0.264	0.25	0.14	0.215	0.201
Sulphur (S), dissolved	mg/L	143	120	107	88	106	93.6	93.6	90.2	95.8	93.2	111	112	117	111	63.6	90.8	80.3
Thallium (Tl), dissolved	mg/L					<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	<0.004	<0.004	0.006	<0.004	0.0057	0.0053	0.009	0.0103	0.0068	0.0049	0.0062	<0.005	0.0056	0.0068	0.009	0.0055	0.0065
Uranium (U), dissolved	mg/L	<0.06	<0.06	<0.06	0.09	0.0045	0.0052	<0.06	0.0061	0.0066	0.0064	0.0064	0.0051	0.0062	0.0057	<0.005	0.0049	0.0054
Vanadium (V), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	0.0006	0.0001	0.0001	0.0007	<0.001	<0.0001	0.0002	<0.001	0.0004	0.0004
Zinc (Zn), dissolved	mg/L	0.154	0.175	0.169	0.346	0.664	0.417	0.343	0.3	0.245	0.256	0.153	0.154	0.143	0.144	0.34	0.229	0.308
Zirconium (Zr), dissolved	mg/L	<0.005	<0.005	<0.005	<0.005			<0.005										

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		22/08/2005	22/09/2005	25/10/2005	25/01/2006	23/02/2006	15/03/2006	28/04/2006	26/05/2006	27/06/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	24/10/2006	29/11/2006	22/01/2007	25/02/2007
Discharge (Flow)	L/s			73							130		108.987092	112				
Total Suspended Solids	mg/L	8	<2	2	<2	4	<2	<2	12	6								
pH (field)	pH units	7.96	8.18		7.11	7.04	7.55	7.15	8.95		7.62		7.4	8.3	8.3	7.8	7.22	7.83
pH (lab)	pH units	7.96		7.62	7.42	7.29	7.38	7.3	7.38	7.94	7.56	8.06	7.86	7.67	7.9		7.43	8.06
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	646	723	704	782	740	755	765	359	647	588	672	681	669	713	1530	747	766
Temperature (field)	C	9.6		0.3	0.2	0.2	1.1				11.6			4.2		0.5	0.3	0.4
Dissolved Oxygen (field)	mg/L	9.2																
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L									348								
Hardness (from dissolved)	mg/L	351	352		394	412	419	414	169									
Alkalinity, total	mg/L	114	133	125	134	128	134	138	73	158								
Chloride	mg/L								0.48									
Fluoride	mg/L								0.06									
Sulphate, dissolved	mg/L		248			270	280	87	106	249								
Ammonia (N)	mg/L	0.004	<0.05	0.013						0.014								
Nitrite (N)	mg/L	<0.03							<0.03	<0.002								
Nitrate (N)	mg/L	0.05		0.12					0.06	0.036								
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	
Aluminum (Al), total	mg/L	0.489	0.012	0.063	0.014	0.011	<0.005	0.017	0.216	0.1	0.031	0.059	0.01	0.008	0.013	0.024	0.048	0.017
Antimony (Sb), total	mg/L	0.0032	0.0003	0.0005	0.0002	<0.0002	<0.0002	0.0004	0.0007	0.0007	0.0005	0.0008	0.0005	0.0003	0.0003	0.0009	0.0002	<0.0002
Arsenic (As), total	mg/L	0.0499	0.0024	0.0076	0.003	0.0027	0.0022	0.0146	0.0057	0.0058	0.0042	0.0065	0.004	0.0027	0.0026	0.0038	0.0023	0.002
Barium (Ba), total	mg/L	0.083	0.054	0.058	0.078	0.067	0.073	0.066	0.04	0.057	0.055	0.061	0.064	0.058	0.062	0.146	0.072	0.07
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L	<0.002	0.003	0.003	0.003	0.003	0.003	0.002	<0.002	<0.002	0.002	0.005	0.004	<0.002	0.002	0.004	0.002	0.002
Cadmium (Cd), total	mg/L	0.0106	0.00219	0.00173	0.00084	0.00068	0.00081	0.00121	0.00159	0.00524	0.00321	0.00222	0.00224	0.00158	0.00123	0.00212	0.0006	0.00056
Calcium (Ca), total	mg/L	98.5	108	115	118	132	132	136	54.6	109	99	108	111	108	115	294	133	127
Chromium (Cr), total	mg/L	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.001	<0.0005	<0.0005	0.0007	<0.0005	<0.0005
Cobalt (Co), total	mg/L	0.0016	0.0002	0.0005	0.0004	0.0003	0.0005	0.0004	0.0006	0.0004	0.0004	0.0002	<0.0002	0.0003	<0.0001	0.0001	0.0003	0.0003
Copper (Cu), total	mg/L	0.007	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	0.002	<0.002	0.002	<0.001	0.002	<0.001	<0.001
Iron (Fe), total	mg/L	3.5	0.1	0.3	0.2	0.2	0.2	0.6	0.7	0.4	0.2	0.3	<0.2	0.1	0.2	0.2	0.2	0.1
Lead (Pb), total	mg/L	0.406	0.0027	0.0247	0.0049	0.0025	0.0019	0.0518	0.026	0.013	0.0057	0.0147	0.0076	0.0028	0.0041	0.0013	0.0043	0.002
Lithium (Li), total	mg/L	0.008	0.009	0.012	0.01	0.012	0.015	0.008	0.004	0.009	0.007	0.01	0.007	0.01	0.01	0.028	0.013	0.01
Magnesium (Mg), total	mg/L	19.7	18.8	19.9	19.8	20.4	22.9	21.1	9.2	18.5	17.3	19.8	21.3	20.4	21.2	65.2	23	22.6
Manganese (Mn), total	mg/L	1.95	0.214	0.326	1.02	1.06	1.06	1.2	0.455	0.515	0.277	0.28	0.18	0.156	0.219	0.419	1.08	0.814
Mercury (Hg), total	mg/L																	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L	0.0052	0.0024	0.0039	0.0024	<0.0005	0.0032	0.0025	0.0027	0.0058	0.0024	0.0041	0.005	0.0024	0.0011	0.005	0.0027	0.0034
Phosphorus (P), total	mg/L		<0.1															
Potassium (K), total	mg/L	0.4	<0.4	0.4	0.4	0.4	0.4	0.5	0.4	<0.4	<0.4	<0.4	<0.8	<0.4	<0.4	2	0.5	<0.4
Selenium (Se), total	mg/L	0.0013	0.0009	0.0011	0.001	0.0009	0.0011	0.0011	0.0007	0.0007	0.0006	0.0009	0.0008	0.0006	0.0006	0.003	0.0009	0.0011
Silicon (Si), total	mg/L	3.45	2.78	3.5	3.71	4.11	4.27	3.92	2.29	1.93	1.94	2	2.52	2.51	3.07	8.3	4.3	3.92

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		22/08/2005	22/09/2005	25/10/2005	25/01/2006	23/02/2006	15/03/2006	28/04/2006	26/05/2006	27/06/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	24/10/2006	29/11/2006	22/01/2007	25/02/2007
Silver (Ag), total	mg/L	0.0019	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0002	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), total	mg/L	1.3	1.4	1.5	1.7	1.4	1.4	1.3	0.8	1.2	1.1	1.3	1	1.4	1.5	4.1	1.4	1.4
Strontium (Sr), total	mg/L	0.176	0.192	0.229	0.228	0.205	0.224	0.229	0.095	0.186	0.179	0.204	0.19	0.186	0.185	0.581	0.218	0.234
Sulphur (S), total	mg/L	71.3	71	77.7	82.1	90	91.3	94.8	35.2	78.6	73.2	81	82.1	79.4	78.2	221	91.8	85.7
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005											<0.00005	<0.00005
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L	0.0192	0.0049	0.0089	0.006	0.0044	0.006	0.0038	0.0081	0.0084	0.005	0.0616	0.005	0.0046	0.0054	0.0116	0.0068	0.0058
Uranium (U), total	mg/L	0.0048	0.0047	0.0051	0.0054	0.0047	0.0052	0.0046	0.0018	0.0042	0.0044	0.0044	0.0053	0.0046	0.0051	0.0074	0.0053	0.0058
Vanadium (V), total	mg/L	0.0017	0.0002	0.0004	0.0001	<0.0001	0.0002	0.0002	0.0007	0.0004	<0.0001	0.0004	<0.0002	0.0001	0.0001	0.0002	0.0002	<0.0001
Zinc (Zn), total	mg/L	0.709	0.275	0.322	0.123	0.116	0.13	0.147	0.218	0.588	0.334	0.213	0.249	0.223	0.182	0.611	0.106	0.101
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.03		0.011	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Antimony (Sb), dissolved	mg/L	0.0004	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003		0.0005	0.0008	0.0004	0.0003	0.0002	0.0008	<0.0002	0.0002
Arsenic (As), dissolved	mg/L	0.0038	0.0022	0.0009	0.0016	0.0016	0.0013	0.0018	0.0027		0.0035	0.0041	0.003	0.0025	0.002	0.0034	0.0012	0.0016
Barium (Ba), dissolved	mg/L	0.057	0.057	0.039	0.069	0.067	0.069	0.066	0.036		0.058	0.059	0.062	0.059	0.062	0.139	0.07	0.073
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L	<0.002	<0.002	0.005	<0.002	0.002	0.002	<0.002	<0.002		<0.002	<0.002	0.003	<0.002	<0.002	0.003	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L	0.00123	0.00173	0.0006	0.00053	0.00045	0.00061	0.0004	0.00108		0.003	0.00193	0.00179	0.00138	0.0011	0.00183	0.0004	0.00044
Calcium (Ca), dissolved	mg/L	105	109	69.7	124	127	130	132	53.1		102	114	113	99.9	119	283	128	133
Chromium (Cr), dissolved	mg/L	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	0.0005	<0.0005	0.0032	<0.0005	0.0005	<0.0005
Cobalt (Co), dissolved	mg/L	<0.0001	<0.0001	<0.0001	0.0004	0.0003	0.0003	0.0003	0.0005		0.0003	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0003	0.0003
Copper (Cu), dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.002	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001
Iron (Fe), dissolved	mg/L	0.02	0.02	0.02	0.04	0.01	0.01	0.04	0.25		0.07		0.06	0.07	0.06	0.04	0.02	0.02
Lead (Pb), dissolved	mg/L	0.0014	0.0003	0.0004	0.0005	0.0005	0.0004	0.0003	0.0034		0.0023	0.0027	0.0025	0.0014	0.0005	0.0004	0.0005	0.004
Lithium (Li), dissolved	mg/L	0.008	0.01	0.006	0.01	0.011	0.011	0.01	0.004		0.007	0.009	0.008	0.01	0.01	0.024	0.011	0.009
Magnesium (Mg), dissolved	mg/L	21.5	19.4	13.1	20.5	22.8	22.8	20.5	8.9		19.5	23	21.8	20	23.5	61.3	21.5	22.3
Manganese (Mn), dissolved	mg/L	0.195	0.21	0.119	1.1	1.04	1.06	1	0.403		0.285	0.275	0.18	0.152	0.209	0.394	0.992	0.843
Mercury (Hg), dissolved	mg/L																	
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	0.0022	0.0014	0.0012	0.0014	<0.0005	<0.0005	<0.0005	0.002		0.003	0.0013	<0.0005	<0.0005	<0.0005	0.0022	0.0014	0.0016
Phosphorus (P), dissolved	mg/L																	
Potassium (K), dissolved	mg/L	<0.4	<0.4	1	0.4	0.5	0.5	0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	2	0.5	<0.4
Selenium (Se), dissolved	mg/L	0.0009	0.0008	0.0005	0.001	0.0012	0.0012	0.0008	0.0002		0.0008	0.0004	0.0006	0.001	0.001	0.0026	0.0008	0.0011
Silicon (Si), dissolved	mg/L	2.92	2.89	2.93	3.9	4.25	4.31	3.88	1.93		2.2	2.12	2.54	2.23	3.21	9.2	4.04	4.11
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L	1	1.4	3.3	1.6	1.4	1.4	1.6	0.8		1.2	1.3	1.4	1.1	1.4	4.1	1.4	1.4
Strontium (Sr), dissolved	mg/L	0.194	0.193	0.164	0.214	0.219	0.212	0.222	0.092		0.185	0.178	0.19	0.184	0.195	0.518	0.228	0.191
Sulphur (S), dissolved	mg/L	74.3	75.1	42.1	89.1	89.6	91	94.5	34.6		70.3	84.6	83.3	73.7	84	218	88.6	90.1
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005											<0.00005	<0.00005
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	0.0033	0.0054	0.0028	0.0053	0.0042	0.0055	0.0033	0.0023		0.0049	0.042	0.0048	0.0045	0.0051	0.0173	0.0075	0.0052
Uranium (U), dissolved	mg/L	0.0041	0.0044	0.0024	0.0047	0.0049	0.0044	0.0049	0.0018		0.0039	0.0047	0.0053	0.0044	0.005	0.0068	0.0051	0.0059
Vanadium (V), dissolved	mg/L	0.0017	0.0002	0.0004	0.0001	0.0004	0.0002	0.0008	0.0002		0.0001	0.0004	0.0006	0.0005	0.0008	0.0002	0.0008	0.0001
Zinc (Zn), dissolved	mg/L	0.231	0.261	0.118	0.119	0.117	0.11	0.105	0.186		0.368	0.174	0.229	0.216	0.198	0.565	0.095	0.092
Zirconium (Zr), dissolved	mg/L																	

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		23/03/2007	18/04/2007	29/05/2007	18/06/2007	13/07/2007	31/08/2007	05/09/2007	29/10/2007	12/11/2007	27/11/2007	09/01/2008	19/05/2008	20/06/2008	06/07/2008	14/08/2008	15/09/2008	03/10/2008
Discharge (Flow)	L/s							60.63							129.6	119.385	80.18	160.71
Total Suspended Solids	mg/L									8	3	6	41	5	9	10	11	20
pH (field)	pH units	7.88	7.78	8.18	7.93	7.86	8.02	7.33	7.79	7.13	7.77	7.4	7.51		7.2	7.42	6.82	7.47
pH (lab)	pH units	8.34	8.12	7.52	7.8	7.6	8.06	7.98	7.96	7.61	7.64	7.87	7.74	7.96	7.98	7.85	7.87	7.7
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	716	734	389	622	508	715	701	699	696	704	731	457	702	660	601	635	594
Temperature (field)	C	0.3	0.9	10.3	12.0	7.8	12.2	5.3	0.2	0.2	0.2	0.1	3		8.5	7	6	5
Dissolved Oxygen (field)	mg/L																	
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L																	
Hardness (from dissolved)	mg/L									388	391	449	233	381	351	320	396	349
Alkalinity, total	mg/L																	
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L																	
Ammonia (N)	mg/L																	
Nitrite (N)	mg/L																	
Nitrate (N)	mg/L																	
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	4
Aluminum (Al), total	mg/L	0.018	0.131	0.756	0.106	0.209	0.014	0.036	0.017	0.051	0.104	0.053	0.45	0.034	0.077	0.023	0.012	0.074
Antimony (Sb), total	mg/L	<0.0002	0.0003	0.001	0.0004	0.0004	0.0006	0.0002	0.0002	0.0006	0.0012	0.0003	0.0014	0.0004	0.0007	0.0003	<0.0002	0.0008
Arsenic (As), total	mg/L	0.0075	0.0024	0.011	0.004	0.004	0.0036	0.0032	0.0016	0.0062	0.0046	0.0055	0.0166	0.0043	0.0058	0.0042	0.0028	0.0053
Barium (Ba), total	mg/L	0.019	0.037	0.048	0.061	0.053	0.061	0.06	0.063	0.067	0.075	0.08	0.05	0.062	0.061	0.055	0.05	0.056
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001
Boron (B), total	mg/L	<0.002	0.004	0.01	0.002	0.002	<0.002	<0.002	<0.002	0.002	0.002	0.002	<0.002	0.003	0.006	0.003	<0.005	<0.005
Cadmium (Cd), total	mg/L	0.00008	0.00256	0.00129	0.00164	0.00497	0.00176	0.00187	0.00122	0.00117	0.00153	0.00094	0.00275	0.00187	0.00346	0.00198	0.00153	0.00359
Calcium (Ca), total	mg/L	147	130	68.1	99.5	83.6	118	111	117	136	118	133	72.3	117	116	97.3	106	104
Chromium (Cr), total	mg/L	0.0008	0.0007	0.002	<0.0005	0.0006	0.0006	<0.0005	<0.0005	0.0011	0.0007	<0.0005	0.0014	<0.0005	0.0006	0.0005	0.0006	0.0005
Cobalt (Co), total	mg/L	0.0002	0.0005	0.001	0.0002	0.0003	<0.0001	0.0002	0.0001	0.0004	0.0005	0.0004	0.0014	0.0001	0.0003	0.0002	0.00016	0.00048
Copper (Cu), total	mg/L	<0.001	0.004	0.004	0.002	0.002	<0.001	0.002	<0.001	0.002	0.001	<0.001	0.004	<0.001	0.002	0.002	<0.001	0.002
Iron (Fe), total	mg/L	<0.1	0.2	1	0.3	0.4	0.1	0.1	0.1	0.3	0.4	0.4	1.3	0.16	0.34	0.17	0.12	0.38
Lead (Pb), total	mg/L	0.0005	0.0015	0.0353	0.0056	0.0075	0.012	0.0029	0.0016	0.0213	0.0215	0.0082	0.0709	0.0084	0.0442	0.0033	0.0036	0.027
Lithium (Li), total	mg/L	0.023	0.014	0.007	0.008	0.007	0.011	0.01	0.011	0.011	0.011	0.014	0.007	0.01	0.01	0.009	0.008	0.007
Magnesium (Mg), total	mg/L	7.7	16.4	9.3	18.6	16.1	21.1	20.1	21.2	21.7	21.8	23	11.2	20.9	21.2	17.6	19.1	18.5
Manganese (Mn), total	mg/L	0.014	0.212	0.456	0.328	0.393	0.268	0.205	0.378	1.23	1.02	1.41	1.04	0.311	0.372	0.261	0.207	0.338
Mercury (Hg), total	mg/L																	
Molybdenum (Mo), total	mg/L	<0.001	0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00011	0.00019
Nickel (Ni), total	mg/L	0.0007	0.0012	0.0058	0.0026	0.0021	0.0019	0.0029	0.0026	0.0022	0.0036	0.0022	0.0044	0.0035	0.0014	0.0028	0.002	0.003
Phosphorus (P), total	mg/L														0.014		0.03	<0.01
Potassium (K), total	mg/L	0.4	1.6	<0.8	<0.4	<0.4	<0.4	<0.4	<0.4	0.7	0.4	0.5	0.6	<0.4	<0.4	<0.4	0.32	0.3
Selenium (Se), total	mg/L	0.0003	0.0008	<0.0004	0.001	0.0014	0.0008	0.0008	0.0013	0.0012	0.0017	0.0009	0.0007	0.0012	0.0008	0.0006	0.0006	0.001
Silicon (Si), total	mg/L	6.2	5.19	3.12	2.36	2.74	1.83	2.6	3.62	4.27	4.11	4.3	2.35	1.95	2.06	2.45	2.81	3.07

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		23/03/2007	18/04/2007	29/05/2007	18/06/2007	13/07/2007	31/08/2007	05/09/2007	29/10/2007	12/11/2007	27/11/2007	09/01/2008	19/05/2008	20/06/2008	06/07/2008	14/08/2008	15/09/2008	03/10/2008
Silver (Ag), total	mg/L	<0.0001	<0.0001	0.0004	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.00107	0.00036	0.00014	0.00002	<0.00001	0.00013
Sodium (Na), total	mg/L	1.7	5.8	<0.8	1.7	1.1	1.3	1.4	1.3	2.8	2.2	1.6	0.8	1.4	1.3	1.1	1.2	1.28
Strontium (Sr), total	mg/L	0.196	0.232	0.11	0.179	0.173	0.241	0.202	0.243	0.222	0.229	0.269	0.142	0.241	0.207	0.202	0.182	0.183
Sulphur (S), total	mg/L	66.6	81.7	42.5	71.4	58	86.4	85	82.4	85.3	84	96.6	56.2	90.2	89.7	72.6		
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001
Tin (Sn), total	mg/L	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Titanium (Ti), total	mg/L	<0.0005	<0.0005	0.06	0.0025	0.0487	0.0058	0.0059	0.007	0.0056	0.0094	0.008	0.0209	0.0086	0.0045	0.0061	0.0008	0.0021
Uranium (U), total	mg/L	0.0022	0.0026	0.002	0.0047	0.0029	0.0048	0.0047	0.0044	0.0044	0.005	0.0044	0.0018	0.0046	0.0038	0.0026	0.0032	0.0029
Vanadium (V), total	mg/L	0.0001	0.0004	0.0023	0.0005	0.0005	0.0002	0.0003	0.0002	0.0002	0.0003	0.0002	0.0012	0.0002	0.0004	0.0002	0.00012	0.00021
Zinc (Zn), total	mg/L	0.015	0.169	0.14	0.244	0.538	0.194	0.263	0.215	0.146	0.184	0.132	0.319	0.308	0.444	0.272	0.196	0.428
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	<0.005	0.023	0.045	0.01	0.015	0.006		<0.005	<0.005	<0.005	<0.005	0.047	0.011	0.01	0.018	0.006	0.031
Antimony (Sb), dissolved	mg/L	<0.0002	0.0003	0.0004	0.0004	0.0003	0.0012		0.0021	0.0003	0.0006	<0.0002		0.001	0.001	0.001	0.0008	0.001
Arsenic (As), dissolved	mg/L	0.009	0.0024	0.0036	0.0032	0.0027	0.0031		0.0014	0.0012	0.0016	0.0031	0.0026	0.0023	0.0027	0.0037	0.0024	0.002
Barium (Ba), dissolved	mg/L	0.019	0.036	0.031	0.057	0.049	0.062		0.065	0.056	0.072	0.077	0.04	0.063	0.056	0.055	0.052	0.049
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Boron (B), dissolved	mg/L	<0.002	0.003	<0.002	<0.002	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004
Cadmium (Cd), dissolved	mg/L	0.00004	0.00266	0.00042	0.00142	0.00532	0.00153		0.00087	0.00021	0.00033	0.0005	0.00145	0.00194	0.00286	0.00194	0.00157	0.0028
Calcium (Ca), dissolved	mg/L	142	141	64.3	98.5	88.3	117		117	122	120	140	74	118	107	98.4	127	108
Chromium (Cr), dissolved	mg/L	0.0012	0.0006	0.0008	<0.0005	<0.0005	<0.0005		<0.0005	0.0009	0.0006	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	0.0009	0.0008
Cobalt (Co), dissolved	mg/L	<0.0001	0.0005	0.0004	<0.0001	0.0002	<0.0001		0.0004	0.0004	0.0002	0.0004	0.0009	0.0002	0.0002	0.0002	0.00025	0.00037
Copper (Cu), dissolved	mg/L	<0.001	0.004	0.002	0.003	0.002	<0.001		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001
Iron (Fe), dissolved	mg/L	<0.01	0.07	0.28	0.08	0.1	0.05		0.01	<0.01	<0.01	0.16	0.24	0.05	0.07	0.08	0.06	0.152
Lead (Pb), dissolved	mg/L	0.0003	0.001	0.0036	0.002	0.0025	0.0011		0.0002	0.0007	0.0001	0.0022	0.0024	0.0012	0.0023	0.0013	0.0009	0.0049
Lithium (Li), dissolved	mg/L	0.024	0.013	0.006	0.007	0.007	0.011		0.01	0.009	0.012	0.01	0.006	0.009	0.008	0.008	0.007	0.006
Magnesium (Mg), dissolved	mg/L	7.1	16.8	9.7	18.1	14.9	21.3		21.4	20.3	22.2	24.3	11.7	21.1	20.3	18	19	19.3
Manganese (Mn), dissolved	mg/L	0.011	0.217	0.369	0.314	0.361	0.237		0.367	1.02	0.866	1.45	0.702	0.281	0.248	0.251	0.188	0.23
Mercury (Hg), dissolved	mg/L																	
Molybdenum (Mo), dissolved	mg/L	<0.001	0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00014	0.00016
Nickel (Ni), dissolved	mg/L	0.0005	0.0015	0.0022	<0.0005	0.0017	0.0005		0.0091	0.0024	0.0026	0.0014	0.0035	<0.0005	0.0006	0.0026	0.002	0.003
Phosphorus (P), dissolved	mg/L																<0.01	<0.01
Potassium (K), dissolved	mg/L	0.4	1.8	<0.4	<0.4	<0.4	<0.4		<0.4	0.5	0.5	0.6	0.5	<0.4	<0.4	<0.4	0.34	0.4
Selenium (Se), dissolved	mg/L	<0.0002	0.0004	0.0004	0.0011	0.0007	0.0007		0.0008	0.0012	0.0011	0.0009	0.0004	0.0009	0.0006	0.0006	0.0014	<0.0006
Silicon (Si), dissolved	mg/L	5.98	5.24	1.98	2.17	2.26	1.97		3.54	4.05	4.08	4.36	1.9	2.03	2.05	2.54	2.77	3.07
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	0.00001	0.00008	<0.00001	<0.00001	<0.00001	<0.00001
Sodium (Na), dissolved	mg/L	1.8	6.7	0.6	1.7	1.1	1.3		1.3	2.3	2.2	1.6	0.8	1.2	1.4	1.3	1.27	1.3
Strontium (Sr), dissolved	mg/L	0.184	0.216	0.108	0.189	0.167	0.227		0.238	0.202	0.219	0.239	0.142	0.21	0.208	0.189	0.185	0.17
Sulphur (S), dissolved	mg/L	66.6	91.5	42.2	70.8	57.2	87.7		82.5	75.6	84.7	100	56	91.4	86	74.7		
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Titanium (Ti), dissolved	mg/L	0.0064	<0.0005	0.048	0.0038	0.0553	0.0057		0.0067	0.0035	0.0079	0.0054	0.0064	0.003	0.0024	0.0065	0.0003	0.0011
Uranium (U), dissolved	mg/L	0.0022	0.0024	0.0017	0.0046	0.003	0.0049		0.0046	0.0039	0.0046	0.0047	0.0017	0.0044	0.0034	0.0026	0.0033	0.0026
Vanadium (V), dissolved	mg/L	0.0023	0.0003	0.0009	0.0008	0.0002	0.0001		0.0002	0.0024	0.0008	0.0002	0.0001	0.0001	0.0001	0.0001	0.00022	0.00021
Zinc (Zn), dissolved	mg/L	0.01	0.186	0.072	0.219	0.501	0.187		0.193	0.12	0.146	0.104	0.245	0.287	0.366	0.264	0.194	0.357
Zirconium (Zr), dissolved	mg/L																<0.0001	0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		12/11/2008	20/12/2008	12/01/2009	03/02/2009	10/03/2009	16/04/2009	07/05/2009	05/06/2009	07/07/2009	11/08/2009	09/09/2009	07/10/2009	13/11/2009	02/12/2009	12/01/2010	11/02/2010	11/03/2010
Discharge (Flow)	L/s								124.365	101.233		102.54	33.155					
Total Suspended Solids	mg/L	<2	69	<2	26	<5	<4	2	18	2	6	1	4	2	1	2	2	2
pH (field)	pH units							6.9	7.53	7.9		7.36	7.51	8.19	7.56	7.94	7.68	7.91
pH (lab)	pH units	7.87	7.88	7.74	7.75	7.58	8.1	7.6	7.9	8.1	8.1	7.9	8	7.9	7.8	7.8	8	7.9
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	665	703	816	631	803	510	36	530	710	813	756	801	872	845	851	860	883
Temperature (field)	C							2.8	16	9.6		7.2	2.1	0.1	0.1	0.5	1	0.2
Dissolved Oxygen (field)	mg/L																	
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L						251	19.4	262	379	457	448	428	449	463	474	481	527
Hardness (from dissolved)	mg/L	339	392	451	405	368	255	19.9	270	398	451	422	423	462	457	490	500	512
Alkalinity, total	mg/L																	
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L										280	260	270	300	310	270	300	280
Ammonia (N)	mg/L																	
Nitrite (N)	mg/L																	
Nitrate (N)	mg/L																	
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L	1.6	1.4	1.7														0.8
Aluminum (Al), total	mg/L	0.025	1.17	0.01	0.042	0.012	0.0473	0.0492	0.0379	0.0055	0.0106	0.0081	0.0241	0.0131	0.0085	0.0076	0.0069	0.0094
Antimony (Sb), total	mg/L	0.0005	0.0201	0.0006	<0.0002	0.0004	0.00011	0.00013	0.00102	0.00039	0.00042	0.00039	0.00054	0.00042	0.00032	0.00028	0.00027	0.00022
Arsenic (As), total	mg/L	0.0026	0.15	0.0043	0.0005	0.005	0.00091	0.0008	0.00719	0.00356	0.00558	0.00338	0.00584	0.00369	0.00355	0.00474	0.00523	0.00597
Barium (Ba), total	mg/L	0.071	0.107	0.093	0.02	0.053	0.0348	0.00689	0.0486	0.0608	0.0616	0.0586	0.0581	0.0591	0.0671	0.0635	0.0624	0.0594
Beryllium (Be), total	mg/L	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	0.000032	<0.000005	<0.000005	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.005	0.002	0.004	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00203	0.0188	0.00106	0.0004	0.00092	0.00016	0.000114	0.00278	0.00137	0.00117	0.00159	0.00203	0.00112	0.00108	0.000934	0.0008	0.000744
Calcium (Ca), total	mg/L	111	119	147	128	124	87.5	5.92	83.1	117	142	141	135	140	150	149	153	168
Chromium (Cr), total	mg/L	0.0004	0.0045	0.0007	0.0007	0.0004	0.0011	0.0002	0.0002	0.0001	<0.0001	0.0003	0.0003	0.0005	0.0004	0.0003	0.0003	0.0003
Cobalt (Co), total	mg/L	0.00042	0.0025	0.0005	0.00016	0.0003	0.000137	0.000043	0.000252	0.000098	0.000149	0.000105	0.000486	0.00131	0.00114	0.00131	0.00137	0.00133
Copper (Cu), total	mg/L	0.003	0.024	0.002	0.002	<0.001	0.00138	0.00128	0.00132	0.00053	0.00043	0.00035	0.00067	0.00048	0.00038	0.00033	0.00033	0.00027
Iron (Fe), total	mg/L	0.16	7.32	0.07	0.1	0.26	0.066	0.076	0.358	0.095	0.195	0.134	0.378	0.271	0.266	0.482	0.496	0.481
Lead (Pb), total	mg/L	0.0101	1.17	0.0044	0.0005	0.0126	0.00114	0.000947	0.0449	0.0187	0.0155	0.00567	0.0472	0.0107	0.00491	0.00515	0.0136	0.00476
Lithium (Li), total	mg/L	0.008	0.011	0.014	0.008	0.01	0.011	<0.0005	0.007	0.0082	0.0115	0.0094	0.0111	0.0145	0.0131	0.0134	0.0143	0.015
Magnesium (Mg), total	mg/L	21.7	21.3	26.4	14	22.5	7.94	1.12	13.2	21.5	25.1	23.3	22.2	23.9	21.8	24.8	24.3	25.9
Manganese (Mn), total	mg/L	0.701	4	1.39	0.173	0.661	0.0765	0.0281	0.4	0.216	0.304	0.273	0.488	1.15	1.33	1.17	1.11	1.15
Mercury (Hg), total	mg/L						0.00001	<0.00001	<0.00001	<0.00001		<0.00001		0.00002	<0.00001		<0.00001	0.00001
Molybdenum (Mo), total	mg/L	0.0001	<0.001	<0.001	0.00106	0.00012	0.00074	0.00005	0.0002	0.00019	0.00024	0.00024	0.00052	0.00049	0.00038	0.00019	0.00021	0.00021
Nickel (Ni), total	mg/L	0.003	0.0059	0.0038	0.001	0.003	0.00065	0.00093	0.00264	0.0017	0.00227	0.00218	0.003	0.00409	0.00301	0.00317	0.0034	0.00351
Phosphorus (P), total	mg/L	<0.01			<0.01	0.014	0.005	0.016	0.014	0.005		0.005		0.004	0.006		0.006	0.009
Potassium (K), total	mg/L	0.4	0.4	0.8	0.7	0.4	0.59	0.44	0.37	0.19	0.25	0.35	0.33	0.38	0.41	0.42	0.42	0.47
Selenium (Se), total	mg/L	0.0009	0.0013	0.0015	<0.0006	0.0006	0.00018	<0.00004	0.00056	0.00088	0.00082	0.00081	0.00085	0.00085	0.00096	0.00099	0.00099	0.001
Silicon (Si), total	mg/L	3.75	5.56	4.79	3.71	3.7	3.45	0.514	1.93	1.88	2.56	3.42	4.01	4.01	3.66	4.49	4.29	4.34

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		12/11/2008	20/12/2008	12/01/2009	03/02/2009	10/03/2009	16/04/2009	07/05/2009	05/06/2009	07/07/2009	11/08/2009	09/09/2009	07/10/2009	13/11/2009	02/12/2009	12/01/2010	11/02/2010	11/03/2010
Silver (Ag), total	mg/L	0.0002	0.0109	0.00002	<0.00001	<0.00001	<0.000005	0.000017	0.000063	<0.000005	0.000007	0.000151	0.000014	0.000008	<0.000005	0.000031	0.00003	0.000011
Sodium (Na), total	mg/L	1.36	2.5	3.4	2.53	1.39	4.98	0.09	0.94	1.4	1.56	1.44	1.38	1.46	1.3	1.53	1.53	1.67
Strontium (Sr), total	mg/L	0.204	0.222	0.286	0.205	0.205	0.173	0.0119	0.148	0.213	0.241	0.227	0.224	0.241	0.245	0.234	0.239	0.264
Sulphur (S), total	mg/L		82.1	101	39.8	88.1	37	<3	62	93	116	117	111	115	124	122	127	137
Thallium (Tl), total	mg/L	<0.00001		<0.00005	<0.00001	<0.00001	0.000003	<0.000002	0.00001	0.000003	<0.000002	0.000002	0.000006	0.000003	0.000003	0.000002	0.000003	<0.000002
Tin (Sn), total	mg/L	<0.0001	<0.001	<0.001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.0015	0.0291	0.0078	0.0018	0.0006	<0.0005	0.001	0.0012	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008
Uranium (U), total	mg/L	0.0035	0.0049	0.0053	0.002	0.0039	0.00125	0.000052	0.00243	0.00421	0.00477	0.00449	0.00426	0.00428	0.00389	0.00423	0.00445	0.00456
Vanadium (V), total	mg/L	0.0001	0.0027	0.0001	0.00014	0.00009	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.234	1.01	0.203	0.025	0.115	0.0107	0.0327	0.254	0.155	0.141	0.191	0.219	0.138	0.118	0.107	0.101	0.0887
Zirconium (Zr), total	mg/L		<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	<0.005	<0.005	0.015	<0.005	<0.005	0.008	0.03	0.0211	0.0062	0.0083	0.0091	0.0019	0.0027	0.0019	0.0624	0.0112	0.0018
Antimony (Sb), dissolved	mg/L	0.0011	0.0014	0.0009	0.0009	0.0013	0.00011	0.00014	0.00081	0.0004	0.00031	0.00029	0.00036	0.00035	0.00027	0.00038	0.00019	0.00019
Arsenic (As), dissolved	mg/L	0.0016	0.004	0.0042	0.0004	0.003	0.00069	0.00061	0.00384	0.00279	0.00293	0.00262	0.00188	0.00185	0.00206	0.0033	0.00285	0.00307
Barium (Ba), dissolved	mg/L	0.065	0.077	0.08	0.018	0.066	0.034	0.00629	0.0484	0.0599	0.0595	0.0573	0.0553	0.0577	0.0659	0.0679	0.0587	0.0569
Beryllium (Be), dissolved	mg/L	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L		<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	0.000021	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000014	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.004	<0.002	0.005	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00184	0.00093	0.0003	0.00037	0.00036	0.000126	0.000102	0.00226	0.00127	0.000784	0.00131	0.00141	0.00087	0.000712	0.000407	0.000291	0.000232
Calcium (Ca), dissolved	mg/L	101	121	137	136	113	89.1	6.1	85.5	123	140	132	133	146	148	155	159	165
Chromium (Cr), dissolved	mg/L	0.0004	<0.0005	<0.0005	0.0005	0.0005	0.0014	0.0002	0.0003	0.0002	0.0002	0.0003	0.0003	0.0003	0.0002	0.0008	0.0007	0.0003
Cobalt (Co), dissolved	mg/L	0.00051	0.0004	0.0005	0.00012	0.00041	0.000098	0.000028	0.000176	0.000129	0.0001	0.000128	0.000421	0.00129	0.00107	0.00135	0.00125	0.00126
Copper (Cu), dissolved	mg/L	<0.001	<0.001	0.006	0.001	<0.001	0.00086	0.00124	0.00121	0.00137	0.00049	0.00059	0.00036	0.00021	0.00018	0.00117	0.00035	0.00015
Iron (Fe), dissolved	mg/L	0.042	<0.01	0.03	<0.01	0.11	0.014	0.053	0.152	0.057	0.053	0.068	0.045	0.089	0.093	0.318	0.191	0.153
Lead (Pb), dissolved	mg/L	0.0008	0.0159	0.0011	0.0002	0.0008	0.00014	0.000639	0.00823	0.0026	0.00121	0.0017	0.000277	0.000447	0.000326	0.0126	0.000535	0.000257
Lithium (Li), dissolved	mg/L	0.008	0.009	0.012	0.008	0.012	0.0114	<0.0005	0.0069	0.0085	0.0119	0.009	0.0112	0.0146	0.013	0.0137	0.0143	0.0154
Magnesium (Mg), dissolved	mg/L	20.8	21.9	26.5	15.6	20.8	7.92	1.14	13.7	22.2	24.6	22.4	22.1	23.9	21.3	25.3	25.1	24.5
Manganese (Mn), dissolved	mg/L	0.67	0.859	1.28	0.186	0.757	0.0722	0.026	0.296	0.276	0.232	0.265	0.377	1.13	1.3	1.2	1.06	1.09
Mercury (Hg), dissolved	mg/L						<0.00001	<0.00001	<0.00001	<0.00001		0.00001	<0.00001	0.00001	<0.00001		<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	0.00008	<0.001	0.001	0.00114	0.00013	0.00076	0.00005	0.00023	0.0002	0.00027	0.00023	0.00053	0.00051	0.00037	0.00026	0.0002	0.00021
Nickel (Ni), dissolved	mg/L	0.003	0.0024	0.0015	0.001	0.004	0.00056	0.0008	0.00261	0.0019	0.00212	0.00246	0.00276	0.00401	0.00289	0.00355	0.00323	0.00329
Phosphorus (P), dissolved	mg/L	<0.01			<0.01	<0.01	0.002	0.009	0.008	0.005		0.004	0.004	0.003	0.005		0.005	0.002
Potassium (K), dissolved	mg/L	0.3	0.4	0.8	0.6	0.4	0.58	0.44	0.42	0.28	0.26	0.33	0.33	0.4	0.41	0.48	0.43	0.45
Selenium (Se), dissolved	mg/L	0.0011	0.0013	0.0014	<0.0006	0.0012	0.00019	<0.00004	0.00057	0.00094	0.00078	0.00077	0.00072	0.00086	0.00095	0.00101	0.00087	0.00093
Silicon (Si), dissolved	mg/L	3.46	3.93	4.54	3.94	3.4	3.4	0.51	1.89	2.23	2.71	3.4	3.37	4.15	3.55	4.54	4.21	4.32
Silver (Ag), dissolved	mg/L	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.000005	0.000012	0.000043	0.000012	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	0.000094	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1.4	1.5	3.7	2.5	1.3	5.07	0.1	1	1.61	1.54	1.45	1.37	1.45	1.26	1.58	1.6	1.59
Strontium (Sr), dissolved	mg/L	0.201	0.216	0.239	0.211	0.266	0.176	0.0119	0.154	0.215	0.239	0.227	0.225	0.243	0.241	0.251	0.233	0.255
Sulphur (S), dissolved	mg/L		82.2	94.7	47.7	82.2	38	<3	63	102	115	107	108	119	122	129	124	130
Thallium (Tl), dissolved	mg/L	<0.00001		<0.00005	<0.00001	<0.00001	<0.000002	<0.000002	0.000004	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000005	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	0.0008	<0.001	<0.001	<0.0001	<0.0001	<0.00001	<0.00001	0.00003	0.00002	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	0.00013	0.00001	0.00001
Titanium (Ti), dissolved	mg/L	0.0005	0.0028	0.0076	0.0004	0.0004	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0032	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.0034	0.0043	0.0048	0.0021	0.0049	0.00127	0.000055	0.00238	0.00414	0.00475	0.00441	0.00432	0.00425	0.00379	0.00431	0.00446	0.00441
Vanadium (V), dissolved	mg/L	<0.00004	0.0009	0.0002	0.00006	0.00006	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.244	0.205	0.204	0.024	0.104	0.0071	0.0315	0.221	0.172	0.12	0.192	0.194	0.127	0.11	0.108	0.0905	0.078
Zirconium (Zr), dissolved	mg/L	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		08/04/2010	05/05/2010	08/06/2010	08/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	07/12/2010	12/01/2011	08/02/2011	22/03/2011	19/04/2011	25/05/2011	22/06/2011	13/07/2011	17/08/2011
Discharge (Flow)	L/s		71.19		94.01815	61.129433	141.375	94.041							135.975	79.95	90.96	127
Total Suspended Solids	mg/L	2	2	1	3	2	6	2	1	5	2	1	2	1	3	1	2	2
pH (field)	pH units	7.77	7.74	7.62	7.74	7.85	7.05	7.88	6.81	8.04	7.85	8.11	7.73		7.84	8.23	7.88	7.78
pH (lab)	pH units	7.9	7.9	8.1	7.93	8.03	8.02	7.97	7.87	7.78	7.59	7.82	7.61	7.69	7.78	7.98	7.8	7.81
Specific Conductance (field)	µS/cm																730	772
Specific Conductance (lab)	µS/cm	853	555	784	749	765	787	796	856	955	854	940	920	955	581	829	748	788
Temperature (field)	C	0.2	2.3	10.6	13.5	14	4.2	1	0.1	0.1	0	0	0.5	0.8	12.1	10.5	12.8	8.1
Dissolved Oxygen (field)	mg/L																	
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L	503	276	390	404	434	424	429	495	518	481	502	573	564	303	470	407	444
Hardness (from dissolved)	mg/L	522	276	423	410	456	439	429	510	525	475	485	544	566	304	464	418	441
Alkalinity, total	mg/L						120	120	130	150	130	130	140	130	85	100	91	110
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L	340	210	310	250	260	290	320	340	420	300	350	390	380	180	290	270	280
Ammonia (N)	mg/L					0.06	<0.005	0.01	0.012	0.047	0.046	0.14	0.1	0.089		0.018	0.043	
Nitrite (N)	mg/L						<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	
Nitrate (N)	mg/L						0.07	0.13	0.18	0.23	0.24	0.23	0.22	0.26			<0.2	
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L					2.8	2	2.4	1.1	3.5	0.7	1.5	1.3	1.2	8.6	<0.5	4.5	5
Aluminum (Al), total	mg/L	0.0135	0.0373	0.0091	0.26	0.0097	0.0231	0.0049	0.0062	0.0083	0.0044	0.0062	0.0097	0.0092	0.0247	0.0078	0.0103	0.0185
Antimony (Sb), total	mg/L	0.00027	0.00042	0.00036	0.00257	0.00036	0.00125	0.00019	0.00021	0.00025	0.00021	0.0002	0.00019	0.00021	0.0004	0.00034	0.00038	0.00032
Arsenic (As), total	mg/L	0.00664	0.00511	0.00327	0.0513	0.00431	0.00976	0.00374	0.00387	0.0037	0.00471	0.00749	0.00873	0.00817	0.00583	0.00421	0.00503	0.00492
Barium (Ba), total	mg/L	0.0574	0.0429	0.0483	0.0739	0.0509	0.0494	0.0458	0.0541	0.0687	0.0602	0.0603	0.0632	0.0578	0.0365	0.0552	0.0442	0.0382
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	0.000016	0.000053	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00077	0.00102	0.00197	0.00779	0.00096	0.00151	0.000895	0.00104	0.00146	0.000802	0.00073	0.000651	0.000735	0.00189	0.00145	0.00147	0.00185
Calcium (Ca), total	mg/L	161	87.5	118	127	133	131	133	158	162	150	161	183	180	99.6	146	127	138
Chromium (Cr), total	mg/L	0.0002	0.0003	0.0003	0.0009	0.0004	0.0006	0.0003	0.0003	0.0002	0.0006	0.0003	0.0004	0.0005	0.0003	0.0002	0.0003	0.0003
Cobalt (Co), total	mg/L	0.00155	0.000795	0.000151	0.00156	0.000128	0.000284	0.000268	0.00139	0.00133	0.00124	0.00165	0.00166	0.0016	0.000347	0.000161	0.000208	0.000338
Copper (Cu), total	mg/L	0.00067	0.00094	0.00055	0.00507	0.00046	0.00071	0.00026	0.00027	0.00055	0.00023	0.00014	0.00029	0.00041	0.00108	0.00037	0.00056	0.00065
Iron (Fe), total	mg/L	0.543	0.564	0.139	3.7	0.147	0.741	0.181	0.196	0.112	0.249	0.4	0.489	0.398	0.362	0.143	0.176	0.249
Lead (Pb), total	mg/L	0.00541	0.00816	0.00543	0.312	0.00489	0.0331	0.00231	0.00506	0.00522	0.00663	0.00795	0.00378	0.00488	0.00814	0.00441	0.00604	0.00846
Lithium (Li), total	mg/L	0.0151	0.0074	0.0122	0.0118	0.0128	0.0123	0.0131	0.0144	0.0178	0.0136	0.0163	0.0158	0.0159	0.0078	0.0118	0.0103	0.0121
Magnesium (Mg), total	mg/L	24.7	13.9	23.2	21.1	24.6	23.6	23.5	24.3	27.6	25.5	24.2	28	28.1	13.2	25.5	22.1	24.3
Manganese (Mn), total	mg/L	1.03	0.45	0.275	1.42	0.216	0.386	0.293	1.42	1.91	1.05	1.37	1.35	1.08	0.404	0.288	0.281	0.344
Mercury (Hg), total	mg/L	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00021	0.00022	0.00028	0.00028	0.00027	0.00021	0.00019	0.00019	0.00021	0.00018	0.00017	0.00019	0.00017	0.00037	0.00024	0.00031	0.00024
Nickel (Ni), total	mg/L	0.00405	0.00295	0.00209	0.00457	0.00204	0.00265	0.00247	0.00439	0.00428	0.00419	0.00433	0.00474	0.00471	0.00276	0.00213	0.00244	0.00324
Phosphorus (P), total	mg/L	0.009		0.007	0.071	0.007	0.014		0.005	0.015	0.007	0.005	0.01	0.01	0.012	0.005	0.008	0.008
Potassium (K), total	mg/L	0.47	0.44	0.21	0.2	0.23	0.36	0.34	0.42	1.31	0.42	0.43	0.48	0.51	0.51	0.21	0.17	0.32
Selenium (Se), total	mg/L	0.00093	0.00061	0.00077	0.0008	0.00079	0.00079	0.00083	0.00086	0.00088	0.00096	0.00082	0.00088	0.00087	0.00066	0.00078	0.00066	0.00074
Silicon (Si), total	mg/L	3.5	2.3	2.19	2.7	2.66	3.14	3.32	4.5	4.71	4.23	3.75	4.82	4.59	2.92	2.16	2.32	3.2

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		08/04/2010	05/05/2010	08/06/2010	08/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010	07/12/2010	12/01/2011	08/02/2011	22/03/2011	19/04/2011	25/05/2011	22/06/2011	13/07/2011	17/08/2011
Silver (Ag), total	mg/L	<0.000005	0.000014	<0.000005	0.00153	0.000017	0.000027	0.000007	0.00002	<0.000005	0.000016	<0.000005	0.00001	<0.000005	0.00002	0.000013	0.000007	0.000029
Sodium (Na), total	mg/L	1.57	0.91	1.42	1.21	1.47	1.48	1.41	1.53	1.64	1.61	1.48	1.69	1.7	0.95	1.57	1.43	1.54
Strontium (Sr), total	mg/L	0.252	0.153	0.215	0.227	0.234	0.22	0.224	0.24	0.278	0.245	0.265	0.268	0.274	0.163	0.254	0.218	0.223
Sulphur (S), total	mg/L	133	71	119	104	121	115	122	121	140	125	122	139	140	74	135	108	117
Thallium (Tl), total	mg/L	0.000005	0.000003	<0.000002	0.000127	0.000002	0.000009	<0.000002	<0.000002	0.000003	0.000002	0.000003	<0.000002	<0.000002	0.000003	0.000008	0.000002	0.000003
Tin (Sn), total	mg/L	0.00009	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	<0.0005	0.0018	<0.0005	0.01	<0.0005	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	0.00425	0.00228	0.00366	0.00334	0.00406	0.00352	0.00389	0.00396	0.00408	0.0046	0.00449	0.00485	0.00494	0.0021	0.00432	0.00364	0.00402
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	0.0009	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.0985	0.133	0.239	0.452	0.124	0.177	0.146	0.166	0.179	0.123	0.101	0.103	0.104	0.19	0.207	0.183	0.226
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.0037	0.0668	0.0047	0.0166	0.0111	0.0046	0.0054	0.0024	0.0015	0.0015	0.0045	0.003	0.0031	0.0207	0.0096	0.0062	0.0087
Antimony (Sb), dissolved	mg/L	0.00022	0.00046	0.00035	0.0004	0.00034	0.0002	0.00015	0.00017	0.00021	0.00016	0.00016	0.00019	0.00017	0.00041	0.00032	0.00036	0.00028
Arsenic (As), dissolved	mg/L	0.00333	0.00405	0.00216	0.00309	0.00327	0.0026	0.00217	0.00241	0.00254	0.00174	0.00271	0.00366	0.00338	0.00481	0.00313	0.00375	0.00322
Barium (Ba), dissolved	mg/L	0.0576	0.0441	0.0496	0.0454	0.0492	0.0449	0.0467	0.0534	0.0658	0.0574	0.0581	0.064	0.057	0.0373	0.0523	0.0455	0.0386
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000154	0.000908	0.00184	0.00106	0.000832	0.000788	0.000764	0.000778	0.000655	0.000101	0.000101	0.000215	0.000171	0.00176	0.00126	0.00116	0.0016
Calcium (Ca), dissolved	mg/L	167	87.4	134	127	143	138	134	162	164	149	151	173	182	98.5	145	131	137
Chromium (Cr), dissolved	mg/L	0.0003	0.0012	0.0003	0.0006	0.0004	0.0005	0.0004	0.0005	0.0002	0.0007	0.0004	0.0005	0.0004	0.0004	0.0003	0.0003	0.0003
Cobalt (Co), dissolved	mg/L	0.00151	0.000851	0.000131	0.000135	0.000113	0.000179	0.00026	0.00136	0.00131	0.0012	0.00168	0.00161	0.00151	0.000431	0.000141	0.00017	0.000307
Copper (Cu), dissolved	mg/L	0.00015	0.00216	0.0005	0.00195	0.00125	0.00056	0.00086	0.0002	0.00034	0.00009	0.00018	0.00043	0.00032	0.00096	0.00108	0.00058	0.00068
Iron (Fe), dissolved	mg/L	0.176	0.521	0.045	0.085	0.076	0.059	0.064	0.06	0.025	0.016	0.029	0.123	0.095	0.277	0.059	0.056	0.081
Lead (Pb), dissolved	mg/L	0.000235	0.00595	0.000948	0.00245	0.00174	0.000871	0.000489	0.000343	0.000924	0.000171	0.000306	0.000517	0.000271	0.00465	0.00216	0.00143	0.00105
Lithium (Li), dissolved	mg/L	0.0157	0.0072	0.0123	0.0113	0.0125	0.0123	0.0132	0.0143	0.017	0.0137	0.0156	0.0162	0.0163	0.0082	0.0115	0.0098	0.0118
Magnesium (Mg), dissolved	mg/L	25.8	14	21.7	22.7	24.3	23.1	22.9	25.5	28.3	25.1	26.1	27.3	27.1	14.1	25.1	21.9	23.9
Manganese (Mn), dissolved	mg/L	1.05	0.445	0.242	0.194	0.203	0.268	0.267	1.41	1.95	1	1.48	1.35	1.01	0.476	0.258	0.257	0.303
Mercury (Hg), dissolved	mg/L	<0.00001		<0.00001	0.00001	<0.00001	<0.00001		<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Molybdenum (Mo), dissolved	mg/L	0.0002	0.00023	0.00029	0.00024	0.00027	0.00019	0.0002	0.00019	0.00021	0.00016	0.00021	0.00018	0.00017	0.00021	0.00026	0.00029	0.00025
Nickel (Ni), dissolved	mg/L	0.00375	0.00322	0.00189	0.00216	0.00221	0.00237	0.00227	0.00449	0.00423	0.00393	0.00451	0.00462	0.00462	0.00354	0.00239	0.00236	0.00304
Phosphorus (P), dissolved	mg/L	0.003		0.003	0.009	0.007	0.005		0.003	0.008	0.004	0.008	0.005	0.012	0.008	0.006	0.004	0.006
Potassium (K), dissolved	mg/L	0.46	0.49	0.2	0.26	0.27	0.36	0.33	0.44	1.27	0.41	0.5	0.55	0.53	0.47	0.25	0.19	0.34
Selenium (Se), dissolved	mg/L	0.00091	0.00061	0.00078	0.00072	0.00079	0.00079	0.00082	0.00083	0.00087	0.00093	0.00084	0.00089	0.00085	0.0004	0.00078	0.00064	0.00069
Silicon (Si), dissolved	mg/L	4.16	2.32	2.16	2.51	3.16	3.33	3.69	4.53	4.63	4.03	3.48	4.34	4.46	2.61	2.14	2.44	3.1
Silver (Ag), dissolved	mg/L	<0.000005	0.000013	<0.000005	0.000007	0.000009	0.000007	<0.000005	<0.000005	0.000008	0.000025	0.000011	<0.000005	<0.000005	0.000018	0.000012	0.000006	<0.000005
Sodium (Na), dissolved	mg/L	1.63	1.15	1.34	1.44	1.55	1.41	1.43	1.63	1.7	1.61	1.6	1.71	1.64	0.97	1.63	1.41	1.51
Strontium (Sr), dissolved	mg/L	0.255	0.153	0.231	0.217	0.216	0.21	0.221	0.24	0.272	0.239	0.252	0.271	0.269	0.16	0.245	0.212	0.229
Sulphur (S), dissolved	mg/L	138	72	111	107	119	109	111	121	140	121	134	139	137	77	122	110	117
Thallium (Tl), dissolved	mg/L	<0.000002	0.000004	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	0.000002	<0.000002	<0.000002	<0.000002	0.000007	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	0.00003	<0.00001	0.00007	0.00006	0.00002	0.00002	0.00002	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	0.00002	0.00011	0.00001	0.00001
Titanium (Ti), dissolved	mg/L	<0.0005	0.0022	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.00433	0.0023	0.00384	0.00325	0.00345	0.00363	0.00353	0.00406	0.00402	0.0045	0.00421	0.00486	0.00501	0.00238	0.00429	0.00381	0.00392
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0811	0.136	0.224	0.146	0.116	0.144	0.128	0.161	0.172	0.0982	0.0831	0.0769	0.0729	0.22	0.201	0.173	0.208
Zirconium (Zr), dissolved	mg/L	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		24/09/2011	29/10/2011	21/11/2011	14/12/2011	15/01/2012	13/02/2012	11/03/2012	08/04/2012	01/05/2012	07/05/2012	03/06/2012	04/07/2012	16/07/2012	01/08/2012	23/09/2012	15/10/2012	21/11/2012
Discharge (Flow)	L/s	127.0575	88	74.8	107.2		77.2	77.3	61.7	147.0	104.7	88.65	85.35	104.69	91	89.1	76.18	
Total Suspended Solids	mg/L	1	1	2.7	4.2	2.1	1.3	1.1	1.8	2.8	3.2	<1.0	1.9		1	1.5	<1.0	2.8
pH (field)	pH units	7.52	7.66	7.49	7.36	7.3	7.21	7.1	7.69	7.67	7.93	7.92	7.93		7.82	7.75	7.56	8
pH (lab)	pH units	8.09	7.55	7.9	7.64	7.59	8.04	8.16	7.77	7.62	7.75	7.97	8.06		8.02	8.09	8.03	8.06
Specific Conductance (field)	µS/cm	842	970		913	829.1	926.8	937.5	1022	526.0	507.0	830	875		960	1030	1056	
Specific Conductance (lab)	µS/cm	848	929	896	906	867	919	914	927	527	539	759	883		866	921	941	928
Temperature (field)	C	4.4	0.4	0.1	-0.1	0	-0.1	-0.1	0.1	1.9	2.3	11	13.1		12.9	5.6	0.6	0.1
Dissolved Oxygen (field)	mg/L		10.56	9.64	12.78	11.1	12.63	13.14	13.55	12.53	13.33	14.7	10.89		10.99	11.12	11.86	12
Dissolved Oxygen (field)	%		75	65.8	87.3	76	86.4	90	93.1	90.50	96.80	134	104.4		104.3	88.9	83.2	82
ORP (field)	mV		244.4			282.6	30.9	293.4	44.4	185.00	220.70	343.5	68		80.2	75.2	81.1	361.3
Hardness (from total)	mg/L	447	511	497	505	468	525	518	483	271	281	365	545		502	492	498	526
Hardness (from dissolved)	mg/L	451	527	493	506	458	545	537	502	268	288	364	459		420	527	494	513
Alkalinity, total	mg/L	120	120	133	138	130	139	135	131	66.4	76.2	98.3	96.3		106	123	124	140
Chloride	mg/L									<0.50	1.1	1.2	1.3		1	1.2	1.2	1.8
Fluoride	mg/L																	
Sulphate, dissolved	mg/L	289	356	342	346	294	329	344	312	196	185	278	353		341	352	365	359
Ammonia (N)	mg/L	0.009	0.063	0.035	0.18	0.11	0.13	0.12	0.12	0.036	0.032	0.025	0.059		0.028	0.012	0.036	0.057
Nitrite (N)	mg/L	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Nitrate (N)	mg/L	0.1	<0.2	0.177	0.234	0.246	0.228	0.27	0.259	1.06	<0.050	<0.20	<0.20		<0.20	<0.20	0.22	0.32
Total Kjeldahl Nitrogen	mg/L		0.3	0.269	1.2	0.278	0.197	<0.20	0.144	0.108	0.466	0.28	0.22		0.3	0.23	<0.20	<0.20
Dissolved Organic Carbon	mg/L	1.9	0.8	1.7	2.1	0.78	1.08	1.57	0.9	10.4	8.55	3.95	2.55		2.86	2.81	2	1.35
Aluminum (Al), total	mg/L	0.0106	0.0046	0.0096	0.011	0.0198	0.003	0.0038	0.009	0.0412	0.0287	0.00723	0.00787		0.00724	0.00713	0.00447	0.0148
Antimony (Sb), total	mg/L	0.00028	0.00025	0.00032	0.00039	0.00026	0.00017	0.00018	0.00018	0.000375	0.000522	0.000286	0.000358		0.000349	0.00021	0.000178	0.000411
Arsenic (As), total	mg/L	0.00527	0.00361	0.00597	0.007	0.00621	0.0103	0.0102	0.00967	0.00819	0.00961	0.00369	0.00492		0.00521	0.00449	0.0036	0.00645
Barium (Ba), total	mg/L	0.0433	0.053	0.0585	0.0643	0.0616	0.0572	0.0585	0.0551	0.0378	0.0417	0.0465	0.0451		0.0462	0.0478	0.0495	0.0687
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	0.000008
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.00215	0.00132	0.0014	0.00123	0.00114	0.000898	0.000818	0.000779	0.00378	0.00239	0.000729	0.000742		0.00086	0.00108	0.000769	0.00132
Calcium (Ca), total	mg/L	141	159	153	159	149	167	163	151	86.7	88.4	112	171		157	155	160	165
Chromium (Cr), total	mg/L	0.0003	<0.0001	0.0002	0.0009	0.0006	<0.0001	0.0001	<0.0001	0.00017	0.00018	0.00019	<0.00010		<0.00010	<0.00010	0.00026	0.00013
Cobalt (Co), total	mg/L	0.000439	0.00243	0.00242	0.00234	0.00187	0.0023	0.00213	0.00219	0.00145	0.00124	0.000225	0.000224		0.000257	0.000691	0.000644	0.00194
Copper (Cu), total	mg/L	0.00039	0.00026	0.00067	0.00248	0.00122	0.00019	0.00024	0.00022	0.00124	0.00143	0.00075	0.000872		0.000408	0.000277	0.000413	0.00119
Iron (Fe), total	mg/L	0.544	0.297	0.366	0.492	0.535	0.571	0.48	0.514	0.991	0.872	0.148	0.21		0.187	0.314	0.202	0.441
Lead (Pb), total	mg/L	0.00411	0.00243	0.0155	0.00752	0.016	0.0039	0.00362	0.00306	0.0135	0.0225	0.00336	0.00559		0.0048	0.00189	0.0027	0.0233
Lithium (Li), total	mg/L	0.0135	0.0175	0.0158	0.0156	0.0146	0.0166	0.018	0.0175	0.00789	0.00773	0.0118	0.0173		0.0172	0.0175	0.017	0.0157
Magnesium (Mg), total	mg/L	23.1	27.7	28.2	26.1	23.2	26.1	26.8	25.5	13.2	14.8	20.6	28.5		26.6	25.6	24	27.5
Manganese (Mn), total	mg/L	0.441	1.32	1.64	1.84	1.06	1.33	1.25	1.07	0.703	0.719	0.25	0.247		0.343	0.517	0.449	1.69
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00035	0.00023	0.0002	0.0002	0.00019	0.00016	0.00015	0.00018	0.000189	0.000329	0.00024	0.000286		0.000335	0.000215	0.000195	0.00021
Nickel (Ni), total	mg/L	0.00263	0.0055	0.00606	0.00643	0.00528	0.00597	0.00556	0.00611	0.00435	0.0044	0.00294	0.0021		0.00284	0.0041	0.00345	0.00677
Phosphorus (P), total	mg/L	0.007	0.006	0.008	0.007	0.024	0.012	0.014	0.008	0.0172	0.0156	0.0138	0.013		0.0023	0.0023	0.0044	0.0058
Potassium (K), total	mg/L	0.41	0.43	0.47	0.61	0.46	0.47	0.5	0.43	0.538	0.551	0.332	0.183		0.24	0.387	0.407	0.438
Selenium (Se), total	mg/L	0.00077	0.00082	0.00096	0.00094	0.00111	0.00091	0.00096	0.00089	0.000553	0.000515	0.000875	0.000758		0.000745	0.000848	0.000855	0.00101
Silicon (Si), total	mg/L	3.4	4	4.1	4.1	4.3	4.3	4.2	3.8	2.47	2.68	2.04	2.46		2.62	3.11	4.07	4.2

Station Name		KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6	KV-6
Sample Date		24/09/2011	29/10/2011	21/11/2011	14/12/2011	15/01/2012	13/02/2012	11/03/2012	08/04/2012	01/05/2012	07/05/2012	03/06/2012	04/07/2012	16/07/2012	01/08/2012	23/09/2012	15/10/2012	21/11/2012
Silver (Ag), total	mg/L	0.000026	0.00002	<0.000005	0.00001	0.000011	<0.000005	0.000008	<0.000005	0.000041	0.000063	0.0000102	0.0000086		0.00001	<0.0000050	0.000005	0.000046
Sodium (Na), total	mg/L	1.41	1.63	1.77	1.87	2.43	1.6	1.7	1.57	0.895	1.02	1.75	1.75		1.64	1.53	1.45	1.77
Strontium (Sr), total	mg/L	0.235	0.271	0.256	0.26	0.244	0.244	0.248	0.25	0.143	0.15	0.211	0.255		0.265	0.274	0.27	0.262
Sulphur (S), total	mg/L	116	143	131	122	138	131	143	131	66	70	106	152		133	140	144	127
Thallium (Tl), total	mg/L	<0.000002	<0.000002	0.000003	0.00001	0.000003	0.000002	0.000004	0.000003	0.000005	0.000006	<0.0000020	0.0000026		<0.0000020	<0.0000020	0.000002	0.000007
Tin (Sn), total	mg/L	0.00018	0.00013	0.00055	0.00013	0.0005	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	0.00035	<0.00020
Titanium (Ti), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00118	0.00071	0.00328	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), total	mg/L	0.00454	0.00415	0.0046	0.0039	0.00411	0.00419	0.00335	0.00392	0.00171	0.0021	0.00378	0.00369		0.00361	0.00401	0.00393	0.00465
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	0.00022
Zinc (Zn), total	mg/L	0.275	0.218	0.219	0.175	0.149	0.139	0.119	0.117	0.364	0.318	0.123	0.0992		0.105	0.163	0.0988	0.173
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	0.00013	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	0.0048	0.0031	0.0016	0.0013	0.0051	0.0035	0.0008	0.001	0.0254	0.0215	0.003	0.00666		0.00354	0.00198	0.00152	0.00137
Antimony (Sb), dissolved	mg/L	0.00025	0.00022	0.00023	0.00022	0.00023	0.00015	0.00018	0.00017	0.000265	0.00035	0.000262	0.000292		0.000303	0.000201	0.000178	0.00025
Arsenic (As), dissolved	mg/L	0.00318	0.00201	0.00289	0.00363	0.00273	0.00446	0.00442	0.00423	0.00535	0.00509	0.00257	0.00308		0.00368	0.00252	0.00242	0.00216
Barium (Ba), dissolved	mg/L	0.045	0.0456	0.0559	0.0625	0.054	0.0568	0.0631	0.0547	0.0366	0.0406	0.0457	0.0427		0.0456	0.0457	0.0484	0.0662
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000025	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.00166	0.00101	0.000769	0.000517	0.000203	0.000212	0.000104	0.000081	0.00321	0.00183	0.000608	0.000515		0.000612	0.00065	0.000684	0.000627
Calcium (Ca), dissolved	mg/L	144	164	153	159	142	172	169	159	85.1	91.1	111	144		125	169	155	159
Chromium (Cr), dissolved	mg/L	0.0003	<0.0001	0.0001	0.0002	0.0023	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	0.00013	0.00011
Cobalt (Co), dissolved	mg/L	0.00037	0.00261	0.00236	0.00225	0.00191	0.00247	0.00234	0.00207	0.00144	0.00122	0.000203	0.000159		0.000207	0.000666	0.000644	0.00181
Copper (Cu), dissolved	mg/L	0.00032	0.00015	0.0003	0.00066	0.0005	0.0001	0.00029	0.0001	0.00106	0.00108	0.000572	0.000232		0.000373	0.000203	0.000308	0.000392
Iron (Fe), dissolved	mg/L	0.072	0.124	0.067	0.163	0.105	0.149	0.131	0.133	0.641	0.504	0.0336	0.0417		0.0518	0.0639	0.059	0.111
Lead (Pb), dissolved	mg/L	0.000328	0.000755	0.000474	0.00064	0.000947	0.000139	0.000088	0.000104	0.00296	0.00409	0.000581	0.000569		0.00104	0.000189	0.000336	0.000454
Lithium (Li), dissolved	mg/L	0.0139	0.0174	0.0154	0.0153	0.0147	0.0171	0.019	0.0168	0.0075	0.008	0.0116	0.0168		0.017	0.0167	0.0171	0.0162
Magnesium (Mg), dissolved	mg/L	22.1	28.8	27.2	26.5	24.8	27.8	27.9	25.5	13.6	14.6	21	24.3		26.1	25.8	25.8	28.4
Manganese (Mn), dissolved	mg/L	0.428	1.37	1.62	1.82	1.05	1.33	1.34	1.04	0.707	0.685	0.245	0.196		0.315	0.487	0.462	1.64
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.0004	0.00022	0.00018	0.00018	0.00017	0.00016	0.00018	0.00015	0.000137	0.000205	0.000238	0.000617		0.000243	0.000217	0.000159	0.000244
Nickel (Ni), dissolved	mg/L	0.00259	0.00607	0.00582	0.00582	0.00522	0.00643	0.0061	0.00549	0.0044	0.00384	0.00271	0.0021		0.00281	0.00359	0.00386	0.0065
Phosphorus (P), dissolved	mg/L	0.007	0.004	0.005	0.003	0.006	0.007	0.007	0.006	0.0125	0.0103	0.0052	0.0076		<0.0020	<0.0020	<0.0020	<0.0020
Potassium (K), dissolved	mg/L	0.41	0.4	0.48	0.62	0.43	0.5	0.53	0.45	0.553	0.553	0.303	0.16		0.259	0.381	0.404	0.44
Selenium (Se), dissolved	mg/L	0.0008	0.00092	0.0009	0.00096	0.00106	0.0009	0.00104	0.00094	0.000471	0.000587	0.000818	0.000771		0.000609	0.00083	0.000855	0.00105
Silicon (Si), dissolved	mg/L	3.3	4.1	3.9	4.3	3.8	4.5	4.4	4	2.39	2.8	2.03	1.83		2.04	3.5	3.99	4.09
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	0.000007	0.000006	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1.36	1.77	1.71	1.8	1.86	1.73	1.83	1.57	0.945	1.01	1.76	1.47		1.61	1.57	1.55	1.84
Strontium (Sr), dissolved	mg/L	0.247	0.259	0.25	0.259	0.235	0.26	0.286	0.248	0.144	0.151	0.207	0.243		0.254	0.265	0.27	0.263
Sulphur (S), dissolved	mg/L	116	141	129	129	124	136	147	134	68	75	112	128		132	136	152	133
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	0.000003	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.000002
Tin (Sn), dissolved	mg/L	0.0001	0.00006	0.00052	0.00007	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.0046	0.00436	0.00459	0.00386	0.00422	0.00452	0.00511	0.00406	0.0018	0.00188	0.00369	0.00363		0.00356	0.00369	0.00405	0.00461
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.262	0.23	0.201	0.145	0.129	0.109	0.079	0.0817	0.365	0.301	0.111	0.0835		0.0952	0.147	0.109	0.155
Zirconium (Zr), dissolved	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010

Data omitted from calculation of summary statistics.

Station Name		KV-6	KV-6	KV-6	KV-6
Sample Date		07/05/2013	08/06/2013	12/07/2013	12/08/2013
Discharge (Flow)	L/s		122.62	81.948	107.92
Total Suspended Solids	mg/L	7.2	16.2	1.6	1.6
pH (field)	pH units	7.72	7.96	8.1	7.4
pH (lab)	pH units	7.64	7.98	7.99	7.85
Specific Conductance (field)	µS/cm	579.5	676	801	823
Specific Conductance (lab)	µS/cm	610	693	870	893
Temperature (field)	C	0	11.5	11.2	8.7
Dissolved Oxygen (field)	mg/L	12.56	10.42	10.81	11.63
Dissolved Oxygen (field)	%	85.6	96	98.8	100.1
ORP (field)	mV	132.6	63.2	125.6	175.5
Hardness (from total)	mg/L	317	378	532	529
Hardness (from dissolved)	mg/L	309	393	514	521
Alkalinity, total	mg/L	39.1	82.4	113	116
Chloride	mg/L	7.55	0.84	<5.0	<5.0
Fluoride	mg/L	0.033	0.117	<0.20	0.21
Sulphate, dissolved	mg/L	268	297	397	408
Ammonia (N)	mg/L	0.0112	0.0186	0.0087	<0.0050
Nitrite (N)	mg/L	0.0011	<0.0010	<0.010	<0.01
Nitrate (N)	mg/L	0.0381	0.0676	0.096	0.136
Total Kjeldahl Nitrogen	mg/L	0.917	0.267	0.138	0.129
Dissolved Organic Carbon	mg/L	14.8	7.40	2.71	1.64
Aluminum (Al), total	mg/L	0.221	0.172	0.0184	0.0278
Antimony (Sb), total	mg/L	0.00089	0.00058	0.00056	0.00061
Arsenic (As), total	mg/L	0.00431	0.00890	0.00552	0.00785
Barium (Ba), total	mg/L	0.0416	0.0503	0.0442	0.0535
Beryllium (Be), total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.00114	0.000842	0.000994	0.00103
Calcium (Ca), total	mg/L	92.0	121	166	162
Chromium (Cr), total	mg/L	0.00061	0.00057	0.00015	0.00017
Cobalt (Co), total	mg/L	0.00041	0.00126	0.00042	0.00038
Copper (Cu), total	mg/L	0.00408	<0.0020	0.00061	0.00053
Iron (Fe), total	mg/L	0.469	0.999	0.223	0.270
Lead (Pb), total	mg/L	0.0297	0.0101	0.00626	0.0127
Lithium (Li), total	mg/L	0.00873	0.00853	0.0145	0.0147
Magnesium (Mg), total	mg/L	21.2	18.2	28.8	30.2
Manganese (Mn), total	mg/L	0.201	1.03	0.526	0.483
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000158	0.000331	0.000351	0.000307
Nickel (Ni), total	mg/L	0.00247	0.00525	0.00320	0.00328
Phosphorus (P), total	mg/L	0.083	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	2.87	0.52	0.21	0.32
Selenium (Se), total	mg/L	0.00023	0.00049	0.00080	0.00095
Silicon (Si), total	mg/L	3.03	2.94	2.56	3.14

Station Name		KV-6	KV-6	KV-6	KV-6
Sample Date		07/05/2013	08/06/2013	12/07/2013	12/08/2013
Silver (Ag), total	mg/L	0.000382	0.000076	0.000029	0.000063
Sodium (Na), total	mg/L	1.90	1.12	1.58	1.73
Strontium (Sr), total	mg/L	0.180	0.163	0.269	0.291
Sulphur (S), total	mg/L	87.3	92.3	131	134
Thallium (Tl), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	0.00018	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	<0.010	<0.010	<0.010	<0.010
Uranium (U), total	mg/L	0.000641	0.00219	0.00470	0.00559
Vanadium (V), total	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.141	0.105	0.160	0.159
Zirconium (Zr), total	mg/L	<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.0082	0.0096	0.0024	0.0024
Antimony (Sb), dissolved	mg/L	0.00055	0.00052	0.00045	0.00045
Arsenic (As), dissolved	mg/L	0.00183	0.00500	0.00403	0.00513
Barium (Ba), dissolved	mg/L	0.0333	0.0476	0.0442	0.0534
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000821	0.000515	0.000795	0.000497
Calcium (Ca), dissolved	mg/L	89.7	126	161	159
Chromium (Cr), dissolved	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00020	0.00109	0.00038	0.00032
Copper (Cu), dissolved	mg/L	0.00261	0.00069	0.00035	<0.00020
Iron (Fe), dissolved	mg/L	0.028	0.242	0.068	0.055
Lead (Pb), dissolved	mg/L	0.00647	0.00224	0.00138	0.00180
Lithium (Li), dissolved	mg/L	0.00817	0.00969	0.0136	0.0144
Magnesium (Mg), dissolved	mg/L	20.7	18.7	27.0	30.3
Manganese (Mn), dissolved	mg/L	0.144	1.02	0.497	0.441
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000116	0.000335	0.000312	0.000272
Nickel (Ni), dissolved	mg/L	0.00190	0.00470	0.00304	0.00308
Phosphorus (P), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	2.74	0.50	0.18	0.30
Selenium (Se), dissolved	mg/L	0.00023	0.00050	0.00082	0.00102
Silicon (Si), dissolved	mg/L	2.37	2.74	2.44	3.01
Silver (Ag), dissolved	mg/L	0.000027	<0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.90	1.11	1.54	1.68
Strontium (Sr), dissolved	mg/L	0.174	0.200	0.279	0.280
Sulphur (S), dissolved	mg/L	86.5	93.7	128	130
Thallium (Tl), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	0.00013	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000566	0.00285	0.00478	0.00555
Vanadium (V), dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.115	0.0882	0.154	0.144
Zirconium (Zr), dissolved	mg/L	<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	25/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005
Discharge (Flow)	L/s	127	180	150	150	247	108	323	121	149	104	102	259	351.685439	233.065736	290	62.099477
Total Suspended Solids	mg/L			<3	<3	17	<1	75	5	3	<1	<2	1	<1	<2	<2	6
pH (field)	pH units	7.95		8.28	7.61	8.3	8.2	7.12	8.3	7.78	7.29	7.3	7.2	7.63	8	9.63	8.4
pH (lab)	pH units		7.7	7.84	7.88	8.2	8.24	8.06	8	8.16	7.95	8	7.99	7.84	7.9	7.9	7.81
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm		730	796	737	595	676	534	750	677	760	760	776	801	845	840	816
Temperature (field)	C	0.2	0.1	0.1	0.1		9.6	6.1	4.1	0.6	0.1	0.2	0.2	0.2	0.3	0.9	0.3
Dissolved Oxygen (field)	mg/L							10.3									
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L												444				
Hardness (from dissolved)	mg/L		434	448	419	297	381	291	460	370	436	406	433		461	462	426
Alkalinity, total	mg/L		147	152	146	120	144	114	149	139	152	158	146	442	169	165	163
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L		264	296	290	201		161	273	217	254	257	260				
Ammonia (N)	mg/L							<0.05									
Nitrite (N)	mg/L							<0.05									
Nitrate (N)	mg/L							0.2									
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L		<0.01	0.03	<0.01	0.13	0.011	1.15	<0.01	0.015	0.01	0.011		0.009	<0.05	0.009	0.058
Antimony (Sb), total	mg/L		<0.02	<0.02	<0.02	0.02	0.0003	0.0006	<0.02	<0.0002	0.0004	<0.0002	<0.0002	0.0002	0.0048	<0.0002	0.0005
Arsenic (As), total	mg/L		<0.04	0.06	<0.04	<0.04	0.0025	0.0092	<0.04	0.0021	0.0019	0.0019	0.0015	0.0017	<0.002	0.002	0.0033
Barium (Ba), total	mg/L		0.0587	0.0511	0.0529	0.0576	0.056	0.084	0.0567	0.054	0.057	0.06	0.059	0.061	0.061	0.061	0.054
Beryllium (Be), total	mg/L		<0.0006	0.0022	<0.0006	<0.0006	<0.0001	<0.0001	<0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		<0.02	0.07	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005		<0.0005	0.009	<0.0005	<0.0005
Boron (B), total	mg/L						0.003	0.031		<0.002	<0.002	<0.002	<0.002	<0.002	<0.02	0.002	<0.002
Cadmium (Cd), total	mg/L		<0.0006	0.0044	0.0045	0.0089	0.00141	0.00413	0.0043	0.00142	0.0031	0.00103	0.00085	0.00071	0.00058	0.00058	0.00123
Calcium (Ca), total	mg/L		164	124	85.7	91.4	111	87.5	116	110	126	122		134	137	137	129
Chromium (Cr), total	mg/L		<0.001	<0.001	<0.001	<0.001	<0.0005	0.0018	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	0.002	<0.0005
Cobalt (Co), total	mg/L		<0.001	0.001	<0.001	<0.001	0.0002	0.0016	<0.001	0.0002	0.0001	0.0002	0.0002	0.0004	<0.001	<0.0001	0.0004
Copper (Cu), total	mg/L		0.001	0.003	<0.001	0.009	0.002	0.007	0.004	<0.001	0.004	0.002	<0.001	<0.001	<0.010	<0.001	<0.001
Iron (Fe), total	mg/L		0.034	0.111	0.17	0.769	0.1	2.1	0.333	0.2	<0.1	0.1		<0.1	0.1	<0.1	0.5
Lead (Pb), total	mg/L		0.033	0.011	<0.01	0.033	0.0011	0.0233	<0.01	0.0008	0.0005	0.0006	0.0004	0.0008	<0.001	0.0006	0.0023
Lithium (Li), total	mg/L		0.009	0.027	0.009	0.007	0.01	0.008	0.008	0.007	0.008	0.011		0.009	0.01	0.009	0.01
Magnesium (Mg), total	mg/L		26.7	24.6	18.7	17.3	23.1	18.9	21.6	23.1	27.8	24.2		26.9	27.2	26.7	25.2
Manganese (Mn), total	mg/L		2.91	3.11	3.02	2.24	0.386	0.615	0.794	0.269	0.127	0.351		0.633	0.427	0.3	0.581
Mercury (Hg), total	mg/L												<0.0002				
Molybdenum (Mo), total	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001
Nickel (Ni), total	mg/L		0.01	0.012	0.007	0.007	0.0034	0.0075	<0.002	0.0022	0.0071	0.0026	0.0036	0.0036	0.0066	0.003	0.004
Phosphorus (P), total	mg/L		<0.06	0.18	0.08	0.06			0.14								
Potassium (K), total	mg/L		<1	<1	<1	<1	0.4	0.5	<1	0.6	0.5	0.6		0.7	0.6	0.6	0.9
Selenium (Se), total	mg/L		<0.1	<0.1	<0.1	<0.1	0.0009	0.0006	<0.1	0.0007	0.0008	0.0007	0.0007	0.0005	<0.002	0.0006	0.0008
Silicon (Si), total	mg/L		3.9	4	4	2.8	2.38	4.03	2.7	2.71	3.26	3.59		3.66	3.88	4	3.7

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	25/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005
Silver (Ag), total	mg/L		<0.002	<0.002	<0.002	<0.002	0.0004	0.0004	<0.002	0.0002	<0.0001	0.0003	<0.0001	0.0001	<0.001	<0.0001	<0.0001
Sodium (Na), total	mg/L		1.71	1.53	1.23	1.24	1.5	1.2	1.07	1.4	1.7	1.7		1.6	1.6	1	2
Strontium (Sr), total	mg/L		0.251	0.27	0.273	0.187	0.258	0.188	0.288	0.24	0.277	0.292		0.259	0.3	0.316	0.281
Sulphur (S), total	mg/L		88.9	108	99.2	53.3	71.9	54.3	74.6	68.6	84.6	79	90.5	89.4	94.6	93.8	88.4
Thallium (Tl), total	mg/L						<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.01	0.041	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001		<0.001	<0.01	<0.001	<0.001
Titanium (Ti), total	mg/L		<0.004	<0.004	0.006	0.008	0.0043	0.0501	0.103	0.0048	0.006	0.004	0.0051	0.0054	<0.005	0.004	0.0071
Uranium (U), total	mg/L		<0.07	<0.07	<0.07	<0.07	0.0026	0.0021	<0.07	0.003	0.0027	0.0036	0.0041	0.004	<0.005	0.005	0.004
Vanadium (V), total	mg/L		<0.001	<0.001	<0.001	0.002	<0.0001	0.0032	<0.001	0.0001	0.0007	0.0005		0.0004	<0.001	<0.0001	0.0004
Zinc (Zn), total	mg/L		2.14	2.560	2.160	2.28	0.392	0.753	1.31	0.387	0.635	0.291	0.275	0.216	0.199	0.225	0.613
Zirconium (Zr), total	mg/L		<0.006	<0.006	<0.006	<0.006	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001		<0.001	<0.010	<0.001	<0.001
Aluminum (Al), dissolved	mg/L		<0.01	0.03	<0.01	0.02	0.009	0.012	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.050	<0.005	0.04
Antimony (Sb), dissolved	mg/L		<0.02	<0.02	<0.02	<0.02	0.0003	0.0003	<0.02	0.0002	0.0003	<0.0002	<0.0002	0.0002	<0.0020	<0.0002	0.0006
Arsenic (As), dissolved	mg/L		<0.04	<0.04	<0.04	0.04	0.0022	0.0022	<0.04	0.0018	0.0018	0.0011	0.0013	0.0011	<0.002	0.001	0.0037
Barium (Ba), dissolved	mg/L		0.0571	0.0506	0.052	0.0564	0.053	0.047	0.056	0.052	0.063	0.055	0.06	0.059	0.062	0.055	0.051
Beryllium (Be), dissolved	mg/L		<0.0006	0.0011	<0.0006	<0.0006	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L		<0.02	0.07	<0.02	0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.007	<0.0005	<0.0005
Boron (B), dissolved	mg/L						<0.002	0.002	0.0055	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02	0.002	<0.002
Cadmium (Cd), dissolved	mg/L		<0.0006	0.0044	0.0039	0.0078	0.00111	0.00178	147	0.00113	0.00304	0.0007	0.0007	0.00057	0.00053	0.00046	0.00117
Calcium (Ca), dissolved	mg/L		132	123	66.9	90.5	113	86.2		110	129	122	130	134	140	141	129
Chromium (Cr), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0001	0.0003	0.001	<0.0001	0.0001	0.0002	0.0002	0.0003	<0.001	<0.0001	<0.0001
Copper (Cu), dissolved	mg/L		<0.001	0.003	<0.001	0.009	<0.001	0.001	0.005	0.007	0.003	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001
Iron (Fe), dissolved	mg/L		<0.002	<0.002	0.009	0.072	0.09	0.07	0.113	0.02	0.03	<0.01	0.012	0.626	<0.01	0.01	0.39
Lead (Pb), dissolved	mg/L		0.033	0.011	<0.01	<0.01	0.0009	0.0005	0.01	0.0001	0.0001	<0.0001	0.0002	<0.0001	<0.001	0.0001	0.0019
Lithium (Li), dissolved	mg/L		0.009	0.023	0.009	0.007	0.008	0.005	0.009	0.006	0.007	0.006		0.008	<0.01	0.007	0.008
Magnesium (Mg), dissolved	mg/L		25.4	24.3	14.3	17.2	24	18.4	22.4	23.3	27.6	24.6	26.4	1.6	27.1	26.4	25.2
Manganese (Mn), dissolved	mg/L		2.86	3.08	2.99	2.21	0.392	0.299	1.38	0.252	0.131	0.343	0.37	267	0.422	0.29	0.581
Mercury (Hg), dissolved	mg/L												<0.0001				
Molybdenum (Mo), dissolved	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001
Nickel (Ni), dissolved	mg/L		0.007	0.012	0.006	0.007	0.0028	0.0028	<0.002	0.0021	<0.0005	0.0007	0.0023	0.0019	<0.0050	0.001	0.003
Phosphorus (P), dissolved	mg/L		<0.06	0.18	0.08	0.06			0.11								
Potassium (K), dissolved	mg/L		<1	<1	<1	<1	<0.4	<0.4	1.2	0.5	0.6	0.6		0.11	<0.4	0.6	0.6
Selenium (Se), dissolved	mg/L		<0.1	<0.1	<0.1	<0.1	0.0008	0.0006	<0.1	0.0009	0.0008	0.0006	0.0006	<0.0002	<0.002	0.0008	0.0009
Silicon (Si), dissolved	mg/L		3.7	4	3.9	2.5	2.6	2.51	2.8	2.81	3.7	3.27	3.81	3.9	3.99	4.1	3.8
Silver (Ag), dissolved	mg/L		<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L		1.69	1.45	1.02	1.23	1.6	1.1	2.56	1.4	1.7	1.7	1.7	0.6	1.7	2	2
Strontium (Sr), dissolved	mg/L		0.245	0.267	0.27	0.185	0.237	0.181	0.307	0.236	0.27	0.24	0.271	0.251	0.297	0.292	0.275
Sulphur (S), dissolved	mg/L		88	106	97	52.8	76.8	53.8	78.5	72.2	84.6	78.1	86.7	89	97.5	96.5	89.6
Thallium (Tl), dissolved	mg/L						<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L		<0.01	0.029	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001
Titanium (Ti), dissolved	mg/L		<0.004	<0.004	0.004	0.004	0.0046	0.003	0.008	0.008	0.0059	0.0034	0.0048	0.005	<0.005	0.005	0.0065
Uranium (U), dissolved	mg/L		<0.06	<0.06	<0.06	0.06	0.0025	0.0018	<0.06	0.0029	0.0029	0.0036	0.0039	0.0036	<0.005	0.004	0.003
Vanadium (V), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	<0.0001	0.0001	<0.001	0.0006	0.0001	0.0001	<0.0001	0.0004	<0.001	<0.0001	0.0003
Zinc (Zn), dissolved	mg/L		2.1	2.53	2.13	1	0.373	0.388	1.29	0.349	0.608	0.282	0.25	0.189	0.228	0.195	0.642
Zirconium (Zr), dissolved	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005				<0.001				

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		27/05/2005	30/06/2005	20/07/2005	23/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	27/06/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006
Discharge (Flow)	L/s	657.269274	136	204	237	149	186	188	117	159.453969				858		251.196066	374
Total Suspended Solids	mg/L	22	<2	2	10	5	<2	<2	4	4	<2	28	34				
pH (field)	pH units	8.7	8.2	8.4	7.86	7.78	8.05	7.29	7.79	7.78	6.69	7.6		6.58		7.4	7.9
pH (lab)	pH units	7.7	8.1		7.86		7.96	8	7.9	7.82	7.97	7.38	8.09	7.4	8.19	8.26	8.12
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	384	618	609	586	590	641	763	710	749	731	239	584	366	628	632	634
Temperature (field)	C	5.6	9.1	5.8	4.8	0.6	0.2	1.2	0.2	1.1				4.1			
Dissolved Oxygen (field)	mg/L				12.9												
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L												302				
Hardness (from dissolved)	mg/L	187	304	322	320	293		408	400	372	397	120					
Alkalinity, total	mg/L	72	125	144	131	136	144	153	151	152	157	56	118				
Chloride	mg/L											0.34					
Fluoride	mg/L											0.05					
Sulphate, dissolved	mg/L					162			240	240	284	56	193				
Ammonia (N)	mg/L			<0.002	<0.002	<0.05	0.009						<0.02				
Nitrite (N)	mg/L			<0.03	<0.03							<0.03	<0.002				
Nitrate (N)	mg/L			0.07	0.06		0.1					0.04	0.079				
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L	0.414	0.008	0.042	0.085	0.103	0.014	0.014	0.032	0.011	0.019	0.509	0.735	1.48	0.046	0.062	0.068
Antimony (Sb), total	mg/L	0.0004	0.0003	0.0003	0.0002	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	0.0004	0.0006	0.0003	<0.0004	0.0003
Arsenic (As), total	mg/L	0.0034	0.0019	0.0024	0.0028	0.0022	0.002	0.0023	0.002	0.002	0.002	0.0129	0.0068	0.0115	0.0028	0.0029	0.0028
Barium (Ba), total	mg/L	0.051	0.055	0.063	0.055	0.054	0.054	0.066	0.056	0.063	0.052	0.04	0.074	0.088	0.061	0.059	0.054
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005
Boron (B), total	mg/L	0.002	<0.002	0.011	<0.002	0.003	0.003	0.002	0.002	0.003	<0.002	<0.002	<0.002	0.003	0.005	0.004	<0.002
Cadmium (Cd), total	mg/L	0.00264	0.00118	0.00224	0.00294	0.00127	0.00108	0.00065	0.00057	0.0006	0.00051	0.00113	0.00347	0.00313	0.00177	0.00131	0.00104
Calcium (Ca), total	mg/L	56.2	88.6	94.6	88.2	82.8	103	117	124	128	132	35.7	91.8	62.9	103	102	100
Chromium (Cr), total	mg/L	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	0.0011	0.0026	<0.0005	<0.001	<0.0005
Cobalt (Co), total	mg/L	0.0005	<0.0001	0.0006	0.0007	0.0003	0.0004	0.0002	0.0001	0.0003	<0.0001	0.0006	0.0012	0.0022	0.0003	<0.0002	0.0004
Copper (Cu), total	mg/L	0.003	<0.001	0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.004	0.004	0.004	0.01	<0.001	<0.002	0.001
Iron (Fe), total	mg/L	0.9	<0.1	0.2	0.4	0.3	<0.1	0.2	0.2	0.1	0.1	1	1.7	3.9	0.2	0.2	0.2
Lead (Pb), total	mg/L	0.0081	0.001	0.0018	0.0022	0.0016	0.0004	0.0017	0.0012	0.0014	0.0013	0.0093	0.0081	0.0225	0.0023	0.0024	0.0036
Lithium (Li), total	mg/L	0.004	0.005	0.009	0.006	0.005	0.008	0.008	0.009	0.011	0.007	0.003	0.007	0.005	0.007	0.006	0.006
Magnesium (Mg), total	mg/L	11.5	18.7	19.8	18.8	16.3	20	22.2	22.2	26.2	23.7	7.3	17.6	12.9	19.3	20.8	20
Manganese (Mn), total	mg/L	0.132	0.101	0.354	0.553	0.201	0.213	0.324	0.353	0.314	0.184	0.185	0.677	0.509	0.559	0.257	0.185
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001
Nickel (Ni), total	mg/L	0.0031	0.0015	0.0022	0.0019	0.0024	0.0028	0.0017	<0.0005	0.0022	0.0014	0.0024	0.0083	0.0086	0.0025	0.0049	0.0023
Phosphorus (P), total	mg/L					<0.1											
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	0.5	0.5	0.5	0.6	0.4	0.5	<0.4	<0.4	<0.8	<0.4
Selenium (Se), total	mg/L	0.0003	0.0007	0.0008	0.0007	0.0006	0.0012	0.0009	0.0011	0.0013	0.0006	0.0004	0.0007	0.0006	0.0009	0.0005	0.0006
Silicon (Si), total	mg/L	3.4	2.49	2.7	3	2.83	3.11	3.43	3.74	4.1	3.67	2.28	3.36	4.1	2.67	2.79	2.7

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		27/05/2005	30/06/2005	20/07/2005	23/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	27/06/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006
Silver (Ag), total	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.0002	<0.0001	<0.0002	<0.0001
Sodium (Na), total	mg/L	0.9	1.2	1.3	1.2	1.2	1.5	1.7	1.7	1.6	1.5	0.6	1.2	0.9	1.4	1	1.2
Strontium (Sr), total	mg/L	0.131	0.226	0.252	0.204	0.194	0.276	0.288	0.253	0.286	0.277	0.085	0.208	0.144	0.237	0.212	0.213
Sulphur (S), total	mg/L	35	56.1	61	56	46.7	63.9	77.6	81.2	83.9	88.7	19	60.6	36.1	70.4	64.1	66.9
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005								
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001
Titanium (Ti), total	mg/L	0.0139	0.003	0.0044	0.0046	0.0063	0.0062	0.0055	0.0044	0.0063	0.0036	0.0166	0.0534	0.0413	0.0521	0.0067	0.0057
Uranium (U), total	mg/L	0.0013	0.0024	0.0024	0.0022	0.0021	0.0027	0.0037	0.0032	0.0036	0.003	0.0006	0.0021	0.0015	0.0021	0.0028	0.0026
Vanadium (V), total	mg/L	0.0014	0.0002	0.0004	0.0005	0.0005	0.0004	0.0001	0.0001	0.0002	0.0002	0.0015	0.0022	0.0047	0.0003	0.0002	0.0003
Zinc (Zn), total	mg/L	0.297	0.191	0.318	0.71	0.233	0.356	0.142	0.13	0.17	0.124	0.166	1.03	0.634	0.242	0.238	0.229
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001
Aluminum (Al), dissolved	mg/L	0.18	<0.005	0.019	0.006	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.03		0.023	0.006	0.008	<0.005
Antimony (Sb), dissolved	mg/L	<0.002	0.0003	0.0003	0.0003	0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002		0.0003	0.0003	0.0003	0.0002
Arsenic (As), dissolved	mg/L	0.003	0.0018	0.0024	0.0019	0.0018	0.0015	0.0015	0.0014	0.001	0.0014	0.0013		0.0018	0.0018	0.0022	0.002
Barium (Ba), dissolved	mg/L	0.04	0.056	0.052	0.055	0.052	0.051	0.06	0.054	0.052	0.052	0.028		0.037	0.054	0.053	0.052
Beryllium (Be), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L	<0.02	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	<0.002	0.002	<0.002
Cadmium (Cd), dissolved	mg/L	0.00283	0.00106	0.00212	0.00183	0.00097	0.00093	0.00043	0.0004	0.00045	0.00042	0.00059		0.00103	0.0016	0.00093	0.00078
Calcium (Ca), dissolved	mg/L	56	90.7	96	93.8	88.1	103	126	119	111	122	35		57.8	106	102	99.1
Chromium (Cr), dissolved	mg/L	<0.005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	0.0015	<0.0005
Cobalt (Co), dissolved	mg/L	<0.001	<0.0001	0.0002	0.0004	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0001		0.0003	0.0002	0.0026	<0.0001
Copper (Cu), dissolved	mg/L	<0.01	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.002	<0.001	<0.001	<0.001
Iron (Fe), dissolved	mg/L	0.4	0.02	0.05	<0.01	0.03	0.03	<0.01	<0.01	<0.01	0.02	0.08		0.07	0.05	0.07	0.05
Lead (Pb), dissolved	mg/L	0.007	0.0003	0.0016	<0.0001	0.0002	0.0004	0.0005	0.0004	0.0004	0.0001	0.0012		0.0006	0.0007	0.0008	0.0005
Lithium (Li), dissolved	mg/L	<0.01	0.005	0.005	0.006	0.005	0.006	0.008	0.008	0.007	0.007	0.002		0.003	0.006	0.006	0.007
Magnesium (Mg), dissolved	mg/L	11.5	18.9	20	20.7	17.7	20.3	22.6	24.7	22.9	22.3	7		11.6	21.9	21.1	19.8
Manganese (Mn), dissolved	mg/L	0.128	0.1	0.355	0.481	0.191	0.208	0.348	0.284	0.258	0.165	0.189		0.192	0.584	0.246	0.155
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	<0.005	0.0014	0.0016	<0.0005	0.0008	0.001	0.0006	<0.0005	<0.0005	<0.0005	0.0009		0.0021	0.0012	0.0008	<0.0005
Phosphorus (P), dissolved	mg/L																
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	0.5	0.5	0.5	0.6	<0.4		<0.4	<0.4	0.5	<0.4
Selenium (Se), dissolved	mg/L	<0.002	0.0008	0.0005	0.0008	0.0008	0.001	0.001	0.0009	0.001	0.0008	<0.0002		0.0006	0.0003	0.0006	0.0007
Silicon (Si), dissolved	mg/L	2.56	2.5	2.67	3.32	2.9	3.24	3.52	3.78	3.64	3.5	1.51		2.11	2.84	2.73	2.62
Silver (Ag), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L	0.9	1	1.3	1	1.3	1.4	1.6	1.5	1.4	2	0.8		0.8	1.3	1.5	0.8
Strontium (Sr), dissolved	mg/L	0.12	0.223	0.22	0.219	0.196	0.236	0.283	0.258	0.237	0.267	0.077		0.14	0.182	0.222	0.211
Sulphur (S), dissolved	mg/L	36.1	60.4	63	61.4	51.2	63.3	84.3	79.3	73.4	85	19.4		34.2	70.1	68.6	64.1
Thallium (Tl), dissolved	mg/L	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005								
Tin (Sn), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	0.008	0.0035	0.0044	0.0027	0.0036	0.0041	0.0055	0.0038	0.0043	0.0031	0.0016		0.0029	0.0448	0.004	0.0044
Uranium (U), dissolved	mg/L	<0.005	0.0024	0.0022	0.0018	0.0018	0.0023	0.0033	0.0032	0.0027	0.0033	0.0006		0.001	0.0024	0.0027	0.0026
Vanadium (V), dissolved	mg/L	<0.001	0.0002	0.0002	0.002	0.0008	0.0004	<0.0001	0.0002	0.0002	0.0007	0.0002		0.0001	0.0004	0.0006	0.0005
Zinc (Zn), dissolved	mg/L	0.3	0.184	0.282	0.356	0.187	0.377	0.136	0.119	0.121	0.112	0.101		0.232	0.184	0.192	0.191
Zirconium (Zr), dissolved	mg/L																

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		25/10/2006	30/11/2006	22/01/2007	28/02/2007	23/03/2007	18/04/2007	29/05/2007	16/06/2007	12/07/2007	31/08/2007	05/09/2007	28/10/2007	27/11/2007	09/01/2008	29/02/2008	14/03/2008
Discharge (Flow)	L/s											189.2					
Total Suspended Solids	mg/L													<2	5	<2	<5
pH (field)	pH units	8.4	6.31	7.84	7.88	7.66	7.67	8.23	8.13	8.12	8.22	8.27	8.24	8.16	7.9	7.88	7.5
pH (lab)	pH units	8	7.46	7.71	8	7.86	7.42	7.66	7.98	7.81	8.23	8.21	8.05	8.03	8.16	8.16	7.69
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	689	680	692	743	755	432	279	560	409	635	627	625	637	636	702	722
Temperature (field)	C		0.4	0.4	0.4	0.4	0.5	3.5	10.5	5.6	5.6	4.3	0.1	0.1	0.1		0.1
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L													355	384	437	383
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L																
Ammonia (N)	mg/L																
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L	0.014	0.014	0.02	0.006	0.029	1.39	0.869	0.101	1.46	0.087	0.198	0.028	0.045	0.032	<0.005	0.013
Antimony (Sb), total	mg/L	0.0002	0.0003	<0.0002	<0.0002	<0.0002	0.001	0.001	0.0003	0.0004	<0.0002	0.0003	0.0002	0.0009	0.0002	<0.0002	<0.0002
Arsenic (As), total	mg/L	0.002	0.0015	0.0016	0.0012	0.0018	0.015	0.0089	0.0026	0.0059	0.0023	0.0029	0.0015	0.0021	0.0021	0.0016	0.0017
Barium (Ba), total	mg/L	0.054	0.069	0.057	0.06	0.062	0.092	0.052	0.048	0.077	0.061	0.063	0.058	0.063	0.066	0.055	0.057
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L	<0.002	0.002	<0.002	0.002	<0.002	0.01	0.006	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.002
Cadmium (Cd), total	mg/L	0.0011	0.00072	0.00046	0.0005	0.00047	0.00237	0.00137	0.00117	0.00126	0.00097	0.0011	0.00153	0.00081	0.00056	0.00118	0.0006
Calcium (Ca), total	mg/L	109	118	122	119	126	71.1	46.3	88.1	66.5	102	101	103	103	111	117	112
Chromium (Cr), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0099	0.002	0.0008	0.0025	0.0006	0.0006	<0.0005	0.0005	<0.0005	0.0006	<0.0005
Cobalt (Co), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.002	0.0009	0.0002	0.0014	0.0001	0.0004	<0.0001	0.0002	0.0001	<0.0001	<0.0001
Copper (Cu), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.02	0.005	0.001	0.006	<0.001	0.003	<0.001	<0.001	<0.001	0.001	<0.001
Iron (Fe), total	mg/L	0.1	<0.1	0.1	<0.1	0.2	3.9	2	0.2	2.8	0.2	0.4	<0.1	0.2	0.1	<0.1	<0.1
Lead (Pb), total	mg/L	0.0008	0.0015	0.0011	0.0009	0.0018	0.0449	0.024	0.0026	0.0086	0.0019	0.0016	0.0005	0.0016	0.0019	0.0004	0.0008
Lithium (Li), total	mg/L	0.007	0.007	0.009	0.008	0.008	0.006	0.004	0.006	0.006	0.007	0.006	0.007	0.007	0.009	0.008	0.01
Magnesium (Mg), total	mg/L	22.1	24.4	24.3	25.3	25.3	15	8	17.5	14.3	19.8	19.9	20.6	20.9	22	24.3	22.4
Manganese (Mn), total	mg/L	0.111	0.11	0.182	0.132	0.282	0.836	0.329	0.227	0.207	0.156	0.182	0.142	0.301	0.404	0.129	0.122
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L	0.0008	0.0017	0.0016	0.0018	0.0019	0.0071	0.0043	0.0026	0.0052	0.0013	0.0047	0.0017	0.0015	0.0014	0.0016	0.0018
Phosphorus (P), total	mg/L																
Potassium (K), total	mg/L	0.4	0.6	0.5	0.5	0.4	5.9	<0.8	<0.4	0.4	<0.4	0.4	<0.4	0.5	0.4	0.7	0.5
Selenium (Se), total	mg/L	0.0005	0.001	0.0008	0.0009	0.0009	<0.0004	<0.0004	0.0009	0.0009	0.0006	0.0008	0.0008	0.0008	0.0007	0.0013	0.0011
Silicon (Si), total	mg/L	3.03	3.73	3.65	3.77	3.97	4.98	3.21	2.56	3.93	2.68	3.11	3.28	3.56	3.82	3.28	3.4

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		25/10/2006	30/11/2006	22/01/2007	28/02/2007	23/03/2007	18/04/2007	29/05/2007	16/06/2007	12/07/2007	31/08/2007	05/09/2007	28/10/2007	27/11/2007	09/01/2008	29/02/2008	14/03/2008
Silver (Ag), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0005	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00001
Sodium (Na), total	mg/L	1.6	1.5	1.5	1.6	1.5	2.2	<0.8	1.2	1	1.3	1.4	1.3	2.2	1.5	3.2	1.6
Strontium (Sr), total	mg/L	0.23	0.245	0.261	0.285	0.279	0.13	0.096	0.201	0.17	0.273	0.23	0.26	0.243	0.271	0.27	0.274
Sulphur (S), total	mg/L	67.8	72.6	80.5	75.7	82.5	46.4	28	59.5	40.3	66.1	67.9	66.8	66.9	73	81.4	76
Thallium (Tl), total	mg/L			<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L	0.005	0.0038	0.005	0.0048	0.0014	0.0501	0.0634	0.055	0.0815	0.0063	0.0083	0.006	0.006	0.0059	0.004	0.005
Uranium (U), total	mg/L	0.0029	0.0027	0.0033	0.0033	0.0035	0.002	<0.001	0.0021	0.0015	0.0028	0.0025	0.0025	0.003	0.003	0.0032	0.0032
Vanadium (V), total	mg/L	0.0001	0.0001	0.0002	<0.0001	0.0002	0.0044	0.0026	0.0004	0.0038	0.0004	0.0008	0.0002	0.0002	0.0002	<0.0001	0.0002
Zinc (Zn), total	mg/L	0.217	0.202	0.138	0.129	0.112	0.372	0.238	0.252	0.204	0.16	0.203	0.282	0.138	0.118	0.216	0.141
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.111	0.04	0.01	0.022	0.006	0.009	<0.005	<0.005	<0.005	<0.02	<0.02
Antimony (Sb), dissolved	mg/L	0.0002	0.0004	<0.0002	<0.0002	<0.0002	0.0007	0.0003	0.0003	0.0003	0.0011	0.0014	0.122	0.0005	<0.0002	<0.001	<0.001
Arsenic (As), dissolved	mg/L	0.0017	0.0016	0.0013	0.0012	0.0013	0.0052	0.0015	0.0021	0.0019	0.002	0.002	0.0017	0.0016	0.0016	0.002	0.002
Barium (Ba), dissolved	mg/L	0.053	0.062	0.057	0.064	0.064	0.052	0.027	0.044	0.044	0.06	0.055	0.058	0.059	0.065	0.03	0.053
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0005
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.01	<0.01
Cadmium (Cd), dissolved	mg/L	0.00093	0.00072	0.00041	0.00048	0.00038	0.00134	0.00053	0.00094	0.00051	0.0008	0.00082	0.00153	0.00041	0.00029	0.00087	0.0004
Calcium (Ca), dissolved	mg/L	111	148	123	126	126	72.1	42.5	86.3	68.4	102	102	104	107	116	132	116
Chromium (Cr), dissolved	mg/L	0.003	<0.0005	0.0006	<0.0005	0.0009	0.0025	0.0008	0.0006	<0.0005	0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.002	<0.002
Cobalt (Co), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.0176	<0.0001	0.0001	<0.0005	<0.0005
Copper (Cu), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	0.003	0.01	0.004	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005
Iron (Fe), dissolved	mg/L	0.04	0.01	0.01	<0.01	0.02	0.55	0.1	0.05	0.12	0.04	0.06	0.02	0.01	0.02	0.01	0.02
Lead (Pb), dissolved	mg/L	0.0002	0.0005	0.0004	0.0003	0.0003	0.0106	0.0028	0.0007	0.0012	0.0009	0.0004	0.0002	<0.0001	0.0002	<0.0005	<0.0005
Lithium (Li), dissolved	mg/L	0.006	0.006	0.008	0.006	0.009	0.005	0.003	0.006	0.004	0.007	0.006	0.009	0.008	0.006	0.007	0.006
Magnesium (Mg), dissolved	mg/L	24.1	30.2	23.3	25.4	24.9	14	8	16.8	13	20	20	20.8	21.6	23.1	26.1	22.9
Manganese (Mn), dissolved	mg/L	0.106	0.13	0.162	0.136	0.134	0.346	0.058	0.203	0.062	0.146	0.162	0.138	0.279	0.401	0.134	0.121
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005
Nickel (Ni), dissolved	mg/L	<0.0005	0.0012	<0.0005	<0.0005	0.0017	0.0041	0.0008	<0.0005	0.0009	<0.0005	0.0028	<0.0005	<0.0005	<0.0005	<0.002	<0.002
Phosphorus (P), dissolved	mg/L																
Potassium (K), dissolved	mg/L	0.4	0.5	0.5	<0.4	0.5	5.8	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5	0.4	0.7	0.6
Selenium (Se), dissolved	mg/L	0.0008	0.001	0.0007	0.0009	0.0006	<0.0002	<0.0002	0.0004	0.0004	0.0007	0.0008	0.0006	0.0008	0.0007	<0.001	<0.001
Silicon (Si), dissolved	mg/L	3.15	4.7	3.65	4.09	3.97	2.08	1.79	2.38	2.37	2.6	2.7	3.18	3.66	3.75	4.43	3.8
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005
Sodium (Na), dissolved	mg/L	1.4	2	1.6	1.6	1.6	2.3	0.5	1.2	1	1.3	1.4	1.3	2.2	1.6	2.6	1.8
Strontium (Sr), dissolved	mg/L	0.23	0.238	0.272	0.25	0.25	0.147	0.095	0.21	0.161	0.248	0.228	0.258	0.232	0.242	0.25	0.24
Sulphur (S), dissolved	mg/L	72.1	94.6	81.2	78.7	85.6	49.9	26.8	57.8	40	67	67.6	65.9	67.5	74.8	86.6	75
Thallium (Tl), dissolved	mg/L			<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0002	<0.0002
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005
Titanium (Ti), dissolved	mg/L	0.0046	0.0038	0.0069	0.0056	0.0068	0.0088	0.0623	0.0586	0.0513	0.0043	0.0045	0.0053	0.006	0.0044	0.003	0.004
Uranium (U), dissolved	mg/L	0.0027	0.0025	0.0033	0.0034	0.0032	0.0011	0.0007	0.0019	0.0014	0.0028	0.0026	0.0025	0.0029	0.0028	0.003	0.002
Vanadium (V), dissolved	mg/L	0.0008	0.0002	0.0008	0.0002	0.002	0.0005	0.0006	0.0005	0.0003	0.0002	0.0009	0.0001	0.0007	0.0002	<0.0005	0.0005
Zinc (Zn), dissolved	mg/L	0.221	0.198	0.128	0.127	0.089	0.248	0.126	0.217	0.102	0.143	0.188	0.259	0.128	0.107	0.23	0.15
Zirconium (Zr), dissolved	mg/L																

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		19/04/2008	17/05/2008	20/06/2008	03/07/2008	13/08/2008	18/09/2008	02/10/2008	12/11/2008	20/12/2008	13/01/2009	01/02/2009	10/03/2009	15/04/2009	27/05/2009	05/06/2009	06/07/2009
Discharge (Flow)	L/s				159.4	437.6	518.43	419.66								441.74	124.245
Total Suspended Solids	mg/L	8	12	<3	29	40	114	50	<2	<5	7	7	<5	<4	33	10	<1
pH (field)	pH units	7.67	7.59		7.1	7.52	7.42	7.1							7.46	7.75	7.68
pH (lab)	pH units	7.99	7.88	8.19	8.15	8.02	8.1	7.78	8.14	8.19	7.63	7.82	7.87	8.1	7.9	8	8.1
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	702	333	636	546	438	432	437	598	628	643	674	712	720	230	330	590
Temperature (field)	C	0.1	1.5		5	4	4	2							5	7.2	8.7
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L													394	108	163	317
Hardness (from dissolved)	mg/L	414	171	345	286	227	233	254	304	348	326	401	369	384	117	160	330
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L																
Ammonia (N)	mg/L																
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L		10.3			6.7	6.9	5	1.8	1.3	1.4	0.8		1.5	7.7	5.4	2.8
Aluminum (Al), total	mg/L	0.005	0.463	0.013	0.64	0.598	0.945	0.483	0.038	0.038	0.028	0.013	0.009	0.0059	0.172	0.0679	0.0109
Antimony (Sb), total	mg/L	<0.0002	0.0006	0.0003	0.0003	0.0003	<0.0002	0.0003	0.0003	0.0003	0.0006	0.0002	0.0002	0.00027	0.00056	0.00049	0.0003
Arsenic (As), total	mg/L	0.0017	0.0038	0.0018	0.0032	0.0038	0.006	0.0034	0.0019	0.0024	0.0024	0.0018	0.0019	0.00244	0.00442	0.00237	0.00214
Barium (Ba), total	mg/L	0.056	0.045	0.055	0.072	0.068	0.072	0.062	0.059	0.064	0.063	0.062	0.051	0.058	0.0404	0.0392	0.0542
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	<0.00004	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	0.00002	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	0.002	<0.002	<0.002	0.004	0.002	<0.005	<0.005	<0.005	<0.002	0.006	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.0003	0.00122	0.00045	0.00059	0.00141	0.00158	0.00146	0.00104	0.00082	0.00068	0.00045	0.0003	0.000426	0.00161	0.000925	0.00061
Calcium (Ca), total	mg/L	131	52	102	90.6	74.3	70.1	78.3	95.6	101	113	125	106	119	33.2	50.1	96
Chromium (Cr), total	mg/L	0.001	0.0013	<0.0005	0.0018	0.0016	0.0022	0.0012	0.0005	<0.0005	<0.0005	0.0006	0.0004	0.0002	0.0005	0.0002	0.0014
Cobalt (Co), total	mg/L	<0.0001	0.0006	<0.0001	0.0008	0.0007	0.00119	0.00063	0.0002	0.0001	0.0003	0.00013	0.00012	0.000083	0.000473	0.000158	0.000065
Copper (Cu), total	mg/L	<0.001	0.003	<0.001	0.003	0.004	0.005	0.003	0.002	<0.001	0.006	<0.001	<0.001	0.00034	0.00328	0.00179	0.00083
Iron (Fe), total	mg/L	<0.1	0.8	0.06	1.19	1.12	2.41	1.17	0.14	0.13	0.13	0.06	0.06	0.092	0.581	0.214	0.185
Lead (Pb), total	mg/L	0.0005	0.0078	0.0011	0.0028	0.0062	0.0106	0.0055	0.0024	0.0065	0.0032	0.0023	0.0019	0.0024	0.0236	0.00796	0.00106
Lithium (Li), total	mg/L	0.009	0.004	0.007	0.007	0.006	0.004	0.004	0.005	0.006	0.008	0.007	0.01	0.0081	0.0023	0.003	0.006
Magnesium (Mg), total	mg/L	25.5	10	20.1	18.5	15.1	14.2	16.2	19.8	20.3	22	24.3	22.6	23.5	6.13	9.28	18.8
Manganese (Mn), total	mg/L	0.027	0.29	0.047	0.121	0.162	0.236	0.145	0.219	0.35	0.391	0.227	0.139	0.126	0.228	0.0816	0.0632
Mercury (Hg), total	mg/L													0.00001	<0.00001	0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.00034	0.00039	0.00024	<0.001	<0.001	0.00017	0.00031	0.00041	0.00027	0.00029	0.00043
Nickel (Ni), total	mg/L	<0.0005	0.0024	0.0016	0.0055	0.0034	0.002	0.003	0.002	0.0013	0.0038	0.002	0.002	0.00126	0.00268	0.00141	0.00126
Phosphorus (P), total	mg/L						0.11	0.046	<0.01			<0.01	<0.01	0.004	0.048	0.009	0.003
Potassium (K), total	mg/L	<0.4	0.6	<0.4	0.4	<0.4	0.42	0.4	0.5	<0.4	0.7	0.5	0.6	0.49	0.34	0.3	0.28
Selenium (Se), total	mg/L	0.0014	0.0003	0.0006	0.0006	0.0007	0.0008	<0.0006	0.0006	0.001	0.0013	<0.0006	0.0007	0.00092	0.00024	0.00036	0.00063
Silicon (Si), total	mg/L	3.64	2.8	2.33	3.26	3.33	3.84	3.54	3.32	3.56	3.71	3.79	3.41	3.62	1.72	2.24	2.34

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		19/04/2008	17/05/2008	20/06/2008	03/07/2008	13/08/2008	18/09/2008	02/10/2008	12/11/2008	20/12/2008	13/01/2009	01/02/2009	10/03/2009	15/04/2009	27/05/2009	05/06/2009	06/07/2009
Silver (Ag), total	mg/L	<0.00001	0.00009	0.00029	0.00005	0.00006	0.00001	0.00002	<0.00001	0.00002	0.00004	<0.00001	<0.00001	<0.000005	0.000035	0.00003	<0.000005
Sodium (Na), total	mg/L	2.5	0.8	1.4	1.4	0.9	1	1.2	1.41	2.5	3.6	1.52	1.45	1.57	0.46	0.76	1.29
Strontium (Sr), total	mg/L	0.27	0.119	0.248	0.215	0.184	0.15	0.168	0.21	0.225	0.255	0.237	0.222	0.255	0.0771	0.116	0.214
Sulphur (S), total	mg/L	89.4	32.8	69.5	57.6	42				63.9	72.8	68	70.7	87	21	33	65
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	0.00002	<0.00001			<0.00001	<0.00001	0.000002	0.000007	0.000006	<0.000002
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.0004	<0.0001	<0.001	<0.001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	0.0024	0.0142	0.0055	0.0252	0.0229	0.028	0.0168	0.0015	0.0046	0.0047	0.0007	0.0006	<0.0005	0.0058	0.0018	<0.0005
Uranium (U), total	mg/L	0.0034	0.0011	0.0031	0.0021	0.0013	0.0013	0.0013	0.0022	0.0028	0.0028	0.0031	0.0026	0.00341	0.000551	0.000978	0.00222
Vanadium (V), total	mg/L	<0.0001	0.0016	<0.0001	0.0021	0.0017	0.00296	0.00145	0.00012	0.0004	0.0002	0.00015	0.00005	<0.0002	0.0004	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.077	0.184	0.088	0.091	0.202	0.187	0.183	0.157	0.128	0.134	0.081	0.062	0.0628	0.18	0.117	0.084
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.0004	0.0002		<0.001	<0.001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	<0.005	0.041	0.008	0.021	0.014	0.02	0.009	0.007	<0.005	<0.005	<0.005	<0.005	0.0025	0.0536	0.0264	0.0085
Antimony (Sb), dissolved	mg/L	0.0012		0.0012	0.0011	0.0009	0.001	0.0009	0.0012	0.0002	0.0003	0.0009	0.0012	0.00024	0.0004	0.00043	0.00031
Arsenic (As), dissolved	mg/L	0.0017	0.0019	0.002	0.0016	0.0019	0.0016	0.0013	0.0013	0.0017	0.0017	0.0014	0.0012	0.00153	0.00169	0.00152	0.00181
Barium (Ba), dissolved	mg/L	0.051	0.034	0.056	0.052	0.048	0.042	0.045	0.054	0.059	0.065	0.06	0.063	0.0555	0.0284	0.0364	0.0532
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	0.000014	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.002	<0.002	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00017	0.00091	0.00049	0.00038	0.00107	0.00055	0.00081	0.00082	0.00029	0.00033	0.00025	0.00014	0.000153	0.000882	0.000766	0.000552
Calcium (Ca), dissolved	mg/L	126	52.3	104	84.6	67.7	70.3	75.8	89.7	105	101	121	109	115	35.8	48.9	100
Chromium (Cr), dissolved	mg/L	<0.0005	0.0005	<0.0005	0.0009	<0.0005	0.001	0.0009	<0.0004	<0.0005	<0.0005	0.0004	0.0004	0.0002	0.0004	0.0004	0.0001
Cobalt (Co), dissolved	mg/L	<0.0001	0.0004	<0.0001	0.0002	<0.0001	0.00027	0.00027	0.00014	0.0002	0.0002	0.00014	0.00015	0.000075	0.000114	0.00008	0.000059
Copper (Cu), dissolved	mg/L	<0.001	0.003	<0.001	0.003	0.001	0.001	0.001	0.002	<0.001	0.001	<0.001	<0.001	0.00046	0.0024	0.00149	0.00057
Iron (Fe), dissolved	mg/L	0.01	0.13	0.04	0.06	0.05	0.08	0.066	0.034	<0.01	<0.01	<0.01	0.01	0.014	0.11	0.072	0.041
Lead (Pb), dissolved	mg/L	0.0001	0.0024	0.0009	0.0009	0.0023	0.001	0.0008	0.0206	0.0004	0.0005	0.0007	0.0003	0.00058	0.00449	0.00271	0.000613
Lithium (Li), dissolved	mg/L	0.008	0.003	0.006	0.005	0.004	0.004	0.003	0.005	0.006	0.008	0.007	0.006	0.0079	0.0024	0.003	0.006
Magnesium (Mg), dissolved	mg/L	24	9.9	20.5	18.2	14.2	14	15.8	19.4	21	21.6	24	23.3	23.6	6.63	9.16	19.4
Manganese (Mn), dissolved	mg/L	0.024	0.242	0.038	0.068	0.064	0.0764	0.0792	0.193	0.329	0.258	0.244	0.139	0.109	0.0601	0.0404	0.0595
Mercury (Hg), dissolved	mg/L													<0.00001	0.00002	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.00029	0.00038	0.0002	<0.001	<0.001	0.00019	0.00032	0.0004	0.00025	0.00034	0.00037
Nickel (Ni), dissolved	mg/L	<0.0005	0.0019	<0.0005	0.0027	0.0014	0.001	0.002	0.002	0.0013	0.0016	0.002	0.002	0.00129	0.00149	0.0014	0.00101
Phosphorus (P), dissolved	mg/L						0.01	<0.01	<0.01			<0.01	<0.01	0.002	0.013	0.004	0.003
Potassium (K), dissolved	mg/L	0.5	0.4	<0.4	<0.4	<0.4	0.31	0.3	0.4	<0.4	0.6	0.5	0.4	0.47	0.39	0.3	0.29
Selenium (Se), dissolved	mg/L	0.0011	0.0003	0.0006	0.0002	0.0005	0.0024	<0.0006	0.0007	0.0012	0.0012	0.0013	0.0008	0.00091	0.00024	0.00036	0.00064
Silicon (Si), dissolved	mg/L	3.82	1.89	2.54	2.25	2.5	2.58	2.77	3.09	3.56	3.64	3.66	3.44	3.55	1.52	2.04	2.5
Silver (Ag), dissolved	mg/L	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000005	0.000048	0.000035	0.000011
Sodium (Na), dissolved	mg/L	2.3	0.8	1.3	1.3	1	1.01	1.1	1.4	1.4	3.8	1.5	1.5	1.6	0.54	0.75	1.33
Strontium (Sr), dissolved	mg/L	0.254	0.115	0.226	0.206	0.161	0.153	0.161	0.206	0.22	0.22	0.227	0.231	0.247	0.0759	0.119	0.215
Sulphur (S), dissolved	mg/L	86.9	31.9	70.8	56	40				63.7	65.8	70.2	72.8	83	22	31	68
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001		<0.00005	<0.00001	<0.00001	<0.000002	0.000002	0.000004	<0.000002
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0001	<0.0001	0.00002	0.00002	0.00006	<0.00001
Titanium (Ti), dissolved	mg/L	0.0029	0.0016	0.0025	0.0093	0.0038	0.0006	0.0005	0.0005	0.0023	0.0026	0.0002	0.0004	<0.0005	0.0011	0.0008	<0.0005
Uranium (U), dissolved	mg/L	0.0031	0.001	0.0028	0.002	0.0012	0.0012	0.0013	0.0021	0.0029	0.003	0.003	0.0029	0.00345	0.000502	0.000938	0.00213
Vanadium (V), dissolved	mg/L	0.0004	0.0002	0.0001	0.0002	0.0003	0.00026	0.00012	<0.00004	0.0002	0.0006	0.00005	0.00004	<0.0002	0.0005	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.07	0.158	0.088	0.068	0.157	0.099	0.146	0.153	0.123	0.125	0.092	0.063	0.0588	0.115	0.0987	0.0813
Zirconium (Zr), dissolved	mg/L						<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		11/08/2009	08/09/2009	06/10/2009	12/11/2009	04/12/2009	13/01/2010	09/02/2010	12/03/2010	08/04/2010	04/05/2010	08/06/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010
Discharge (Flow)	L/s		269.23	228.95							612.41	357.17	287.520533	231.0865	186.5	184.638	
Total Suspended Solids	mg/L	<4	3	3	1	<1	1	<1	<1	1	23	9	6	3	3	2	<1
pH (field)	pH units		7.79	7.66	8.03	7.59	7.88	8.41	8.44	8.17	8	7.96	8.15	8.15	7.74	8.25	7.34
pH (lab)	pH units	8.2	8.1	8.1	8.2	8.1	8.1	8.2	8.1	8.2	8.1	8.2	8.06	8.13	8.16	8.09	8.13
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	676	518	569	673	687	723	735	752	732	332	472	513	556	608	624	680
Temperature (field)	C		5.9	1.8	0.2	0.1	1	1	1.3	0	0.6	4.3	7.5	7.1	4	0	0
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L	361	302	292	346	373	384	442	448	424	163	240	265	297	324	334	379
Hardness (from dissolved)	mg/L	378	281	323	357	366	435	425	435	429	161	251	266	316	318	339	401
Alkalinity, total	mg/L														140	140	150
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	190	130	150	190	250	140	210	200	270	110	140	160	160	170	200	230
Ammonia (N)	mg/L													<0.05	<0.005	<0.005	<0.005
Nitrite (N)	mg/L														<0.005	<0.005	<0.005
Nitrate (N)	mg/L														0.03	0.09	0.12
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L	2.1	4.1	3.3	<0.5	1.4	1.3	1.1	1	1.3	13.5	6.1	4.9	3.1	3.9	2	1
Aluminum (Al), total	mg/L	0.0052	0.0208	0.0144	0.0069	0.0053	0.0048	0.0049	0.0064	0.012	0.11	0.0538	0.0412	0.0196	0.0172	0.0081	0.0047
Antimony (Sb), total	mg/L	0.00027	0.00029	0.00025	0.00025	0.00022	0.00019	0.00017	0.00018	0.00023	0.00031	0.0003	0.00028	0.00025	0.00022	0.00017	0.00019
Arsenic (As), total	mg/L	0.00229	0.00209	0.00198	0.00163	0.00181	0.00204	0.00236	0.00239	0.00229	0.00433	0.00249	0.0022	0.00228	0.00251	0.00241	0.00152
Barium (Ba), total	mg/L	0.0534	0.05	0.0505	0.0542	0.0606	0.0561	0.0534	0.0538	0.0521	0.0356	0.041	0.0446	0.0501	0.0498	0.047	0.0505
Beryllium (Be), total	mg/L	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000525	0.000833	0.000933	0.000591	0.000624	0.000543	0.000453	0.000349	0.000313	0.000967	0.000772	0.000521	0.000515	0.000574	0.000464	0.00054
Calcium (Ca), total	mg/L	109	91.8	87.4	105	117	116	137	139	131	49.7	71.2	79.5	89.1	96.7	99	117
Chromium (Cr), total	mg/L	<0.0001	0.0003	0.0003	0.0003	<0.0001	0.0002	0.0002	0.0003	0.0005	0.0004	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003
Cobalt (Co), total	mg/L	0.000067	0.000106	0.000158	0.000237	0.000292	0.000342	0.000288	0.000252	0.000223	0.000469	0.000194	0.000141	0.000102	0.000161	0.000128	0.000231
Copper (Cu), total	mg/L	0.0004	0.00092	0.0007	0.00027	0.0003	0.00029	0.00029	0.00027	0.0007	0.00281	0.00154	0.00106	0.00074	0.00062	0.00044	0.00051
Iron (Fe), total	mg/L	0.083	0.12	0.118	0.066	0.08	0.134	0.179	0.139	0.126	0.601	0.219	0.178	0.13	0.161	0.136	0.052
Lead (Pb), total	mg/L	0.000882	0.00212	0.00152	0.000636	0.000883	0.00125	0.00162	0.0013	0.00142	0.0111	0.00349	0.00173	0.00132	0.00129	0.000783	0.000353
Lithium (Li), total	mg/L	0.0072	0.0046	0.0053	0.0077	0.0079	0.0085	0.0093	0.0095	0.0095	0.0034	0.005	0.0054	0.0061	0.0064	0.0069	0.008
Magnesium (Mg), total	mg/L	21.6	17.6	18	20.6	19.6	22.9	24.4	24.6	23.8	9.35	15.1	16.2	18	19.9	21	21.5
Manganese (Mn), total	mg/L	0.0913	0.0909	0.126	0.217	0.379	0.366	0.292	0.232	0.154	0.241	0.103	0.0754	0.0785	0.144	0.137	0.339
Mercury (Hg), total	mg/L		<0.00001		0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001		<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00042	0.0004	0.00049	0.00049	0.00043	0.00035	0.00039	0.00042	0.00043	0.00032	0.00046	0.00039	0.00044	0.00043	0.00039	0.00044
Nickel (Ni), total	mg/L	0.00114	0.00134	0.00153	0.00167	0.00145	0.00165	0.00157	0.00161	0.00189	0.00364	0.00151	0.00132	0.00119	0.00142	0.00126	0.00218
Phosphorus (P), total	mg/L		0.007		0.002	0.003	0.003	0.006	0.008	0.007		0.01	0.007	0.004	0.007		0.003
Potassium (K), total	mg/L	0.32	0.35	0.3	0.36	0.41	0.4	0.46	0.46	0.48	0.43	0.23	0.24	0.29	0.39	0.37	0.42
Selenium (Se), total	mg/L	0.00081	0.00063	0.00071	0.00089	0.00088	0.00092	0.00088	0.00096	0.00088	0.00033	0.00038	0.00052	0.00068	0.00067	0.00078	0.00076
Silicon (Si), total	mg/L	2.77	3.28	3.1	3.47	3.37	3.82	4.34	3.5	3.51	2.11	2.39	2.66	2.87	2.99	3.23	3.81

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		11/08/2009	08/09/2009	06/10/2009	12/11/2009	04/12/2009	13/01/2010	09/02/2010	12/03/2010	08/04/2010	04/05/2010	08/06/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	16/11/2010
Silver (Ag), total	mg/L	<0.000005	0.000011	0.00001	<0.000005	<0.000005	0.000021	<0.000005	0.000005	<0.000005	0.000029	<0.000005	0.000013	0.000006	<0.000005	0.000006	<0.000005
Sodium (Na), total	mg/L	1.45	1.23	1.29	1.36	1.25	1.5	1.61	1.68	1.62	0.66	1.01	1.07	1.26	1.35	1.42	1.48
Strontium (Sr), total	mg/L	0.229	0.191	0.193	0.22	0.235	0.231	0.233	0.265	0.249	0.111	0.157	0.184	0.206	0.207	0.208	0.232
Sulphur (S), total	mg/L	77	57	59	72	86	84	101	101	97	32	51	54	61	69	73	77
Thallium (Tl), total	mg/L	<0.000002	0.000003	<0.000002	0.000003	<0.000002	0.000003	<0.000002	<0.000002	<0.000002	0.000004	0.000002	<0.000002	<0.000002	0.000002	<0.000002	<0.000002
Tin (Sn), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), total	mg/L	<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0032	0.0015	0.0008	0.0006	0.0008	<0.0005	<0.0005
Uranium (U), total	mg/L	0.00282	0.00193	0.00208	0.0026	0.00257	0.00291	0.00294	0.00326	0.00309	0.000986	0.00146	0.00155	0.00186	0.00193	0.00206	0.00244
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.0832	0.105	0.139	0.107	0.0932	0.0851	0.0658	0.061	0.0526	0.105	0.1	0.0673	0.0732	0.0967	0.0857	0.113
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.0062	0.0119	0.0043	0.0066	0.0017	0.0026	0.0022	0.003	0.0077	0.0225	0.0113	0.0114	0.0074	0.0054	0.003	0.0035
Antimony (Sb), dissolved	mg/L	0.00028	0.00029	0.00025	0.00027	0.00021	0.00017	0.00016	0.00018	0.00019	0.00023	0.00028	0.00027	0.00024	0.00021	0.00017	0.00018
Arsenic (As), dissolved	mg/L	0.00206	0.00175	0.00146	0.00136	0.00133	0.00137	0.00136	0.00143	0.00144	0.00165	0.00147	0.00167	0.0018	0.00189	0.00175	0.00136
Barium (Ba), dissolved	mg/L	0.053	0.05	0.0509	0.053	0.0562	0.0582	0.0539	0.0535	0.0522	0.0284	0.0365	0.0417	0.0481	0.0461	0.0497	0.0487
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	0.000012	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000443	0.00073	0.000873	0.000555	0.000464	0.000332	0.000192	0.000144	0.000111	0.00043	0.000532	0.00039	0.000415	0.000434	0.00039	0.000456
Calcium (Ca), dissolved	mg/L	114	84.9	98.9	108	115	133	130	134	132	49.4	75.7	80.1	95.3	96.4	101	124
Chromium (Cr), dissolved	mg/L	0.0001	0.0003	0.0003	0.0004	<0.0001	0.0003	0.0003	0.0003	0.0004	0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0004
Cobalt (Co), dissolved	mg/L	0.000058	0.000068	0.000104	0.00022	0.000262	0.000331	0.000285	0.000216	0.000198	0.000131	0.000055	0.000061	0.000065	0.000096	0.000111	0.000238
Copper (Cu), dissolved	mg/L	0.00037	0.00084	0.00059	0.00031	0.00021	0.00031	0.00027	0.00018	0.00024	0.00175	0.00107	0.00085	0.00063	0.00065	0.00039	0.00033
Iron (Fe), dissolved	mg/L	0.034	0.06	0.044	0.017	0.007	0.013	0.016	0.014	0.018	0.152	0.049	0.052	0.036	0.051	0.05	0.023
Lead (Pb), dissolved	mg/L	0.000311	0.00135	0.000353	0.000107	0.000037	0.000119	0.000152	0.000115	0.00015	0.00132	0.00048	0.000499	0.000251	0.000317	0.000192	0.00027
Lithium (Li), dissolved	mg/L	0.0072	0.0045	0.0052	0.0076	0.0078	0.0091	0.0091	0.0096	0.0099	0.0032	0.0048	0.005	0.0059	0.006	0.0075	0.0075
Magnesium (Mg), dissolved	mg/L	22.5	16.9	18.5	20.9	19	24.9	24.2	24.1	24.5	9.19	15	16	19	18.8	20.9	22.4
Manganese (Mn), dissolved	mg/L	0.0908	0.0719	0.114	0.216	0.359	0.399	0.278	0.213	0.14	0.062	0.0464	0.0485	0.066	0.119	0.127	0.345
Mercury (Hg), dissolved	mg/L		<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	0.00001		0.00001	0.00002	<0.00001	<0.00001		0.00001
Molybdenum (Mo), dissolved	mg/L	0.00043	0.00039	0.00047	0.00049	0.00043	0.00049	0.00038	0.00042	0.00042	0.0003	0.00042	0.00037	0.00045	0.00038	0.00042	0.00043
Nickel (Ni), dissolved	mg/L	0.00116	0.00116	0.00132	0.00166	0.00135	0.00176	0.00153	0.00144	0.00154	0.0016	0.00115	0.0011	0.00109	0.00125	0.00117	0.00181
Phosphorus (P), dissolved	mg/L			0.003	0.003	0.003	0.002	0.004	0.003	0.003		0.003	0.003	0.004	0.003		0.004
Potassium (K), dissolved	mg/L	0.33	0.31	0.34	0.39	0.4	0.49	0.45	0.45	0.46	0.43	0.23	0.22	0.31	0.4	0.36	0.44
Selenium (Se), dissolved	mg/L	0.00067	0.00058	0.00068	0.00091	0.00087	0.00097	0.00088	0.00095	0.00086	0.00033	0.00039	0.00051	0.00064	0.00066	0.00079	0.0008
Silicon (Si), dissolved	mg/L	2.62	3.1	3.41	3.65	3.29	4.12	4.08	3.82	3.78	2	2.25	2.71	3.7	3.01	3.35	4.07
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000008	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1.51	1.2	1.25	1.38	1.21	1.63	1.61	1.65	1.63	0.65	1.01	1.1	1.36	1.27	1.41	1.55
Strontium (Sr), dissolved	mg/L	0.23	0.193	0.202	0.224	0.228	0.253	0.238	0.266	0.253	0.109	0.159	0.178	0.197	0.194	0.22	0.228
Sulphur (S), dissolved	mg/L	77	55	68	76	83	99	93	94	95	31	49	52	65	62	72	77
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	<0.00001	0.00002
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.00283	0.00192	0.00211	0.0026	0.00249	0.00293	0.00293	0.0032	0.00313	0.000946	0.00149	0.00152	0.00169	0.00199	0.0022	0.00232
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0822	0.0985	0.126	0.103	0.0869	0.0843	0.0614	0.0534	0.0468	0.0613	0.0812	0.0573	0.0647	0.0811	0.079	0.111
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		07/12/2010	13/01/2011	09/02/2011	22/03/2011	19/04/2011	13/05/2011	22/06/2011	20/07/2011	18/08/2011	23/09/2011	24/10/2011	26/11/2011	14/12/2011	13/01/2012	10/02/2012	10/03/2012
Discharge (Flow)	L/s						357.0665	104.985		258.7	286.48	173	125.7		153.7		
Total Suspended Solids	mg/L	2	<1	<1	<1	2	2	<1	72	15	2	3	<1.0	3.2	1.5	1.2	<1.0
pH (field)	pH units	8.1	8.4	8.21	8.02		7.66	8.47	8.4	7.3	8.18	8.2	8.19	8.14	7.8	7.88	7.82
pH (lab)	pH units	7.97	7.9	7.98	7.66	7.9	7.71	8.07	7.73	8.01	8.16	8.09	8.13	7.82	8.12	8.26	8.25
Specific Conductance (field)	µS/cm								301	448	623	722.4		742	714	764.8	
Specific Conductance (lab)	µS/cm	729	699	763	820	813	315	677	304	463	630	690	734	724	755	751	768
Temperature (field)	C	0	0.1	0	0.1	0.9	0.5	8.1	4.1	5.3	2.7	0.3	-0.1	-0.1	0	-0.1	-0.1
Dissolved Oxygen (field)	mg/L											10.68	13.39	12.93	12	14.52	16.1
Dissolved Oxygen (field)	%											73.2	91.6	88.5	82	99.3	109.9
ORP (field)	mV											282				95	60.5
Hardness (from total)	mg/L	392	383	412	495	489	159	385	152	250	325	355	417	396	391	407	421
Hardness (from dissolved)	mg/L	398	396	349	487	465	149	380	155	243	319	368	409	389	406	426	400
Alkalinity, total	mg/L	150	140	150	160	140	64	130	70	110	140	140	147	142	148	150	150
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L	290	210	250	280	280	100	200	88	130	179	195	235	237	225	276	251
Ammonia (N)	mg/L	0.006	0.24	0.033	0.016	0.026	0.016	0.037		0.026	0.13	0.038	0.037	0.088	0.042	0.053	0.043
Nitrite (N)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006		<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05
Nitrate (N)	mg/L	0.12	0.17	0.18	0.15	0.19	0.03	0.04		<2	0.08	0.12	0.152	0.17	0.188	0.204	0.28
Total Kjeldahl Nitrogen	mg/L											0.02	0.314	0.083	0.359	0.122	<0.20
Dissolved Organic Carbon	mg/L	1.3	1.2	1	1.4	1.7	19.4	3.1	12.7	6.8	2.5	1.7	1.68	1.21	1.48	1.92	0.97
Aluminum (Al), total	mg/L	0.0031	0.0042	0.0052	0.0054	0.0052	0.0343	0.0069	0.946	0.0984	0.0174	0.0156	0.0069	0.0109	0.0043	0.0038	0.0035
Antimony (Sb), total	mg/L	0.00018	0.00017	0.00033	0.00028	0.00016	0.0002	0.00034	0.00105	0.00028	0.00025	0.00023	0.00019	0.0002	0.00016	0.00015	0.00016
Arsenic (As), total	mg/L	0.00169	0.00174	0.00185	0.00166	0.00169	0.00298	0.00243	0.0179	0.00313	0.00244	0.00241	0.00177	0.00335	0.00329	0.00345	0.00364
Barium (Ba), total	mg/L	0.0576	0.0512	0.0608	0.0612	0.0533	0.0274	0.0527	0.08	0.0472	0.0491	0.0524	0.0525	0.0572	0.0552	0.056	0.0545
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00004	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.0007	0.000298	0.000646	0.000835	0.000345	0.000793	0.000584	0.00411	0.000898	0.000791	0.000858	0.000732	0.000748	0.00056	0.000462	0.000398
Calcium (Ca), total	mg/L	121	115	129	151	155	48.3	117	44.5	75.1	99.6	110	127	121	120	125	128
Chromium (Cr), total	mg/L	0.0001	0.0006	0.0004	0.0005	0.0003	0.0004	0.0002	0.0016	0.0004	0.0002	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co), total	mg/L	0.000349	0.000166	0.000138	0.000092	0.00007	0.00016	0.000052	0.00214	0.00026	0.000153	0.000417	0.000561	0.000597	0.000592	0.000523	0.000425
Copper (Cu), total	mg/L	0.00026	0.0003	0.00027	0.00117	0.00023	0.0023	0.00059	0.0094	0.0018	0.00068	0.00083	0.00035	0.00045	0.00024	0.0003	0.0002
Iron (Fe), total	mg/L	0.057	0.075	0.065	0.027	0.036	0.272	0.067	2.94	0.366	0.156	0.196	0.078	0.226	0.18	0.176	0.169
Lead (Pb), total	mg/L	0.000654	0.00166	0.00545	0.00316	0.00075	0.00448	0.00103	0.0648	0.00566	0.00123	0.00206	0.000879	0.00265	0.00113	0.00107	0.00102
Lithium (Li), total	mg/L	0.0103	0.0076	0.0087	0.0095	0.0096	0.0028	0.0068	0.0032	0.0043	0.0071	0.0087	0.0097	0.009	0.0098	0.0102	0.0107
Magnesium (Mg), total	mg/L	22.2	23.5	22.2	29	25	9.42	22.4	9.8	15.1	18.5	19.6	24.1	23	22.5	23.2	24.6
Manganese (Mn), total	mg/L	0.613	0.181	0.161	0.122	0.0937	0.126	0.0336	0.652	0.109	0.134	0.284	0.549	0.564	0.446	0.367	0.297
Mercury (Hg), total	mg/L	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001
Molybdenum (Mo), total	mg/L	0.00035	0.00039	0.00035	0.00036	0.00036	0.00021	0.00041	0.00049	0.00034	0.00045	0.00042	0.00037	0.00035	0.00038	0.00034	0.00036
Nickel (Ni), total	mg/L	0.00191	0.00177	0.00147	0.00152	0.0014	0.00202	0.00104	0.0068	0.00178	0.00136	0.00169	0.00257	0.00256	0.0026	0.00247	0.00222
Phosphorus (P), total	mg/L	<0.002	0.005	<0.002	0.009	0.004	0.016	0.002	0.181	0.016	0.006	0.017	0.006	0.002	0.004	0.005	0.008
Potassium (K), total	mg/L	0.5	0.44	0.41	0.92	0.49	0.67	0.38	<0.3	0.27	0.38	0.45	0.45	0.41	0.43	0.46	0.48
Selenium (Se), total	mg/L	0.00074	0.00088	0.00082	0.00092	0.00082	0.00027	0.00067	0.00034	0.00053	0.00074	0.00092	0.00093	0.00099	0.00099	0.00089	0.00093
Silicon (Si), total	mg/L	3.72	3.55	3.27	4.49	4.08	2.14	2.77	3.12	2.9	3.1	3.3	3.9	3.6	3.9	3.6	3.8

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		07/12/2010	13/01/2011	09/02/2011	22/03/2011	19/04/2011	13/05/2011	22/06/2011	20/07/2011	18/08/2011	23/09/2011	24/10/2011	26/11/2011	14/12/2011	13/01/2012	10/02/2012	10/03/2012
Silver (Ag), total	mg/L	<0.000005	0.000013	<0.000005	0.000006	<0.000005	0.000033	0.000007	0.000732	0.000027	0.000011	0.000016	0.000006	0.000009	<0.000005	<0.000005	<0.000005
Sodium (Na), total	mg/L	1.38	1.57	1.4	2.05	1.66	0.7	1.47	0.6	0.98	1.25	1.34	1.6	1.52	1.44	1.53	1.59
Strontium (Sr), total	mg/L	0.24	0.234	0.246	0.278	0.278	0.0984	0.239	0.105	0.16	0.208	0.232	0.239	0.241	0.238	0.241	0.245
Sulphur (S), total	mg/L	92	82	82	112	101	34	90	<50	48	68	82	87	86	105	89	102
Thallium (Tl), total	mg/L	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	0.000002	0.000003	0.000036	0.000005	0.000003	0.000003	0.000002	0.000005	0.000002	<0.000002	0.000003
Tin (Sn), total	mg/L	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.00007	0.00003	<0.0002	<0.00001	0.0001	0.00006	0.00013	0.00003	<0.0002	<0.0002	<0.0002
Titanium (Ti), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	0.024	0.0028	0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	0.00251	0.0028	0.00293	0.00306	0.00302	0.000787	0.0025	0.000817	0.00122	0.00236	0.00247	0.00272	0.00255	0.00262	0.00294	0.00228
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0026	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.116	0.0695	0.0772	0.142	0.0768	0.108	0.0813	0.37	0.104	0.107	0.141	0.131	0.115	0.0945	0.0829	0.0671
Zirconium (Zr), total	mg/L	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.0012	0.002	0.0019	0.0028	0.0036	0.0226	0.0082	0.0308	0.0129	0.0046	0.0021	0.0032	0.0011	0.0012	0.0037	0.0009
Antimony (Sb), dissolved	mg/L	0.00018	0.00016	0.00023	0.00022	0.00018	0.00017	0.00034	0.00031	0.00024	0.00023	0.00024	0.0002	0.00019	0.00015	0.00014	0.00014
Arsenic (As), dissolved	mg/L	0.0013	0.00121	0.00131	0.00149	0.00141	0.00179	0.00212	0.00166	0.00185	0.00169	0.00152	0.00126	0.00165	0.00162	0.00156	0.00167
Barium (Ba), dissolved	mg/L	0.0566	0.051	0.053	0.0628	0.0541	0.028	0.0537	0.0322	0.0408	0.0502	0.0506	0.0528	0.0562	0.0545	0.0532	0.0527
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000513	0.000131	0.000377	0.000735	0.000259	0.000536	0.000562	0.00144	0.000615	0.000556	0.000716	0.000591	0.000313	0.000099	0.000053	0.000042
Calcium (Ca), dissolved	mg/L	122	119	104	149	146	45.8	117	45.2	72.8	98.9	112	125	117	124	129	124
Chromium (Cr), dissolved	mg/L	0.0001	0.0008	0.0003	0.0004	0.0004	0.0004	0.0002	0.0003	0.0003	0.0002	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co), dissolved	mg/L	0.000364	0.000149	0.000135	0.000082	0.000072	0.000109	0.000043	0.00011	0.000089	0.000132	0.000367	0.000554	0.000541	0.00059	0.000516	0.000384
Copper (Cu), dissolved	mg/L	0.0002	0.0002	0.00018	0.00033	0.00127	0.00173	0.00119	0.00219	0.0013	0.00051	0.0003	0.00046	0.00038	0.0002	0.00015	0.00017
Iron (Fe), dissolved	mg/L	0.016	0.01	0.006	0.01	0.014	0.162	0.05	0.091	0.054	0.042	0.017	0.015	0.02	0.01	0.008	0.008
Lead (Pb), dissolved	mg/L	0.000225	0.000071	0.000746	0.000648	0.000508	0.00143	0.00122	0.00166	0.000549	0.000289	0.0001	0.000151	0.000273	0.000064	0.000109	0.000035
Lithium (Li), dissolved	mg/L	0.0102	0.0076	0.0075	0.0097	0.0093	0.0028	0.007	0.0024	0.004	0.0072	0.0083	0.0097	0.0091	0.0105	0.0105	0.0103
Magnesium (Mg), dissolved	mg/L	22.7	23.9	21.6	28.2	24.5	8.46	21.4	10.1	15	17.6	21.2	23.5	23.5	23.4	25.2	22
Manganese (Mn), dissolved	mg/L	0.61	0.175	0.151	0.117	0.0892	0.081	0.0303	0.0368	0.0554	0.122	0.265	0.551	0.55	0.455	0.372	0.269
Mercury (Hg), dissolved	mg/L	<0.00001	0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001		<0.000020	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	0.00038	0.00042	0.00033	0.00035	0.00037	0.00023	0.00046	0.00031	0.00037	0.00045	0.00038	0.00037	0.00036	0.00034	0.00038	0.00036
Nickel (Ni), dissolved	mg/L	0.00207	0.00164	0.00141	0.00131	0.00149	0.00175	0.0011	0.00167	0.00137	0.00127	0.00171	0.00246	0.0024	0.00255	0.00237	0.0021
Phosphorus (P), dissolved	mg/L	<0.002	<0.002	<0.002	0.003	0.005	0.01	<0.002	0.007	0.004	0.004	0.005	0.008	<0.002	0.003	0.004	0.003
Potassium (K), dissolved	mg/L	0.49	0.44	0.41	0.69	0.55	0.62	0.36	0.18	0.27	0.38	0.41	0.47	0.5	0.45	0.48	0.43
Selenium (Se), dissolved	mg/L	0.00079	0.0009	0.00084	0.0009	0.00074	0.00026	0.00064	0.00024	0.00046	0.00075	0.00087	0.00094	0.00094	0.00104	0.00092	0.00092
Silicon (Si), dissolved	mg/L	3.68	3.61	2.54	4.25	3.91	1.86	2.7	2.2	2.7	2.9	3.3	3.8	3.6	4	3.9	3.6
Silver (Ag), dissolved	mg/L	<0.000005	0.000021	<0.000005	<0.000005	<0.000005	0.000016	0.000019	0.000008	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1.43	1.62	1.36	1.8	1.62	0.61	1.44	0.72	1.12	1.18	1.43	1.54	1.64	1.53	1.64	1.45
Strontium (Sr), dissolved	mg/L	0.242	0.234	0.211	0.283	0.273	0.101	0.237	0.101	0.157	0.216	0.224	0.239	0.241	0.248	0.242	0.244
Sulphur (S), dissolved	mg/L	89	83	80	108	104	28	80	28	46	65	82	89	92	108	98	91
Thallium (Tl), dissolved	mg/L	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	0.00016	0.00004	0.00017	0.00006	<0.0002	<0.0002	<0.0002
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.00255	0.00281	0.0025	0.00316	0.00303	0.000796	0.00262	0.000494	0.00149	0.00241	0.00226	0.00264	0.0025	0.0027	0.00291	0.00298
Vanadium (V), dissolved	mg/L	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.113	0.067	0.071	0.135	0.0768	0.0846	0.081	0.181	0.0801	0.0995	0.13	0.126	0.103	0.0882	0.0752	0.0514
Zirconium (Zr), dissolved	mg/L	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		11/03/2012	06/04/2012	01/05/2012	07/05/2012	01/06/2012	05/07/2012	16/07/2012	02/08/2012	21/09/2012	15/10/2012	19/11/2012	07/12/2012	12/01/2013	08/02/2013	08/03/2013	12/04/2013
Discharge (Flow)	L/s			540.4	600.0	368.9875		205.67	258	270.1				75	63.08	90.7	118.1
Total Suspended Solids	mg/L		<1.0	44.8	11.8	5.1	2.2		3	1.7	1.1	1.3	3.4	2.2	1.7	1.8	1.4
pH (field)	pH units	7.83	7.86	8.05	8.17	7.73	8.2		8.06	8.01	7.8	8.12	7.08	6.98	8.51	7.82	7.46
pH (lab)	pH units		8.16	7.69	7.81	7.93	8.13		8.09	8.08	8.1	8.11	8.1	7.85	8.22	8.23	8.07
Specific Conductance (field)	µS/cm	785.8		289.6	244.7	313.3	638.1		617.5	671.4	761.1	717	846	777	817.3	393.1	509.6
Specific Conductance (lab)	µS/cm		760	284	260	431	583		577	602	674	716	744	719	749	774	766
Temperature (field)	C	-0.1	0	0.2	0.7	6.8	7.2		6.7	3.8	-0.1	0	0.05	0.04	0	-0.1	0
Dissolved Oxygen (field)	mg/L	15.13		14.98	15.34		12.4		12.95	12.58	12.61	13.6		14.28	14.05	13.22	12.9
Dissolved Oxygen (field)	%	103.8		103.00	107.20		103.1		106.1	95.6	86.3	93		98.1	95.5	89.7	86.7
ORP (field)	mV	56.8	69.2	171.00	245.00		107		114.8	119.3	116	428.1			86.1	79	61.6
Hardness (from total)	mg/L		391	150	135	198	348		326	296	339	385	401	432	409	408	480
Hardness (from dissolved)	mg/L		410	145	136	197	267		308	316	346	382	388	429	404	435	448
Alkalinity, total	mg/L		148	57.3	58.3		114		121	131	138	153	148	143	151	152	155
Chloride	mg/L			1.2	1.4		1.2		0.78	1.3	1.7	1	1.1	0.87	1.2	1.6	0.83
Fluoride	mg/L																0.124
Sulphate, dissolved	mg/L		215	85.3	74.8	134	185		173	174	199	212	236	236	268	292	272
Ammonia (N)	mg/L		0.031	0.027	0.0092		0.024		0.03	0.0074	0.024	0.034	0.052	0.03	0.032	0.032	0.0177
Nitrite (N)	mg/L		<0.005	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	0.063	<0.0050	<0.0050	<0.0050	<0.0050	0.0019
Nitrate (N)	mg/L		0.218	<0.20	<0.050	<0.20	<0.20		<0.20	<0.20	<0.20	<0.20	0.187	0.188	0.197	0.207	0.207
Total Kjeldahl Nitrogen	mg/L		0.068	0.8	0.573	0.25	0.21		0.28	0.32	0.26	0.89	0.086	0.03	0.064	0.056	0.084
Dissolved Organic Carbon	mg/L		0.53	18	14.5	<0.50	2.94		2.47	3.41	2.3	1.13	1.28	<0.50	0.91	0.92	1.00
Aluminum (Al), total	mg/L		0.003	0.125	0.0737	0.0364	0.0136		0.0181	0.0108	0.00571	0.00867	0.00868	0.00562	0.00813	0.00486	0.0276
Antimony (Sb), total	mg/L		0.00015	0.000313	0.000242	0.000366	0.000286		0.000244	0.000215	0.000294	0.000193	0.000385	0.00019	0.000181	0.000154	0.00032
Arsenic (As), total	mg/L		0.00285	0.0102	0.00413	0.00226	0.00256		0.00266	0.00234	0.00208	0.0017	0.00193	0.00231	0.00273	0.00259	0.00378
Barium (Ba), total	mg/L		0.0514	0.0403	0.0282	0.0391	0.0473		0.0512	0.0485	0.0559	0.06	0.0609	0.0676	0.0578	0.0553	0.0594
Beryllium (Be), total	mg/L		<0.00001	0.000014	<0.000010	0.000015	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
Bismuth (Bi), total	mg/L		<0.000005	<0.0000050	0.000008	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050
Boron (B), total	mg/L		<0.05	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010
Cadmium (Cd), total	mg/L		0.000301	0.00224	0.00343	0.000492	0.000454		0.000523	0.000724	0.00126	0.00069	0.00134	0.000523	0.000435	0.000344	0.000474
Calcium (Ca), total	mg/L		120	45.1	40.7	58.4	107		99.1	89.6	104	117	122	134	126	125	146
Chromium (Cr), total	mg/L		<0.0001	0.00024	0.00012	0.00017	<0.00010		<0.00010	0.00046	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00031
Cobalt (Co), total	mg/L		0.000307	0.00123	0.000414	0.000157	0.000104		0.00013	0.000124	0.000114	0.000289	0.000192	0.00015	0.000199	0.000153	0.00025
Copper (Cu), total	mg/L		0.00018	0.00342	0.00311	0.00385	0.000616		0.000675	0.000636	0.00101	0.000415	0.000418	0.000264	0.000245	0.000374	0.00091
Iron (Fe), total	mg/L		0.125	1.15	0.467	0.147	0.128		0.145	0.144	0.0941	0.0731	0.069	0.0808	0.103	0.0767	0.163
Lead (Pb), total	mg/L		0.000811	0.0206	0.00747	0.00366	0.00147		0.00179	0.00084	0.00102	0.0015	0.00229	0.00202	0.00187	0.00154	0.00748
Lithium (Li), total	mg/L		0.0104	0.00298	0.00244	0.00518	0.00684		0.00701	0.00616	0.00763	0.00827	0.00838	0.00941	0.00979	0.0108	0.0106
Magnesium (Mg), total	mg/L		22.6	8.99	8.19	12.7	19.6		19.2	17.5	19.5	22.7	23.7	23.4	23.2	23	27.8
Manganese (Mn), total	mg/L		0.165	0.67	0.195	0.0722	0.0771		0.0903	0.121	0.106	0.329	0.295	0.201	0.205	0.138	0.161
Mercury (Hg), total	mg/L		<0.00001	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L		0.00035	0.000227	0.000239	0.000408	0.000353		0.000377	0.000368	0.000356	0.000384	0.000303	0.000334	0.000369	0.000396	0.000459
Nickel (Ni), total	mg/L		0.00211	0.00353	0.00268	0.00169	0.00106		0.00122	0.00133	0.0013	0.00228	0.00211	0.00162	0.00188	0.00178	0.00224
Phosphorus (P), total	mg/L		0.003	0.0542	0.018	0.0106	0.0055		<0.0020	<0.0020	0.0036	0.0022	<0.0020	0.0024	0.0035	0.0054	<0.050
Potassium (K), total	mg/L		0.44	0.658	0.517	0.49	0.284		0.287	0.325	0.408	0.422	0.416	0.501	0.456	0.458	0.57
Selenium (Se), total	mg/L		0.00086	0.000294	0.000328	0.000446	0.000667		0.00071	0.000442	0.000781	0.00106	0.000881	0.000805	0.00109	0.00102	0.00099
Silicon (Si), total	mg/L		3.5	1.96	1.82	2.04	3.26		3.18	2.74	3.31	3.59	3.7	4.22	3.95	3.67	4.09

Station Name		KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7	KV-7
Sample Date		11/03/2012	06/04/2012	01/05/2012	07/05/2012	01/06/2012	05/07/2012	16/07/2012	02/08/2012	21/09/2012	15/10/2012	19/11/2012	07/12/2012	12/01/2013	08/02/2013	08/03/2013	12/04/2013
Silver (Ag), total	mg/L		<0.000005	0.0001	0.00004	0.000254	0.0000082		<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000012	<0.0000050	<0.0000050	<0.0000050	0.000046
Sodium (Na), total	mg/L		1.57	0.647	0.606	1.77	1.37		1.36	1.17	1.25	1.51	1.57	1.5	1.6	1.79	1.72
Strontium (Sr), total	mg/L		0.245	0.0957	0.0868	0.143	0.195		0.212	0.204	0.242	0.241	0.248	0.279	0.265	0.269	0.294
Sulphur (S), total	mg/L		91	28	24	47	70		68	61	83	89.3	87	98.6	87	94	98.2
Thallium (Tl), total	mg/L		<0.000002	0.00001	0.000004	0.000003	0.0000022		0.000002	<0.0000020	<0.0000020	<0.0000020	0.000003	<0.0000020	<0.0000020	<0.0000020	<0.000010
Tin (Sn), total	mg/L		<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	0.00029	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Titanium (Ti), total	mg/L		<0.0005	0.00413	0.00149	0.00075	0.00072		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010
Uranium (U), total	mg/L		0.00275	0.00076	0.000668	0.00137	0.00182		0.0018	0.00184	0.00208	0.00265	0.00262	0.00292	0.00301	0.00309	0.00348
Vanadium (V), total	mg/L		<0.0002	0.00045	0.00022	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010
Zinc (Zn), total	mg/L		0.0551	0.225	0.338	0.0589	0.0607		0.0678	0.0957	0.159	0.107	0.178	0.0691	0.0649	0.053	0.0641
Zirconium (Zr), total	mg/L		<0.0001	0.00038	0.00013	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Aluminum (Al), dissolved	mg/L		0.0101	0.0228	0.0342	0.0103	0.00415		0.00565	0.00355	0.00174	0.0017	0.00232	0.00091	0.00161	0.0016	0.0019
Antimony (Sb), dissolved	mg/L		0.00013	0.000171	0.000185	0.000263	0.000244		0.000207	0.000214	0.000259	0.000177	0.000368	0.000186	0.00017	0.000165	0.00016
Arsenic (As), dissolved	mg/L		0.00159	0.00194	0.0019	0.0015	0.00193		0.0019	0.00173	0.00178	0.00122	0.00147	0.00141	0.00154	0.00146	0.00161
Barium (Ba), dissolved	mg/L		0.0535	0.025	0.0239	0.0366	0.0452		0.0477	0.048	0.0529	0.058	0.0622	0.0637	0.0564	0.0539	0.0549
Beryllium (Be), dissolved	mg/L		<0.00001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
Bismuth (Bi), dissolved	mg/L		<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.00050
Boron (B), dissolved	mg/L		<0.05	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010
Cadmium (Cd), dissolved	mg/L		0.000033	0.000473	0.00279	0.000294	0.000316		0.000367	0.000608	0.00113	0.000561	0.00124	0.000294	0.00013	0.000087	0.000061
Calcium (Ca), dissolved	mg/L		125	43.7	41.1	58	79.5		93.4	96.4	106	116	118	133	123	134	137
Chromium (Cr), dissolved	mg/L		<0.0001	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
Cobalt (Co), dissolved	mg/L		0.000247	0.000208	0.000165	0.0000525	0.000053		0.000075	0.000108	0.000092	0.000246	0.000156	0.000144	0.000166	0.000143	0.00018
Copper (Cu), dissolved	mg/L		0.00023	0.00192	0.00221	0.001	0.000445		0.000461	0.000517	0.000541	0.000344	0.000297	0.000314	0.000152	0.000208	0.00027
Iron (Fe), dissolved	mg/L		0.007	0.222	0.207	0.0356	0.0327		0.0372	0.0345	0.0241	0.0075	0.0058	0.0067	0.0093	0.0065	<0.010
Lead (Pb), dissolved	mg/L		0.000037	0.00122	0.00125	0.000549	0.000368		0.000227	0.000141	0.00017	0.000127	0.000312	0.000201	0.000167	0.000128	0.000211
Lithium (Li), dissolved	mg/L		0.0106	0.00293	0.00244	0.0045	0.0067		0.00688	0.00645	0.00744	0.00828	0.00914	0.00957	0.0102	0.0107	0.00944
Magnesium (Mg), dissolved	mg/L		23.7	8.69	7.99	12.5	16.6		18.1	18.3	19.7	22.7	22.7	23.5	23.4	24.5	25.7
Manganese (Mn), dissolved	mg/L		0.153	0.112	0.0821	0.0389	0.0543		0.0662	0.112	0.0984	0.314	0.287	0.189	0.187	0.124	0.123
Mercury (Hg), dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L		0.00034	0.000226	0.000227	0.000326	0.000351		0.000376	0.000376	0.000325	0.000421	0.000341	0.000366	0.000359	0.000388	0.000410
Nickel (Ni), dissolved	mg/L		0.00205	0.00188	0.00186	0.0011	0.000978		0.00107	0.00126	0.00133	0.0021	0.00204	0.00162	0.00187	0.00188	0.00200
Phosphorus (P), dissolved	mg/L		0.004	0.0112	0.0101	0.0048	0.004		<0.0020	<0.0020	<0.0020	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.050
Potassium (K), dissolved	mg/L		0.46	0.656	0.513	0.319	0.267		0.282	0.336	0.406	0.415	0.428	0.493	0.442	0.461	0.50
Selenium (Se), dissolved	mg/L		0.00087	0.000165	0.00028	0.000449	0.000626		0.000659	0.000692	0.000662	0.000898	0.00105	0.00078	0.000897	0.00106	0.00102
Silicon (Si), dissolved	mg/L		3.7	1.78	1.85	2.05	2.18		2.95	3.02	3.41	3.7	3.37	4.11	3.77	4.09	3.70
Silver (Ag), dissolved	mg/L		<0.000005	0.000015	0.000015	0.000007	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010
Sodium (Na), dissolved	mg/L		1.63	0.664	0.585	1.04	1.16		1.3	1.23	1.26	1.49	1.5	1.53	1.61	2.03	1.51
Strontium (Sr), dissolved	mg/L		0.237	0.0939	0.0866	0.14	0.187		0.201	0.203	0.228	0.234	0.247	0.275	0.243	0.265	0.266
Sulphur (S), dissolved	mg/L		95	27	27	46	62		66	66	84	86.3	84.8	98.7	83.9	91	90.6
Thallium (Tl), dissolved	mg/L		<0.000002	0.000002	0.000002	<0.0000020	<0.0000020		0.000002	<0.0000020	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010
Tin (Sn), dissolved	mg/L		<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	0.00027	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Titanium (Ti), dissolved	mg/L		<0.0005	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010
Uranium (U), dissolved	mg/L		0.00263	0.000698	0.000594	0.00138	0.00174		0.00169	0.0018	0.00198	0.00258	0.00243	0.00294	0.00292	0.00319	0.00330
Vanadium (V), dissolved	mg/L		<0.0002	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010
Zinc (Zn), dissolved	mg/L		0.0447	0.0975	0.297	0.0416	0.0513		0.0581	0.0904	0.159	0.108	0.183	0.0731	0.0581	0.0483	0.0430
Zirconium (Zr), dissolved	mg/L		<0.0001	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	0.0001	<0.00010	<0.00010	0.00018	<0.00010	<0.00010	<0.00010	

Data omitted from calculation of summary statistics.

Station Name		KV-7	KV-7	KV-7	KV-7
Sample Date		10/05/2013	07/06/2013	04/07/2013	11/08/2013
Discharge (Flow)	L/s		852	223.8	101.93
Total Suspended Solids	mg/L	15.5	23.2	2.2	<1.0
pH (field)	pH units	8.08	7.9	8.02	8.04
pH (lab)	pH units	7.96	8.05	8.12	8.14
Specific Conductance (field)	µS/cm	515.3	298.2	644.9	666.4
Specific Conductance (lab)	µS/cm	616	328	590	698
Temperature (field)	C	0.1	5.3	7.6	7.6
Dissolved Oxygen (field)	mg/L	12.56	13.24	10.46	12.4
Dissolved Oxygen (field)	%	84.3	103.4	86.2	102
ORP (field)	mV	95	49.4	92.5	192.6
Hardness (from total)	mg/L	358	175	337	396
Hardness (from dissolved)	mg/L	359	177	344	394
Alkalinity, total	mg/L	116	72.3	125	141
Chloride	mg/L	1.51	0.64	1.15	<2.5
Fluoride	mg/L	0.122	0.073	0.103	0.16
Sulphate, dissolved	mg/L	217	107	200	250
Ammonia (N)	mg/L	0.0051	0.0077	<0.0050	<0.0050
Nitrite (N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0050
Nitrate (N)	mg/L	0.0863	0.0469	0.0727	0.064
Total Kjeldahl Nitrogen	mg/L	2.27	0.284	0.175	0.116
Dissolved Organic Carbon	mg/L	5.65	8.91	4.56	1.65
Aluminum (Al), total	mg/L	0.176	0.333	0.0573	0.0111
Antimony (Sb), total	mg/L	0.00078	0.00074	0.00038	0.00033
Arsenic (As), total	mg/L	0.00901	0.00464	0.00315	0.00305
Barium (Ba), total	mg/L	0.0455	0.0409	0.0462	0.0518
Beryllium (Be), total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.00286	0.000864	0.000634	0.000516
Calcium (Ca), total	mg/L	112	53.3	102	118
Chromium (Cr), total	mg/L	0.00049	0.00071	0.00021	0.00013
Cobalt (Co), total	mg/L	0.00058	0.00060	0.00017	<0.00010
Copper (Cu), total	mg/L	0.00317	0.00321	0.00235	0.00053
Iron (Fe), total	mg/L	0.707	0.868	0.205	0.090
Lead (Pb), total	mg/L	0.0236	0.0171	0.00535	0.000908
Lithium (Li), total	mg/L	0.00980	0.00350	0.00615	0.00793
Magnesium (Mg), total	mg/L	18.9	10.0	19.7	24.8
Manganese (Mn), total	mg/L	0.354	0.182	0.118	0.0860
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000369	0.000322	0.000448	0.000496
Nickel (Ni), total	mg/L	0.00286	0.00269	0.00159	0.00119
Phosphorus (P), total	mg/L	<0.050	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	1.10	0.36	0.32	0.37
Selenium (Se), total	mg/L	0.00062	0.00031	0.00055	0.00077
Silicon (Si), total	mg/L	3.28	2.39	2.78	3.01

Station Name		KV-7	KV-7	KV-7	KV-7
Sample Date		10/05/2013	07/06/2013	04/07/2013	11/08/2013
Silver (Ag), total	mg/L	0.000403	0.000173	0.000032	<0.000010
Sodium (Na), total	mg/L	1.34	0.689	1.38	1.48
Strontium (Sr), total	mg/L	0.201	0.112	0.200	0.263
Sulphur (S), total	mg/L	75.6	33.0	64.6	84.4
Thallium (Tl), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	0.00015	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	<0.010	<0.010	<0.010	<0.010
Uranium (U), total	mg/L	0.00206	0.000870	0.00236	0.00302
Vanadium (V), total	mg/L	<0.0010	0.0011	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.163	0.0876	0.0792	0.0671
Zirconium (Zr), total	mg/L	<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.0034	0.0219	0.0186	0.0032
Antimony (Sb), dissolved	mg/L	0.00029	0.00036	0.00032	0.00032
Arsenic (As), dissolved	mg/L	0.00283	0.00194	0.00234	0.00254
Barium (Ba), dissolved	mg/L	0.0388	0.0326	0.0471	0.0509
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.00145	0.000544	0.000498	0.000457
Calcium (Ca), dissolved	mg/L	113	54.4	105	118
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00025	0.00015	0.00011	<0.00010
Copper (Cu), dissolved	mg/L	0.00114	0.00175	0.00098	0.00021
Iron (Fe), dissolved	mg/L	0.063	0.112	0.046	0.031
Lead (Pb), dissolved	mg/L	0.00171	0.00324	0.000713	0.000282
Lithium (Li), dissolved	mg/L	0.00958	0.00306	0.00636	0.00823
Magnesium (Mg), dissolved	mg/L	18.8	9.99	19.8	23.8
Manganese (Mn), dissolved	mg/L	0.190	0.0959	0.0976	0.0797
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000312	0.000293	0.000431	0.000441
Nickel (Ni), dissolved	mg/L	0.00200	0.00178	0.00137	0.00108
Phosphorus (P), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	1.08	0.30	0.29	0.35
Selenium (Se), dissolved	mg/L	0.00057	0.00028	0.00059	0.00072
Silicon (Si), dissolved	mg/L	2.89	1.98	2.75	2.98
Silver (Ag), dissolved	mg/L	<0.000010	0.000023	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.30	0.689	1.21	1.49
Strontium (Sr), dissolved	mg/L	0.197	0.106	0.203	0.253
Sulphur (S), dissolved	mg/L	74.1	33.4	64.0	82.5
Thallium (Tl), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00202	0.000867	0.00229	0.00289
Vanadium (V), dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.114	0.0655	0.0699	0.0642
Zirconium (Zr), dissolved	mg/L	<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		24/01/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	25/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005	27/05/2005	30/06/2005
Discharge (Flow)	L/s	302			268		347						383	302		357		268
Total Suspended Solids	mg/L		<3	<3		<1	14	<2	1	<1	<2	1	<1	2	<2	5	4	<2
pH (field)	pH units	7.68	8.97		8.34	8.3	7.15	8.4	7.81	7.72	7.21	7.24	7.5	7.68	8.97	8.4	8.7	8.34
pH (lab)	pH units		7.69	7.63	7.9	8.2	7.97	8.1	8.18	7.93	7.8	7.95	7.91	7.8	7.8	7.71	7.65	8.11
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm		781	597	590	689	528	740	690	784	760	766	827	890	840	783	399	616
Temperature (field)	C	0.1			9.8	9.9	7.8	8.1	0.8	0.7	0.1		0.1	0.1		0.1	6	9.8
Dissolved Oxygen (field)	mg/L						9.2											
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L											440						
Hardness (from dissolved)	mg/L		440	307	286	416	291	425	375	436	406	461	474	480	476	418	188	301
Alkalinity, total	mg/L		149	109	118	133	102	143	145	173	158	160	164	173	171	156	76	129
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L		285	233	199		160	274	219	249	248	277						
Ammonia (N)	mg/L						<0.05											
Nitrite (N)	mg/L						<0.05											
Nitrate (N)	mg/L						0.1											
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	
Aluminum (Al), total	mg/L		0.06	<0.01	0.06	0.006	0.306	<0.01	0.009	<0.005	0.007		<0.005	<0.05	0.02	0.16	0.197	<0.005
Antimony (Sb), total	mg/L		<0.02	<0.02	<0.02	0.0005	0.0004	<0.02	0.0003	0.0004	0.0005	0.0004	0.0004	0.0054	0.0004	0.0008	0.0005	0.0004
Arsenic (As), total	mg/L		0.06	<0.04	<0.04	0.0028	0.0043	<0.04	0.0024	0.0024	0.0021	0.0026	0.0014	<0.002	0.0022	0.0028	0.0027	0.0024
Barium (Ba), total	mg/L		0.0567	0.0404	0.0497	0.054	0.055	0.0511	0.053	0.061	0.056	0.057	0.061	0.064	0.058	0.052	0.041	0.053
Beryllium (Be), total	mg/L		0.0022	<0.0006	<0.0006	<0.0001	<0.0001	<0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		0.12	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005		<0.0005	0.0083	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L					0.003	0.033		<0.002	<0.002	<0.002	0.003	<0.002	<0.02	0.002	<0.002	0.002	<0.002
Cadmium (Cd), total	mg/L		0.0056	0.0077	0.0056	0.00121	0.0033	0.0024	0.00145	0.0023	0.00122	0.00117	0.00185	0.00074	0.00066	0.00124	0.00275	0.0012
Calcium (Ca), total	mg/L		126	55.8	88.2	113	84.7	116	113	131	122		138	144	132	126	54.8	89.9
Chromium (Cr), total	mg/L		0.002	<0.001	<0.001	0.0009	0.0005	<0.001	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	<0.005	<0.0005	<0.0005	0.0005	<0.0005
Cobalt (Co), total	mg/L		<0.001	<0.001	<0.001	<0.0001	0.0005	<0.001	0.0002	0.0002	0.0001	0.0002	0.0002	<0.001	<0.0001	0.0002	0.0002	<0.0001
Copper (Cu), total	mg/L		0.008	<0.001	0.007	0.004	0.003	0.002	0.002	<0.001	<0.001	0.007	<0.001	<0.010	0.001	0.002	0.002	<0.001
Iron (Fe), total	mg/L		0.056	0.121	0.416	0.1	0.6	0.033	0.2	0.1	0.1		<0.1	<0.1	0.1	0.4	0.5	0.1
Lead (Pb), total	mg/L		0.027	<0.01	0.022	0.0017	0.0068	<0.01	0.0008	0.0007	0.0017	0.0058	0.0011	0.0014	0.002	0.0052	0.0051	0.0013
Lithium (Li), total	mg/L		0.007	<0.007	<0.007	0.01	0.007	0.009	0.007	0.008	0.006		0.008	<0.01	0.008	0.009	0.003	0.005
Magnesium (Mg), total	mg/L		25.5	13.2	16.7	23.6	18	21	23.8	28.6	24.6		28.1	29.9	26.5	24.8	11.4	18.8
Manganese (Mn), total	mg/L		1.86	1.18	1.28	0.176	0.264	0.391	0.258	0.231	0.246		0.285	0.189	0.11	0.21	0.094	0.074
Mercury (Hg), total	mg/L											<0.0002						
Molybdenum (Mo), total	mg/L		<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L		0.01	0.005	0.004	0.0026	0.004	<0.002	0.0022	0.0081	0.0019	0.003	0.0031	0.0061	0.002	0.011	0.0022	0.0014
Phosphorus (P), total	mg/L		0.31	<0.06	<0.06			0.13										
Potassium (K), total	mg/L		<1	<1	<1	<0.4	<0.4	<1	0.5	0.6	<0.4		0.8	0.6	0.6	0.9	<0.4	<0.4
Selenium (Se), total	mg/L		<0.1	<0.1	<0.1	0.0009	0.0008	<0.1	0.0006	0.0008	0.0009	0.0007	0.0006	<0.002	0.0007	0.0007	0.0003	0.0006
Silicon (Si), total	mg/L		4	2.8	2.6	2.3	2.78	2.5	2.71	3.47	3.1		3.75	4.3	3.9	3.6	2.91	2.3

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		24/01/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	25/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005	27/05/2005	30/06/2005
Silver (Ag), total	mg/L		<0.002	<0.002	<0.002	0.0003	0.0003	<0.002	0.0001	<0.0001	0.0005	<0.0001	0.0001	<0.001	<0.0001	0.0002	0.0002	<0.0001
Sodium (Na), total	mg/L		1.45	0.9	1.23	1.4	1.1	1.17	1.5	1.7	1.7		1.6	2	2	2	0.8	1.2
Strontium (Sr), total	mg/L		0.27	0.193	0.183	0.256	0.183	0.277	0.241	0.293	0.27		0.262	0.319	0.305	0.273	0.13	0.232
Sulphur (S), total	mg/L		104	68.3	51.5	77.7	52.4	74	71	82.6	78.3	88.1	94	100	91.7	85.2	34.2	57
Thallium (Tl), total	mg/L					<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001		<0.001	<0.01	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L		0.028	<0.004	<0.004	0.0049	0.0119	0.007	0.0042	0.0058	0.004	0.0064	0.0056	0.0061	0.004	0.0068	0.0065	0.0032
Uranium (U), total	mg/L		<0.07	<0.07	<0.07	0.0031	0.0019	<0.07	0.0029	0.003	0.0035	0.0037	0.0039	<0.005	0.004	0.004	0.0011	0.0023
Vanadium (V), total	mg/L		<0.001	<0.001	<0.001	<0.0001	0.0009	<0.001	<0.0001	0.003	0.0003		<0.0001	<0.001	0.0001	0.0002	0.0007	0.0001
Zinc (Zn), total	mg/L		1.910	1.860	1.470	0.322	0.569	0.614	0.398	0.614	0.385	0.362	0.36	0.291	0.2	0.373	0.43	0.214
Zirconium (Zr), total	mg/L		<0.006	<0.006	<0.006	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001		<0.001	<0.010	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L		<0.01	<0.01	0.02	<0.005	0.008	0.04	0.016	<0.005	<0.005	<0.005	<0.005	<0.050	<0.005	0.17	0.08	<0.005
Antimony (Sb), dissolved	mg/L		<0.02	<0.02	<0.02	0.0004	0.0004	<0.02	0.0003	0.0004	0.0003	0.0003	0.0004	<0.0020	0.0003	0.0008	<0.002	0.0004
Arsenic (As), dissolved	mg/L		<0.04	<0.04	<0.04	0.0027	0.0026	<0.04	0.002	0.0015	0.001	0.0013	0.0013	<0.002	0.001	0.0032	0.002	0.0023
Barium (Ba), dissolved	mg/L		0.0517	0.039	0.0492	0.053	0.043	0.049	0.052	0.065	0.054	0.063	0.061	0.06	0.057	0.05	0.04	0.052
Beryllium (Be), dissolved	mg/L		0.0011	<0.0006	<0.0006	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.001	<0.0001
Bismuth (Bi), dissolved	mg/L		0.06	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.005	<0.0005
Boron (B), dissolved	mg/L					<0.002	<0.002	0.0036	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02	0.002	<0.002	<0.02	<0.002
Cadmium (Cd), dissolved	mg/L		0.0033	0.0081	0.005	0.00076	0.00276	134	0.00123	0.00218	0.001	0.00105	0.00186	0.00076	0.00053	0.00114	0.00297	0.00109
Calcium (Ca), dissolved	mg/L		125	45.8	87.3	124	86.5		112	129	122	138	143	144	145	126	56	89.8
Chromium (Cr), dissolved	mg/L		0.002	<0.001	<0.001	0.001	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	0.0005	<0.005	<0.0005
Cobalt (Co), dissolved	mg/L		<0.001	<0.001	<0.001	<0.0001	0.0001	<0.001	<0.0001	0.0002	<0.0001	0.0001	0.0002	<0.001	<0.0001	<0.0001	<0.001	<0.0001
Copper (Cu), dissolved	mg/L		0.007	<0.001	0.007	<0.001	0.002	0.004	0.009	<0.001	<0.001	0.004	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001
Iron (Fe), dissolved	mg/L		<0.002	0.03	0.064	0.01	0.07	0.117	0.03	0.02	0.01	0.013	<0.01	0.02	<0.01	0.3	0.24	0.03
Lead (Pb), dissolved	mg/L		<0.01	<0.01	<0.01	0.0001	0.0006	<0.01	0.0001	<0.0001	<0.0001	0.0007	0.0003	<0.001	<0.0001	0.0042	0.005	0.0003
Lithium (Li), dissolved	mg/L		<0.007	<0.007	<0.007	0.009	0.005	0.009	0.007	0.007	0.006		0.008	<0.01	0.007	0.008	<0.01	0.006
Magnesium (Mg), dissolved	mg/L		24	11.3	16.5	25.9	18.3	21.7	23.6	27.6	24.7	28.3	28.4	29.1	27.7	24.9	11.6	18.7
Manganese (Mn), dissolved	mg/L		1.84	1.17	1.26	0.174	0.211	0.763	0.247	0.236	0.23	0.245	0.296	0.177	0.093	0.22	0.094	0.071
Mercury (Hg), dissolved	mg/L											<0.0001						
Molybdenum (Mo), dissolved	mg/L		<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001
Nickel (Ni), dissolved	mg/L		0.005	0.004	0.003	0.0021	0.0027	<0.002	0.0023	<0.0005	0.0007	0.0021	0.0015	<0.005	0.0006	0.0097	<0.005	0.0013
Phosphorus (P), dissolved	mg/L		0.24	<0.06	<0.06			0.14										
Potassium (K), dissolved	mg/L		<1	<1	<1	<0.4	<0.4	<1	0.5	0.4	0.6		0.8	0.5	0.6	0.5	<0.4	<0.4
Selenium (Se), dissolved	mg/L		<0.1	<0.1	<0.1	0.0007	0.0005	<0.1	0.0008	0.0007	0.0008	0.0007	0.0003	<0.002	0.0007	0.0008	<0.002	0.0006
Silicon (Si), dissolved	mg/L		4	2.8	2.3	2.57	2.45	2.5	2.82	3.87	3.26	4.05	4.14	4.18	4.2	3.8	2.5	2.28
Silver (Ag), dissolved	mg/L		<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.001	<0.0001
Sodium (Na), dissolved	mg/L		1.43	0.66	1.22	1.6	1.1	1.82	1.5	1.6	1.8	2.2	1.7	2.2	2	2	0.9	0.9
Strontium (Sr), dissolved	mg/L		0.267	0.182	0.182	0.247	0.181	0.282	0.247	0.279	0.242	0.292	0.273	0.304	0.302	0.267	0.12	0.219
Sulphur (S), dissolved	mg/L		103	67.6	50.6	85.4	53.5	76.6	73	83.1	77.1	92.4	96	98.7	97.8	89.4	35.1	61.4
Thallium (Tl), dissolved	mg/L					<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.0005	<0.00005
Tin (Sn), dissolved	mg/L		<0.01	0.019	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.001
Titanium (Ti), dissolved	mg/L		<0.004	<0.004	<0.004	0.005	0.0032	0.009	0.0089	0.0058	0.0039	0.0054	0.0055	<0.005	0.005	0.0061	<0.005	0.0035
Uranium (U), dissolved	mg/L		<0.06	<0.06	<0.06	0.003	0.0017	<0.06	0.0029	0.0031	0.0036	0.0039	0.0037	<0.005	0.004	0.003	<0.005	0.0022
Vanadium (V), dissolved	mg/L		<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	0.0007	0.0001	0.0001	0.0001	0.0006	<0.001	0.0001	0.0006	<0.001	0.0002
Zinc (Zn), dissolved	mg/L		1.89	1.84	0.768	0.221	0.503	0.856	0.383	0.586	0.357	0.322	0.362	0.233	0.188	0.389	0.43	0.196
Zirconium (Zr), dissolved	mg/L		<0.005	<0.005	<0.005			<0.005				<0.001						

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		20/07/2005	22/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	25/10/2006	22/01/2007	18/04/2007	29/05/2007
Discharge (Flow)	L/s				282	336		332	313		221		263.1					
Total Suspended Solids	mg/L	<2	3	2	<2	4	<3	<2	<2	9								
pH (field)	pH units		8.13	7.81	7.82	7.16	7.4	7.16			6.9		7.4	7.9	8.3	7.38	7.5	8.06
pH (lab)	pH units	8	8.13	7.94	7.89	7.92	7.89	7.81	7.86	7.4	8	8.14	8.21	8.09	8	7.52	7.29	7.62
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	609	584	597	637	762	700	731	712	222	391	620	622	636	674	826	253	264
Temperature (field)	C		4.5	0.8	0.2	0.2	0.2	-0.1	0.1		5.5					0.4	0.5	3.2
Dissolved Oxygen (field)	mg/L		12.9															
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L																	
Hardness (from dissolved)	mg/L	321	317	285		331	392	376	392	100								
Alkalinity, total	mg/L	145	137	136	144	154	151	156	150	58								
Chloride	mg/L									0.29								
Fluoride	mg/L									0.04								
Sulphate, dissolved	mg/L			158			230	267	274	50								
Ammonia (N)	mg/L	<0.002	<0.002	<0.05	0.008													
Nitrite (N)	mg/L	<0.03	<0.03							<0.03								
Nitrate (N)	mg/L	0.05	0.06		0.1					0.03								
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	
Aluminum (Al), total	mg/L	0.013	0.05	0.048	0.014	0.02	0.014	0.008	0.026	0.19	1.2	0.014	0.02	0.011	0.01	0.006	0.059	0.611
Antimony (Sb), total	mg/L	0.0004	0.0003	0.0003	0.0002	0.0006	0.0003	0.0003	0.0003	0.0004	0.0006	0.0004	<0.0004	0.0003	0.0003	0.0004	0.0003	0.001
Arsenic (As), total	mg/L	0.0028	0.0028	0.0026	0.0024	0.0018	0.002	0.0018	0.002	0.0026	0.0114	0.003	0.0031	0.0027	0.0022	0.0018	0.0016	0.0077
Barium (Ba), total	mg/L	0.051	0.05	0.046	0.049	0.059	0.054	0.064	0.053	0.028	0.069	0.059	0.054	0.051	0.05	0.062	0.023	0.043
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Boron (B), total	mg/L	0.005	<0.002	0.002	0.003	<0.002	0.002	0.002	0.002	<0.002	0.003	0.005	<0.004	<0.002	<0.002	<0.002	<0.002	0.005
Cadmium (Cd), total	mg/L	0.00182	0.00279	0.00179	0.00148	0.00071	0.0006	0.00066	0.00104	0.0013	0.00334	0.00134	0.00129	0.001	0.00107	0.00093	0.00075	0.00197
Calcium (Ca), total	mg/L	94	87.6	83.6	99.7	110	122	130	125	31.7	61.5	102	102	99.4	104	144	34	42.5
Chromium (Cr), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.001	<0.0005	0.0009	<0.0005	<0.0005	0.0022	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	0.001	0.002
Cobalt (Co), total	mg/L	<0.0001	0.0004	0.0002	0.0003	0.0001	<0.0001	0.0003	<0.0001	0.0002	0.0015	<0.0001	<0.0002	0.0003	<0.0001	<0.0001	0.0001	0.0007
Copper (Cu), total	mg/L	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.002	0.001	0.003	0.007	0.001	<0.002	0.001	<0.001	0.004	0.002	0.005
Iron (Fe), total	mg/L	0.1	0.3	0.2	0.1	0.1	0.2	0.2	0.1	0.4	3	0.1	<0.2	0.2	0.1	<0.1	0.1	1
Lead (Pb), total	mg/L	0.0014	0.0023	0.0025	0.0008	0.0034	0.0019	0.0033	0.0016	0.0068	0.0197	0.0014	0.002	0.0014	0.001	0.0006	0.002	0.0286
Lithium (Li), total	mg/L	0.008	0.005	0.005	0.008	0.004	0.008	0.01	0.007	0.002	0.005	0.007	0.006	0.006	0.007	0.01	0.003	0.003
Magnesium (Mg), total	mg/L	19.3	18.8	16.4	19.5	12.9	21.9	26.8	22.4	6.5	12.3	19.2	20.8	19.9	21.2	27.9	13.7	7.4
Manganese (Mn), total	mg/L	0.149	0.386	0.203	0.135	0.121	0.239	0.132	0.117	0.114	0.349	0.202	0.18	0.148	0.1	0.278	0.079	0.286
Mercury (Hg), total	mg/L																	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Nickel (Ni), total	mg/L	0.0017	0.0012	0.0021	0.0023	0.001	<0.0005	0.0021	0.0014	0.0016	0.0068	0.0019	0.0041	0.0017	0.0007	0.0017	0.0011	0.0038
Phosphorus (P), total	mg/L			<0.1														
Potassium (K), total	mg/L	0.6	<0.4	<0.4	0.4	<0.4	0.5	0.5	0.7	<0.4	<0.4	<0.4	<0.8	<0.4	0.5	0.6	1	<0.8
Selenium (Se), total	mg/L	0.0007	0.0009	0.0007	0.0011	0.0004	0.0009	0.0012	0.0008	0.0003	0.0005	0.0008	0.0005	0.0005	0.0007	0.0008	0.0003	<0.0004
Silicon (Si), total	mg/L	2.47	2.91	2.74	3	1.98	3.67	4.08	3.45	1.71	3.72	2.63	2.88	2.6	3	4.4	0.9	2.55

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		20/07/2005	22/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	25/10/2006	22/01/2007	18/04/2007	29/05/2007
Silver (Ag), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
Sodium (Na), total	mg/L	1.3	1.1	1.2	1.4	1	1.5	1.6	1.8	0.7	0.8	1.5	1	1	1.5	1.7	0.9	<0.8
Strontium (Sr), total	mg/L	0.229	0.197	0.185	0.26	0.24	0.245	0.288	0.26	0.074	0.137	0.247	0.209	0.211	0.221	0.313	0.073	0.09
Sulphur (S), total	mg/L	62.8	54.6	48	59.9	66.4	78.9	83	85.3	16.5	36.9	69.4	66.2	66.2	63	94.8	33.1	25.5
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00013									<0.00005	<0.00005	<0.0001
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Titanium (Ti), total	mg/L	0.004	0.0038	0.0039	0.006	0.0049	0.0042	0.0061	0.0041	0.0066	0.031	0.044	0.0041	0.0041	0.0045	0.0057	0.0392	0.0998
Uranium (U), total	mg/L	0.0023	0.0021	0.002	0.0025	0.0024	0.0041	0.0036	0.0027	0.0005	0.0013	0.0021	0.0027	0.0025	0.0027	0.0034	0.0007	<0.001
Vanadium (V), total	mg/L	0.0003	0.0002	0.0003	0.0003	<0.0001	0.0001	0.0002	0.0002	0.0006	0.0036	0.0002	<0.0002	0.0001	0.0001	0.0002	0.0003	0.0022
Zinc (Zn), total	mg/L	0.282	0.564	0.301	0.388	0.165	0.154	0.198	0.186	0.196	0.669	0.197	0.246	0.227	0.247	0.312	0.118	0.318
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Aluminum (Al), dissolved	mg/L	0.008	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.03	0.022	0.006	0.008	<0.005	<0.005	<0.005	<0.005	0.033
Antimony (Sb), dissolved	mg/L	0.0003	0.0003	0.0003	0.0002	0.0004	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0003	0.0003	0.0003	0.0004	0.0002	0.0004
Arsenic (As), dissolved	mg/L	0.0028	0.0022	0.0023	0.0018	0.0022	0.0013	0.0011	0.0016	0.0015	0.0019	0.0021	0.0028	0.0025	0.0016	0.0016	0.0015	0.0022
Barium (Ba), dissolved	mg/L	0.048	0.052	0.049	0.047	0.088	0.052	0.052	0.053	0.025	0.035	0.052	0.05	0.051	0.049	0.062	0.018	0.027
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L	0.00171	0.00194	0.00159	0.00136	0.00087	0.00045	0.0005	0.00101	0.00097	0.00169	0.00115	0.00099	0.00094	0.00088	0.00082	0.00069	0.00114
Calcium (Ca), dissolved	mg/L	95.7	93	85.8	101	112	117	112	121	31.6	58	103	102	99.2	108	138	33.4	41.1
Chromium (Cr), dissolved	mg/L	<0.0005	0.0007	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	0.0005	<0.0005	0.0006	<0.0005	0.0009	<0.0005	0.0048	<0.0005	<0.0005	0.0007
Cobalt (Co), dissolved	mg/L	<0.0001	0.0002	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
Copper (Cu), dissolved	mg/L	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.002
Iron (Fe), dissolved	mg/L	0.04	<0.01	0.04	0.03	<0.01	<0.01	<0.01	0.03	0.09	0.08	0.04	0.09	0.08	0.03	<0.01	0.02	0.12
Lead (Pb), dissolved	mg/L	0.0013	<0.0001	0.0004	0.0002	0.0005	0.0004	0.0004	0.0005	0.0011	0.0008	0.0004	0.0011	0.0004	<0.0001	0.0004	0.0012	0.0032
Lithium (Li), dissolved	mg/L	0.005	0.006	0.005	0.005	0.011	0.008	0.007	0.008	0.002	0.003	0.006	0.006	0.007	0.006	0.008	0.003	0.003
Magnesium (Mg), dissolved	mg/L	19.9	20.6	17.2	19.9	12.7	24.3	23.2	21.7	6.5	12.4	21.5	20.9	19.7	23.6	25.5	12.7	7.8
Manganese (Mn), dissolved	mg/L	0.144	0.329	0.189	0.132	0.122	0.117	0.106	0.116	0.051	0.125	0.206	0.17	0.144	0.096	0.251	0.072	0.096
Mercury (Hg), dissolved	mg/L																	
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	0.0007	<0.0005	0.0011	0.0007	0.001	<0.0005	<0.0005	<0.0005	0.0011	0.0023	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	0.0006
Phosphorus (P), dissolved	mg/L																	
Potassium (K), dissolved	mg/L	0.4	<0.4	<0.4	<0.4	<0.4	0.5	0.5	0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.6	0.9	<0.4
Selenium (Se), dissolved	mg/L	0.0005	0.0009	0.0007	0.0008	0.0013	0.0009	0.0011	0.0008	<0.0002	0.0005	<0.0002	0.0004	0.0008	0.0007	0.0007	0.0002	<0.0002
Silicon (Si), dissolved	mg/L	2.44	3	2.8	3.17	1.37	3.75	3.65	3.37	1.5	2.38	2.95	2.79	2.59	3.16	4.17	0.75	1.78
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L	1.3	0.9	1.2	1.5	1	1.5	1.5	2	<0.4	0.8	1.3	1.4	1	1.4	1.6	0.8	0.6
Strontium (Sr), dissolved	mg/L	0.219	0.213	0.196	0.233	0.423	0.258	0.239	0.259	0.072	0.14	0.181	0.212	0.21	0.22	0.315	0.075	0.09
Sulphur (S), dissolved	mg/L	62.6	60.2	50.6	62.9	67.1	76.8	73.7	84.5	16.6	34.4	68.3	66.2	64.5	68.1	91.7	33.6	25.4
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005									<0.00005	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	0.004	0.0034	0.0035	0.0039	0.0079	0.0041	0.0044	0.0031	0.0016	0.0028	0.0479	0.0041	0.0044	0.0044	0.0086	0.0035	0.0525
Uranium (U), dissolved	mg/L	0.002	0.002	0.0018	0.0022	0.005	0.0031	0.0027	0.0031	<0.0005	0.0009	0.0023	0.0027	0.0025	0.0026	0.0034	0.0006	0.0006
Vanadium (V), dissolved	mg/L	0.0001	0.0019	0.0004	0.0002	<0.0001	0.0003	0.0002	0.0005	0.0002	0.0001	0.0004	0.0005	0.0006	0.0007	0.0006	0.0002	0.0006
Zinc (Zn), dissolved	mg/L	0.242	0.351	0.265	0.274	0.264	0.141	0.143	0.177	0.165	0.313	0.146	0.21	0.214	0.33	0.282	0.131	0.197
Zirconium (Zr), dissolved	mg/L																	

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		16/06/2007	13/07/2007	31/08/2007	05/09/2007	31/10/2007	12/11/2007	27/11/2007	29/02/2008	17/05/2008	20/06/2008	03/07/2008	13/08/2008	18/09/2008	03/10/2008	20/12/2008	01/02/2009	10/03/2009
Discharge (Flow)	L/s			159.145	200.28							210	488.35	412.38	724.44			
Total Suspended Solids	mg/L						2	<2	<2	11	<5	11	13	40	89	<2	14	5
pH (field)	pH units	8.04	8.05	8.05	7.98	8.27	7.01	8.12	7.83	7.66		7.07	7.37	7.52	7.39			
pH (lab)	pH units		8.1	8.21	8.17	8.07	7.74	7.99	8.04	7.9	8.2	8.15	7.98	8.03		8.22	7.88	7.85
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm		415	628	622	638	621	1130	965	338	613	547	434	450		633	678	719
Temperature (field)	C	13.0	6.2	6.3	4.1	0.2	0.2	0.1		0		5	4.5	5	5			
Dissolved Oxygen (field)	mg/L																	
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L																	
Hardness (from dissolved)	mg/L						334	666	633	173	327	287	226	246	234	344	393	375
Alkalinity, total	mg/L																	
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L																	
Ammonia (N)	mg/L																	
Nitrite (N)	mg/L																	
Nitrate (N)	mg/L																	
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L									9.8			7.7	8.6	6.4	3.5	1.2	
Aluminum (Al), total	mg/L	0.111	0.998	0.115	0.078	0.082	0.011	0.01	<0.005	0.317	0.011	0.38	0.24	0.446	0.215	0.024	0.028	0.068
Antimony (Sb), total	mg/L	0.0005	0.0005	0.0005	0.0003	0.0003	0.0004	0.0012	0.0006	0.0003	0.0004	0.0004	0.0003	<0.0002	0.0003	0.0003	0.0004	0.001
Arsenic (As), total	mg/L	0.0043	0.0056	0.0033	0.0039	0.002	0.0021	0.0036	0.0032	0.0032	0.0026	0.0035	0.003	0.0044	0.0028	0.0018	0.002	0.0029
Barium (Ba), total	mg/L	0.048	0.07	0.06	0.053	0.058	0.064	0.108	0.082	0.042	0.052	0.059	0.052	0.054	0.051	0.056	0.054	0.059
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00004	<0.00004	<0.0001	<0.00004	<0.00004
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001
Boron (B), total	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004	0.002	<0.002	<0.002	0.005	0.002	<0.005	<0.005	<0.002	<0.005	<0.005
Cadmium (Cd), total	mg/L	0.00142	0.00173	0.00101	0.00123	0.00171	0.00103	0.00131	0.00266	0.00099	0.0008	0.00072	0.00167	0.00181	0.00153	0.00077	0.00068	0.00066
Calcium (Ca), total	mg/L	80.8	67.6	102	100	105	114	201	168	51.8	101	89.2	72.3	73.3	66.9	97.8	126	106
Chromium (Cr), total	mg/L	0.0009	0.0018	0.0007	<0.0005	0.0008	0.0016	0.0006	0.0017	0.0009	<0.0005	0.0014	0.001	0.0012	0.0008	<0.0005	0.0009	0.0006
Cobalt (Co), total	mg/L	0.0002	0.0008	0.0001	0.0002	<0.0001	0.0002	<0.0001	<0.0001	0.0004	0.0001	0.0005	0.0003	0.00054	0.0004	<0.0001	0.00009	0.00017
Copper (Cu), total	mg/L	0.002	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.003	<0.001	0.002	0.002	0.003	0.003	<0.001	0.003	0.002
Iron (Fe), total	mg/L	0.3	1.7	0.3	0.3	0.2	<0.1	<0.1	<0.1	0.5	0.07	0.75	0.46	1.17	0.49	0.12	0.13	0.27
Lead (Pb), total	mg/L	0.005	0.009	0.0101	0.0023	0.0027	0.0016	0.0024	0.0008	0.0048	0.0018	0.0048	0.0038	0.0085	0.0043	0.0017	0.0041	0.0059
Lithium (Li), total	mg/L	0.006	0.005	0.006	0.006	0.007	0.008	0.015	0.012	0.003	0.006	0.006	0.005	0.004	0.003	0.006	0.007	0.008
Magnesium (Mg), total	mg/L	16.2	14.6	20	19.8	20.8	22.3	42.4	37.4	9.7	20	18	14.6	14.8	14.3	19.6	24.5	23.2
Manganese (Mn), total	mg/L	0.16	0.179	0.156	0.175	0.106	0.232	0.223	0.154	0.276	0.042	0.085	0.115	0.175	0.117	0.168	0.108	0.124
Mercury (Hg), total	mg/L																	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00033	0.00036	<0.001	0.00022	0.00049
Nickel (Ni), total	mg/L	0.0024	0.0026	0.001	0.0025	0.0019	0.0017	0.0018	0.0033	0.002	0.0024	0.0052	0.0024	0.001	0.003	0.001	0.002	0.002
Phosphorus (P), total	mg/L											0.004	0.008	0.04	<0.01		<0.01	0.011
Potassium (K), total	mg/L	<0.4	0.4	<0.4	0.4	0.4	0.9	0.9	1.9	0.6	0.4	<0.4	<0.4	0.44	0.4	<0.4	0.5	0.7
Selenium (Se), total	mg/L	0.0006	0.001	0.0008	0.0008	0.0008	0.001	0.0021	0.0018	0.0002	0.0008	0.0004	0.0005	<0.0006	0.0006	0.001	<0.0006	<0.0006
Silicon (Si), total	mg/L	2.56	4.21	2.69	2.83	3.44	3.7	6.85	4.75	2.44	2.54	3.01	2.8	3.23	2.9	3.39	3.78	3.48

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		16/06/2007	13/07/2007	31/08/2007	05/09/2007	31/10/2007	12/11/2007	27/11/2007	29/02/2008	17/05/2008	20/06/2008	03/07/2008	13/08/2008	18/09/2008	03/10/2008	20/12/2008	01/02/2009	10/03/2009
Silver (Ag), total	mg/L	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00007	0.00032	0.00006	0.00004	<0.00001	<0.00001	0.00001	<0.00001	0.00003
Sodium (Na), total	mg/L	1.1	1	1.3	1.4	1.3	2.8	3.6	2.6	0.7	1.4	1.3	0.9	1	1.04	2.5	1.57	1.61
Strontium (Sr), total	mg/L	0.192	0.174	0.264	0.23	0.262	0.237	0.489	0.392	0.114	0.242	0.215	0.18	0.156	0.154	0.214	0.226	0.247
Sulphur (S), total	mg/L	54.1	41.7	64.8	66	67.3	72.8	133	122	32.9	67.1	57.3	41.2			61.3	81	70.7
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001		<0.00001	<0.00001
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0006	<0.0001	<0.001	0.0004	<0.0001
Titanium (Ti), total	mg/L	0.0431	0.07	0.0078	0.0062	0.0076	0.0038	0.0098	0.0068	0.0107	0.0053	0.0201	0.0096	0.054	0.0055	0.0039	0.0011	0.0026
Uranium (U), total	mg/L	0.0018	0.0016	0.0028	0.0025	0.0025	0.0029	0.0058	0.0041	0.001	0.003	0.0021	0.0012	0.0012	0.0012	0.0027	0.0026	0.0031
Vanadium (V), total	mg/L	0.0005	0.0024	0.0004	0.0004	0.0003	0.0001	0.0001	0.0001	0.0012	<0.0001	0.0013	0.0008	0.00134	0.0007	0.0003	0.00013	0.00022
Zinc (Zn), total	mg/L	0.264	0.228	0.174	0.229	0.333	0.234	0.312	0.48	0.165	0.102	0.118	0.245	0.215	0.234	0.126	0.111	0.109
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0002	0.0002	<0.001	0.0003	<0.0001
Aluminum (Al), dissolved	mg/L	0.027	0.022	0.017	0.008	<0.005	<0.005	<0.005	<0.02	0.033	0.006	0.012	0.013	0.018	0.011	<0.005	<0.005	0.005
Antimony (Sb), dissolved	mg/L	0.0005	0.0004	0.0012	0.0011	0.0017	0.0005	0.0009	<0.001		0.0014	0.001	0.0009	0.0012	0.0012	0.0003	0.0009	0.0013
Arsenic (As), dissolved	mg/L	0.0031	0.0025	0.0026	0.0028	0.0016	0.0011	0.0031	0.003	0.0022	0.0026	0.0024	0.002	0.0017	0.0015	0.0016	0.0014	0.0014
Barium (Ba), dissolved	mg/L	0.047	0.046	0.058	0.053	0.058	0.054	0.103	0.055	0.035	0.052	0.046	0.046	0.042	0.04	0.056	0.056	0.063
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.0001	<0.00004	<0.00004
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005	<0.0001	<0.0001
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.01	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.002	<0.004	<0.004
Cadmium (Cd), dissolved	mg/L	0.00114	0.00103	0.00078	0.00109	0.00159	0.00079	0.00097	0.0027	0.00082	0.00051	0.00053	0.00153	0.00102	0.00125	0.00054	0.00037	0.00027
Calcium (Ca), dissolved	mg/L	81.3	71.1	99.5	103	106	100	198	188	52.9	98.9	84.7	67.4	73.8	69.6	104	118	110
Chromium (Cr), dissolved	mg/L	0.0007	<0.0005	0.0005	<0.0005	<0.0005	0.001	0.0007	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.0006	<0.0005	<0.0004	0.0006
Cobalt (Co), dissolved	mg/L	<0.0001	0.0002	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0005	0.0002	<0.0001	0.0001	0.0002	0.00029	0.00027	0.0002	0.00009	0.00022
Copper (Cu), dissolved	mg/L	0.002	0.002	0.001	<0.001	<0.001	<0.001	0.001	<0.005	0.002	<0.001	0.002	0.002	0.002	0.001	<0.001	0.001	0.033
Iron (Fe), dissolved	mg/L	0.08	0.1	0.05	0.08	0.02	<0.01	0.01	0.04	0.1	0.04	0.05	0.07	0.08	0.076	<0.01	0.01	0.01
Lead (Pb), dissolved	mg/L	0.0016	0.0019	0.0016	0.0006	0.0003	0.0002	0.0014	<0.0005	0.004	0.0008	0.0007	0.0008	0.0008	0.0008	<0.0001	0.0002	0.0002
Lithium (Li), dissolved	mg/L	0.006	0.004	0.006	0.006	0.006	0.005	0.015	0.01	0.003	0.006	0.006	0.004	0.004	0.003	0.006	0.007	0.006
Magnesium (Mg), dissolved	mg/L	16.1	13.5	19.8	20.1	21.5	20.3	41.8	39.9	10	19.5	18.2	14	14.8	14.7	20.8	23.7	24.1
Manganese (Mn), dissolved	mg/L	0.132	0.065	0.114	0.161	0.088	0.196	0.2	0.162	0.247	0.038	0.043	0.065	0.084	0.0676	0.159	0.0909	0.0641
Mercury (Hg), dissolved	mg/L																	
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	0.00027	0.00032	<0.001	0.00021	0.00035
Nickel (Ni), dissolved	mg/L	<0.0005	0.0006	0.004	0.0025	<0.0005	0.0012	<0.0005	0.003	0.0013	0.0015	0.0048	0.0015	0.001	0.002	0.001	0.002	0.07
Phosphorus (P), dissolved	mg/L													0.01	<0.01		<0.01	<0.01
Potassium (K), dissolved	mg/L	0.4	<0.4	<0.4	0.4	0.4	0.5	0.9	1.8	0.5	<0.4	<0.4	<0.4	0.37	0.3	0.4	0.5	0.9
Selenium (Se), dissolved	mg/L	0.0006	0.0003	0.0007	0.001	0.0006	0.0008	0.0018	<0.001	<0.0002	0.0005	0.0003	0.0005	0.0016	<0.0006	0.001	<0.0006	0.0007
Silicon (Si), dissolved	mg/L	2.36	2.4	2.61	2.68	3.27	3.35	6.86	6.4	1.84	2.53	2.27	2.49	2.67	2.64	3.47	3.5	3.4
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001	0.00004	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Sodium (Na), dissolved	mg/L	1.1	1	1.3	1.4	1.4	2.2	3.8	3.6	0.7	1.2	1.3	0.9	1.06	1	1.5	1.6	1.8
Strontium (Sr), dissolved	mg/L	0.201	0.168	0.243	0.239	0.259	0.208	0.446	0.38	0.118	0.216	0.209	0.16	0.159	0.145	0.22	0.225	0.237
Sulphur (S), dissolved	mg/L	54.6	42.3	64.8	67.3	67.5	62.4	129	128	33.4	66.3	55.5	40.3			63.3	68.2	72
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001		<0.00001	<0.00001
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001
Titanium (Ti), dissolved	mg/L	0.0688	0.0491	0.0044	0.0041	0.0055	0.0029	0.0125	0.0063	0.0021	0.0024	0.0086	0.0036	0.0003	0.0004	0.0024	0.0002	0.0004
Uranium (U), dissolved	mg/L	0.0018	0.0014	0.0027	0.0025	0.0025	0.0025	0.0053	0.004	0.001	0.0026	0.002	0.0011	0.0013	0.0011	0.0028	0.0028	0.0031
Vanadium (V), dissolved	mg/L	0.0004	0.0003	0.0002	0.0009	0.0001	0.002	0.0003	<0.0005	0.0003	<0.0001	0.0003	0.0002	0.00026	0.00011	0.0001	0.00006	0.00006
Zinc (Zn), dissolved	mg/L	0.217	0.164	0.15	0.213	0.308	0.211	0.276	0.513	0.163	0.1	0.096	0.221	0.16	0.19	0.138	0.113	0.242
Zirconium (Zr), dissolved	mg/L													0.0002	0.0001		0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		15/04/2009	27/05/2009	05/06/2009	06/07/2009	11/08/2009	08/09/2009	09/10/2009	08/04/2010	28/05/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	17/11/2010	07/12/2010	09/02/2011	22/03/2011
Discharge (Flow)	L/s		1421.154	356.11	94.06		220.16				340.0533	230.559	137.65	130.976				
Total Suspended Solids	mg/L	5	11	18	2	<4	1	27	3	2	3	5	2	2	8	2	67	3
pH (field)	pH units		6.85	7.97	8.29		7.76	7.83	8.22	7.89	8.35	8.12	7.45	8.15	8.2	7.87	7.83	7.7
pH (lab)	pH units	8	7.8	8	8.2	8.3	8.1	8.1	8.1	8.2	8.07	8.05	8.14	8.11	8.12	7.91	7.94	7.89
Specific Conductance (field)	µS/cm																	
Specific Conductance (lab)	µS/cm	700	210	320	570	654	517	600	814	483	517	548	604	630	677	711	835	869
Temperature (field)	C		4.5	7.5	8.7		6	0.8	0.2	4.8	8.7	8.3	3.5	0	0	0	0.3	0
Dissolved Oxygen (field)	mg/L																	
Dissolved Oxygen (field)	%																	
ORP (field)	mV																	
Hardness (from total)	mg/L	388	95.9	156	318	347	292	312	456	242	266	298	321	329	387	381	457	530
Hardness (from dissolved)	mg/L	383	102	155	322	362	280	326	507	274	266	289	315	338	390	384	398	515
Alkalinity, total	mg/L												130	140	150	150	160	180
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L					180	140	150	300	150	160		170	200	200	270	280	290
Ammonia (N)	mg/L											0.06		<0.005	0.006	<0.005	0.021	0.02
Nitrite (N)	mg/L													<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (N)	mg/L													0.08	0.15	0.12	0.17	0.18
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L	3.9	7.8	5.8	3.1	1.9	4.1	2.8	2.4	3.3	5.4	2	3.7	2.5	1.2	1.3	1.4	1.9
Aluminum (Al), total	mg/L	0.0288	0.0911	0.0626	0.011	0.0056	0.0105	0.142	0.0152	0.0199	0.0196	0.0245	0.0087	0.0074	0.0114	0.0035	0.0839	0.0053
Antimony (Sb), total	mg/L	0.00045	0.00052	0.00055	0.00038	0.00041	0.00034	0.00053	0.00037	0.00036	0.00039	0.00039	0.00031	0.00028	0.00034	0.00028	0.00064	0.00043
Arsenic (As), total	mg/L	0.00242	0.0028	0.00278	0.00287	0.0029	0.0022	0.00793	0.00207	0.0019	0.00265	0.00385	0.00346	0.00345	0.00277	0.00186	0.00779	0.00175
Barium (Ba), total	mg/L	0.0563	0.0285	0.036	0.0494	0.0507	0.0468	0.0595	0.0564	0.0416	0.0432	0.0489	0.0475	0.0472	0.0496	0.0559	0.0764	0.0697
Beryllium (Be), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000008	<0.000005	<0.000005	<0.000005	<0.000005	0.000008	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000593	0.0015	0.00125	0.00073	0.000819	0.000969	0.00219	0.000458	0.000361	0.000863	0.000849	0.000818	0.00074	0.000789	0.000909	0.00228	0.00142
Calcium (Ca), total	mg/L	118	29.1	47.5	96.1	104	89	95	137	74.3	79.6	89	95.4	98.7	118	115	140	161
Chromium (Cr), total	mg/L	0.0012	0.0003	0.0002	0.0002	0.0001	0.0003	0.0005	0.0007	0.0002	0.0005	0.0004	0.0004	0.0003	0.0004	<0.0001	0.0005	0.0004
Cobalt (Co), total	mg/L	0.000205	0.000205	0.000151	0.000051	0.000061	0.000053	0.000499	0.000102	0.000081	0.000081	0.00011	0.000085	0.000077	0.00009	0.000082	0.000394	0.00008
Copper (Cu), total	mg/L	0.00439	0.00241	0.00209	0.0009	0.00044	0.00074	0.00223	0.00066	0.00083	0.00128	0.00089	0.00062	0.00039	0.0005	0.0003	0.00137	0.001
Iron (Fe), total	mg/L	0.146	0.232	0.217	0.084	0.106	0.096	0.88	0.099	0.103	0.106	0.169	0.132	0.178	0.152	0.062	0.585	0.068
Lead (Pb), total	mg/L	0.00387	0.0141	0.00883	0.00192	0.00193	0.00152	0.0273	0.00176	0.00154	0.0022	0.00525	0.00226	0.00243	0.00326	0.00143	0.0602	0.00252
Lithium (Li), total	mg/L	0.0077	0.002	0.0031	0.0051	0.0066	0.0046	0.0054	0.0101	0.0051	0.0055	0.0057	0.0063	0.0071	0.0075	0.0092	0.0096	0.0092
Magnesium (Mg), total	mg/L	23.1	5.66	8.96	18.9	21.1	16.9	18.2	27.4	13.7	16.4	18.5	20	20	22.5	22.6	26.4	30.9
Manganese (Mn), total	mg/L	0.078	0.13	0.082	0.0517	0.0793	0.0715	0.323	0.0709	0.0437	0.0564	0.0942	0.112	0.131	0.156	0.19	0.29	0.145
Mercury (Hg), total	mg/L	<0.00001	<0.00001	0.00001	<0.00001		<0.00001		<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00002
Molybdenum (Mo), total	mg/L	0.00042	0.00023	0.00031	0.00039	0.00042	0.00037	0.00041	0.00045	0.00037	0.00041	0.00042	0.00042	0.00037	0.0004	0.00032	0.00033	0.00037
Nickel (Ni), total	mg/L	0.00332	0.00343	0.00148	0.00106	0.00094	0.00118	0.00233	0.0014	0.00098	0.00121	0.0012	0.00116	0.00107	0.00143	0.00138	0.00198	0.00148
Phosphorus (P), total	mg/L	0.019	0.018	0.01	0.004		0.004		0.006	0.005	0.005	0.015	0.005		0.005	<0.002	0.031	0.006
Potassium (K), total	mg/L	1.11	0.32	0.32	0.38	0.32	0.34	0.36	0.59	0.32	0.29	0.34	0.4	0.36	0.44	0.5	0.62	0.95
Selenium (Se), total	mg/L	0.0009	0.00021	0.00032	0.00065	0.00072	0.00057	0.00083	0.00103	0.00053	0.00048	0.00066	0.00061	0.00067	0.00072	0.00067	0.00087	0.00089
Silicon (Si), total	mg/L	3.57	1.53	2.13	2.35	2.43	3.17	3.89	3.44	2.46	2.55	2.88	2.87	3.17	3.89	3.62	3.69	4.9

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		15/04/2009	27/05/2009	05/06/2009	06/07/2009	11/08/2009	08/09/2009	09/10/2009	08/04/2010	28/05/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	17/11/2010	07/12/2010	09/02/2011	22/03/2011
Silver (Ag), total	mg/L	0.000006	0.00007	0.000041	<0.000005	0.000006	0.000009	0.000037	<0.000005	0.000008	0.000014	0.00003	0.000012	0.000011	0.000028	<0.000005	0.000011	<0.000005
Sodium (Na), total	mg/L	1.91	0.43	0.75	1.44	1.43	1.16	1.22	1.9	0.96	1.11	1.29	1.35	1.34	1.53	1.37	1.71	2.04
Strontium (Sr), total	mg/L	0.246	0.0668	0.111	0.203	0.222	0.189	0.2	0.272	0.168	0.186	0.208	0.206	0.218	0.237	0.237	0.296	0.301
Sulphur (S), total	mg/L	85	20	32	63	73	57	66	105	50	54	61	68	71	80	88	101	117
Thallium (Tl), total	mg/L	0.000004	0.000005	0.000005	<0.000002	<0.000002	<0.000002	0.000007	<0.000002	<0.000002	0.000002	0.000002	0.000002	<0.000002	<0.000002	<0.000002	0.000006	0.000002
Tin (Sn), total	mg/L	0.00024	<0.00001	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	0.00004	<0.00001	0.00002	0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.00001	<0.00001
Titanium (Ti), total	mg/L	<0.0005	0.0017	0.0019	0.0005	<0.0005	<0.0005	0.0067	0.0006	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	0.0025	<0.0005
Uranium (U), total	mg/L	0.00317	0.000402	0.000842	0.0022	0.00259	0.00181	0.00216	0.00335	0.00175	0.00143	0.00182	0.00181	0.00203	0.00246	0.00235	0.0031	0.00318
Vanadium (V), total	mg/L	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.132	0.19	0.145	0.101	0.131	0.126	0.249	0.0847	0.0473	0.102	0.111	0.119	0.116	0.146	0.156	0.251	0.212
Zirconium (Zr), total	mg/L	0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.0041	0.0414	0.0399	0.0146	0.0037	0.0106	0.0031	0.0211	0.0094	0.0091	0.0046	0.0085	0.0087	0.0024	0.0017	0.0023	0.0027
Antimony (Sb), dissolved	mg/L	0.0004	0.0004	0.00055	0.00039	0.00041	0.00036	0.00035	0.00041	0.00036	0.00034	0.00035	0.00029	0.00027	0.00031	0.00026	0.00035	0.00042
Arsenic (As), dissolved	mg/L	0.0015	0.00144	0.0018	0.00272	0.00251	0.00216	0.00196	0.0019	0.00156	0.00233	0.00278	0.00286	0.00232	0.00172	0.00141	0.00149	0.00138
Barium (Ba), dissolved	mg/L	0.054	0.0241	0.0341	0.0496	0.0505	0.046	0.0503	0.0612	0.0424	0.0419	0.0462	0.044	0.0469	0.0503	0.055	0.0581	0.072
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000313	0.00101	0.0011	0.000646	0.000766	0.000937	0.000981	0.000529	0.000314	0.000746	0.000667	0.000737	0.000601	0.000683	0.000753	0.000862	0.00132
Calcium (Ca), dissolved	mg/L	114	31.1	47.5	97.5	109	84.7	100	154	83.8	79.7	86.4	95.7	102	118	116	120	155
Chromium (Cr), dissolved	mg/L	0.0004	0.0003	0.0004	0.0002	0.0001	0.0003	0.0003	0.0005	0.0002	0.0003	0.0004	0.0004	0.0004	0.0003	0.0005	0.0004	0.0004
Cobalt (Co), dissolved	mg/L	0.000092	0.00006	0.000084	0.000055	0.000061	0.00005	0.000089	0.000068	0.000044	0.000055	0.000044	0.000103	0.000074	0.000071	0.000078	0.000036	0.000061
Copper (Cu), dissolved	mg/L	0.00234	0.00191	0.00269	0.00085	0.00047	0.00088	0.0008	0.00071	0.00076	0.00105	0.00066	0.00081	0.00043	0.00042	0.00029	0.00029	0.00053
Iron (Fe), dissolved	mg/L	0.021	0.081	0.096	0.075	0.046	0.065	0.064	0.03	0.04	0.057	0.032	0.085	0.053	0.029	0.033	0.011	0.03
Lead (Pb), dissolved	mg/L	0.00101	0.00289	0.00396	0.00154	0.000693	0.00125	0.000594	0.000262	0.000466	0.00139	0.000498	0.00159	0.000392	0.00021	0.000321	0.000296	0.000509
Lithium (Li), dissolved	mg/L	0.0078	0.0019	0.0029	0.0054	0.0067	0.0046	0.0061	0.0115	0.0054	0.0056	0.0054	0.0061	0.0073	0.0077	0.0086	0.0084	0.0094
Magnesium (Mg), dissolved	mg/L	23.9	5.99	8.87	19.1	21.7	16.6	18.5	29.9	15.6	16.2	17.7	18.6	20.1	23.4	22.8	24	31
Manganese (Mn), dissolved	mg/L	0.053	0.0329	0.0363	0.0503	0.0798	0.0652	0.099	0.0645	0.0328	0.0483	0.0609	0.107	0.115	0.136	0.183	0.0576	0.143
Mercury (Hg), dissolved	mg/L	<0.00001	0.00001	<0.00001	<0.00001		<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00002
Molybdenum (Mo), dissolved	mg/L	0.00038	0.00019	0.00032	0.00038	0.00042	0.0004	0.00045	0.0005	0.00041	0.00037	0.00041	0.0004	0.00037	0.00041	0.00037	0.0003	0.00035
Nickel (Ni), dissolved	mg/L	0.00168	0.00141	0.00157	0.00101	0.00112	0.00121	0.00129	0.00142	0.00098	0.00112	0.00105	0.00119	0.0011	0.00137	0.00152	0.00107	0.00134
Phosphorus (P), dissolved	mg/L	0.008	0.007	0.007	0.006		0.006	0.006	0.004	0.002	0.003	0.003	0.004		0.003	<0.002	<0.002	0.005
Potassium (K), dissolved	mg/L	1.02	0.34	0.54	0.31	0.35	0.33	0.37	0.71	0.35	0.24	0.32	0.42	0.38	0.46	0.48	0.56	0.9
Selenium (Se), dissolved	mg/L	0.00089	0.0002	0.00031	0.00063	0.00067	0.00051	0.00072	0.00104	0.00049	0.00045	0.0006	0.00058	0.00065	0.00074	0.00069	0.00081	0.0009
Silicon (Si), dissolved	mg/L	3.53	1.42	2	2.59	2.7	2.81	3.42	4.59	2.74	2.56	2.64	2.92	3.27	3.86	3.52	2.98	4.35
Silver (Ag), dissolved	mg/L	<0.000005	0.000043	0.000066	0.000007	<0.000005	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	0.000008	0.000012	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1.94	0.45	1.18	1.32	1.48	1.28	1.24	2.17	1.09	1.07	1.25	1.25	1.36	1.6	1.41	1.52	1.98
Strontium (Sr), dissolved	mg/L	0.246	0.0679	0.112	0.204	0.223	0.189	0.212	0.308	0.172	0.18	0.195	0.194	0.22	0.241	0.237	0.253	0.304
Sulphur (S), dissolved	mg/L	83	21	28	65	75	54	64	116	55	56	60	62	69	82	84	93	116
Thallium (Tl), dissolved	mg/L	<0.000002	0.000002	0.000003	<0.000002	<0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003
Tin (Sn), dissolved	mg/L	0.00013	<0.00001	0.00007	0.00001	<0.00001	0.00003	<0.00001	0.00002	<0.00001	0.00001	0.00002	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti), dissolved	mg/L	<0.0005	0.0009	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.00332	0.00039	0.000785	0.0022	0.00262	0.00184	0.00229	0.0037	0.00172	0.00139	0.00166	0.00183	0.00208	0.00245	0.00233	0.00273	0.0032
Vanadium (V), dissolved	mg/L	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.102	0.155	0.127	0.0935	0.129	0.13	0.15	0.0927	0.0445	0.0926	0.0935	0.111	0.105	0.137	0.146	0.141	0.213
Zirconium (Zr), dissolved	mg/L	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		19/04/2011	25/05/2011	22/06/2011	20/07/2011	19/08/2011	24/09/2011	24/10/2011	24/11/2011	15/12/2011	13/01/2012	10/02/2012	10/03/2012	06/04/2012	05/05/2012	01/06/2012	05/07/2012	02/08/2012
Discharge (Flow)	L/s			106.99			290.185	188	137.5	134	162.2		90.4		677.0	388.94		192
Total Suspended Solids	mg/L	<1	12	6	17	16	1	1	<1.0	1.1	<1.0	3.3	<1.0	4.3	1.7	2.1	<1.0	1.2
pH (field)	pH units		8.1	8.41	7.76	7.42	7.52	7.65	8.16	7.79	7.62	7.62	9.73	7.74	7.86	7.87	8.09	8.01
pH (lab)	pH units	7.91	7.73	8.05	7.68	7.94	8.03	8.03	8.04	8.03	8.04	8.16	8.38	8.12	8.01	8.08	8.13	8.16
Specific Conductance (field)	µS/cm				285	465	601	713.9		728.4	657.2	586.3	771.1		278.5	311.11	660	622.3
Specific Conductance (lab)	µS/cm	807	194	639	295	463	603	685	743	720	741	735	958	734	279	421	601	582
Temperature (field)	C	0.5	3.5	9	4.7	5.1	3	0	-0.1	-0.1	0	-0.1	-0.1	-0.1	0.0	6.7	7.6	7.2
Dissolved Oxygen (field)	mg/L							11.4	13.26	12.73	11.8	13.31	15.63	11.8	15.27		11.75	13.29
Dissolved Oxygen (field)	%							78.2	90	87.1	81	91	107.9	80.5	104.70		98.7	110.8
ORP (field)	mV							269.2				100.8	53.7	86.5	39.20		95.5	122.5
Hardness (from total)	mg/L	465	94.1	374	140	248	314	351	397	384	403	418	542	407	143	194	356	336
Hardness (from dissolved)	mg/L	458	92.1	354	151	243	311	355	434	400	401	409	489	410	139	191	296	308
Alkalinity, total	mg/L	150	43	130	66	110	130					149						
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L	290	48	200	82	130	183	196	242	184	215	219	321	206	81.6		198	186
Ammonia (N)	mg/L	0.016				0.45												
Nitrite (N)	mg/L	<0.005				<0.5												
Nitrate (N)	mg/L	0.19				<2												
Total Kjeldahl Nitrogen	mg/L								0.344									
Dissolved Organic Carbon	mg/L	1.6	9.1	3.6	14.2	7.2	3.3	2	2.84	1.61	1.14	1.55	2.26	<0.50	18.6	5	2.55	3.23
Aluminum (Al), total	mg/L	0.0034	0.15	0.0874	0.26	0.0975	0.0093	0.0037	0.0059	0.0033	0.0026	0.0024	0.0031	0.0512	0.035	0.0217	0.00699	0.0108
Antimony (Sb), total	mg/L	0.00028	0.00458	0.00076	0.00058	0.00028	0.00027	0.00029	0.00025	0.00023	0.00022	0.00021	0.00028	0.00026	0.000214	0.000352	0.000468	0.00028
Arsenic (As), total	mg/L	0.00158	0.00371	0.00822	0.00424	0.00313	0.00299	0.00238	0.00175	0.00212	0.0021	0.00198	0.00262	0.00192	0.00308	0.00254	0.00274	0.00304
Barium (Ba), total	mg/L	0.0547	0.0314	0.0594	0.0384	0.046	0.0456	0.0515	0.0532	0.0519	0.0521	0.0512	0.0591	0.0495	0.026	0.035	0.0473	0.0479
Beryllium (Be), total	mg/L	<0.00001	0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	<0.000005	0.000011	<0.000005	<0.00002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.000619	0.00142	0.00175	0.00292	0.000903	0.00106	0.000942	0.000974	0.000688	0.000472	0.000412	0.000667	0.000305	0.000785	0.000683	0.000559	0.000607
Calcium (Ca), total	mg/L	145	28.8	114	41.6	74.3	95.5	109	119	116	125	129	164	126	42.7	56.7	107	104
Chromium (Cr), total	mg/L	0.0003	0.0004	0.0004	0.0007	0.0004	0.0002	<0.0001	0.0026	<0.0001	<0.0001	<0.0001	0.0001	0.0003	<0.00010	0.00013	<0.00010	<0.00010
Cobalt (Co), total	mg/L	0.000037	0.00029	0.000343	0.00044	0.000261	0.000089	0.000122	0.000178	0.000158	0.000136	0.000098	0.000084	0.000085	0.000168	0.0000784	0.0000591	0.000066
Copper (Cu), total	mg/L	0.00079	0.00339	0.00195	0.0034	0.00188	0.00067	0.00043	0.00054	0.00039	0.00024	0.00018	0.00047	0.0006	0.00243	0.00132	0.000701	0.000686
Iron (Fe), total	mg/L	0.034	0.351	0.551	0.71	0.356	0.15	0.097	0.075	0.078	0.072	0.065	0.052	0.071	0.291	0.115	0.101	0.123
Lead (Pb), total	mg/L	0.00116	0.121	0.0284	0.0142	0.00382	0.00149	0.00101	0.00231	0.0013	0.00103	0.000846	0.000678	0.00394	0.00516	0.00416	0.00162	0.00176
Lithium (Li), total	mg/L	0.0086	0.0017	0.0063	0.0023	0.004	0.0065	0.0079	0.0097	0.0084	0.0092	0.0095	0.0124	0.0096	0.0027	0.00424	0.00717	0.00677
Magnesium (Mg), total	mg/L	25.1	5.41	21.8	8.8	15.1	18.4	19.4	24.1	22.8	21.8	23.2	32.5	22.6	8.74	12.8	21.7	18.7
Manganese (Mn), total	mg/L	0.0739	0.19	0.328	0.184	0.103	0.122	0.136	0.229	0.201	0.144	0.117	0.0865	0.0533	0.12	0.0515	0.0695	0.0572
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00032	0.00023	0.00044	0.00036	0.00037	0.00041	0.00036	0.0004	0.00034	0.0003	0.00052	0.00046	0.00037	0.000212	0.000302	0.000373	0.00038
Nickel (Ni), total	mg/L	0.00117	0.00179	0.00175	0.0028	0.00181	0.00128	0.00124	0.00325	0.00185	0.00163	0.00156	0.00153	0.00431	0.00202	0.00127	0.00115	0.001
Phosphorus (P), total	mg/L	0.004	0.021	0.02	0.026	0.017	0.004	0.005	0.004	<0.002	0.003	0.005	0.012	0.003	0.0171	0.0088	0.0068	<0.0020
Potassium (K), total	mg/L	0.59	0.31	0.46	<0.3	0.27	0.38	0.43	0.46	0.41	0.43	0.47	1.14	0.45	0.585	0.339	0.332	0.29
Selenium (Se), total	mg/L	0.0008	0.00019	0.0006	0.00023	0.00049	0.0007	0.00085	0.00087	0.00088	0.00101	0.00093	0.00125	0.00086	0.000252	0.000382	0.000557	0.000692
Silicon (Si), total	mg/L	4.01	1.83	2.94	2.46	2.8	2.9	3.2	3.7	3.4	4.1	3.8	4.8	3.6	1.84	1.98	2.99	3.2

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		19/04/2011	25/05/2011	22/06/2011	20/07/2011	19/08/2011	24/09/2011	24/10/2011	24/11/2011	15/12/2011	13/01/2012	10/02/2012	10/03/2012	06/04/2012	05/05/2012	01/06/2012	05/07/2012	02/08/2012
Silver (Ag), total	mg/L	0.000007	0.000609	0.000208	0.00016	0.000028	0.000014	0.000007	0.00001	0.000008	0.000005	0.000006	<0.000005	0.000007	0.000041	0.0000092	0.0000084	0.000006
Sodium (Na), total	mg/L	1.67	0.43	1.44	0.6	1	1.21	1.27	1.58	1.53	1.46	1.71	3.22	1.55	0.648	1.07	1.54	1.33
Strontium (Sr), total	mg/L	0.272	0.0643	0.238	0.0913	0.156	0.2	0.233	0.245	0.237	0.231	0.232	0.31	0.24	0.0936	0.134	0.205	0.213
Sulphur (S), total	mg/L	102	18	82	<50	49	65	78	88	83	103	93	132	89	28	47	77	65
Thallium (Tl), total	mg/L	<0.000002	0.000027	0.000048	0.000009	0.000005	<0.000002	0.000002	<0.000002	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	0.0000025	0.0000021	<0.0000020
Tin (Sn), total	mg/L	<0.00001	0.00007	0.00004	<0.0002	0.00001	0.00013	0.00004	0.00016	0.00004	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), total	mg/L	<0.0005	0.0055	0.0026	0.008	0.0028	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00126	0.0008	<0.00050	<0.00050
Uranium (U), total	mg/L	0.00281	0.000379	0.00237	0.000458	0.00122	0.00229	0.00235	0.00264	0.00244	0.00239	0.00243	0.0029	0.00266	0.000731	0.0012	0.00185	0.00174
Vanadium (V), total	mg/L	<0.0002	0.0004	0.0003	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	0.117	0.163	0.18	0.31	0.105	0.139	0.152	0.182	0.129	0.102	0.0945	0.0965	0.0784	0.138	0.0894	0.0846	0.0777
Zirconium (Zr), total	mg/L	<0.0001	0.0003	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.00010	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	0.0019	0.0393	0.0125	0.0292	0.0149	0.0047	0.0033	0.0029	0.0009	0.0012	0.0318	0.0012	0.0022	0.021	0.0116	0.00381	0.00471
Antimony (Sb), dissolved	mg/L	0.00028	0.00109	0.00054	0.00033	0.00025	0.00027	0.00027	0.00026	0.00022	0.00022	0.00021	0.00027	0.00022	0.000186	0.000318	0.000315	0.000278
Arsenic (As), dissolved	mg/L	0.00141	0.0017	0.00402	0.00204	0.00181	0.00245	0.00183	0.00141	0.00152	0.00167	0.00149	0.00202	0.00135	0.00198	0.00194	0.00242	0.00247
Barium (Ba), dissolved	mg/L	0.0551	0.0245	0.0541	0.0303	0.0418	0.0471	0.0504	0.0524	0.0546	0.0505	0.0527	0.0579	0.0512	0.0238	0.0309	0.0469	0.0473
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.000553	0.0006	0.000736	0.00244	0.00059	0.00086	0.000851	0.000924	0.000505	0.000294	0.000219	0.000384	0.000157	0.000551	0.000547	0.000504	0.000496
Calcium (Ca), dissolved	mg/L	143	27.9	108	44.4	73	97.1	108	132	122	122	125	149	126	42.2	55.9	90.2	92.9
Chromium (Cr), dissolved	mg/L	0.0004	0.0051	0.0003	0.0003	0.0003	0.0003	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	0.0001	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00003	0.000096	0.000074	0.000091	0.000083	0.000086	0.000116	0.000147	0.000146	0.000138	0.000108	0.000085	0.000042	0.000098	0.0000417	0.0000526	0.000048
Copper (Cu), dissolved	mg/L	0.0003	0.00372	0.00109	0.00244	0.00121	0.0006	0.00037	0.00061	0.00015	0.00028	0.00022	0.00042	0.00038	0.00203	0.0011	0.000466	0.000534
Iron (Fe), dissolved	mg/L	0.014	0.108	0.115	0.107	0.059	0.078	0.029	0.025	0.02	0.014	0.01	0.011	0.011	0.175	0.0459	0.0492	0.0553
Lead (Pb), dissolved	mg/L	0.00029	0.0146	0.00411	0.00205	0.000563	0.000438	0.000173	0.000269	0.000118	0.0001	0.000067	0.000094	0.00018	0.00158	0.000602	0.00051	0.000587
Lithium (Li), dissolved	mg/L	0.009	0.0017	0.0065	0.0021	0.0039	0.0068	0.0075	0.01	0.0087	0.0092	0.0097	0.0117	0.0096	0.00279	0.00421	0.00708	0.00666
Magnesium (Mg), dissolved	mg/L	24.4	5.45	20.6	9.83	14.7	16.6	20.7	25.4	23.4	23.3	23.5	28.5	23.1	8.26	12.4	17.2	18.5
Manganese (Mn), dissolved	mg/L	0.0691	0.00711	0.0635	0.0528	0.0548	0.112	0.131	0.233	0.196	0.145	0.112	0.0782	0.0405	0.0767	0.0263	0.0562	0.0523
Mercury (Hg), dissolved	mg/L	<0.000002	<0.00001	<0.00001	<0.00001		<0.00001		<0.000020	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00037	0.00079	0.00045	0.00029	0.00036	0.00046	0.00035	0.00036	0.00036	0.00034	0.00035	0.00045	0.00034	0.00021	0.000296	0.000378	0.000385
Nickel (Ni), dissolved	mg/L	0.00116	0.00529	0.00127	0.002	0.00133	0.00121	0.00127	0.00202	0.00167	0.00175	0.00164	0.00153	0.00169	0.00174	0.00104	0.000874	0.000921
Phosphorus (P), dissolved	mg/L	0.006	0.007	0.027	0.006	0.003	0.004	0.004	0.005	<0.002	0.002	0.004	0.007	0.004	0.0114	0.0025	0.0047	<0.0020
Potassium (K), dissolved	mg/L	0.51	0.3	0.41	0.18	0.26	0.38	0.4	0.5	0.42	0.47	0.48	0.91	0.46	0.551	0.324	0.281	0.305
Selenium (Se), dissolved	mg/L	0.00071	0.00019	0.00056	0.00024	0.00046	0.00068	0.00083	0.00092	0.00097	0.00094	0.00089	0.00119	0.00089	0.000277	0.000427	0.000657	0.00055
Silicon (Si), dissolved	mg/L	3.93	1.59	2.7	2.33	2.7	2.9	3.2	4	3.7	3.9	3.6	4.3	3.7	1.82	1.96	2.26	2.84
Silver (Ag), dissolved	mg/L	<0.000005	0.000275	0.000021	0.000019	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000016	0.0000087	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1.53	0.46	1.39	0.67	0.98	1.09	1.36	1.68	1.6	1.57	1.67	2.66	1.58	0.617	1.02	1.19	1.31
Strontium (Sr), dissolved	mg/L	0.266	0.0631	0.233	0.0944	0.155	0.213	0.227	0.249	0.245	0.236	0.239	0.305	0.23	0.0904	0.127	0.197	0.207
Sulphur (S), dissolved	mg/L	102	16	74	26	46	62	77	90	89	103	94	112	92	27	44	65	67
Thallium (Tl), dissolved	mg/L	<0.000002	0.000003	0.000008	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	<0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), dissolved	mg/L	<0.00001	0.00004	0.00002	0.00002	<0.00001	0.00014	0.00006	0.00028	0.00004	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	0.00087	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.00293	0.000363	0.00243	0.000419	0.00143	0.00237	0.00225	0.00266	0.00254	0.00252	0.00225	0.00369	0.00263	0.000602	0.00107	0.00184	0.00168
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.113	0.109	0.106	0.325	0.0792	0.123	0.145	0.177	0.123	0.105	0.0914	0.0979	0.0687	0.121	0.0736	0.0737	0.0731
Zirconium (Zr), dissolved	mg/L	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010

Data omitted from calculation of summary statistics.

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		21/09/2012	11/10/2012	19/11/2012	07/12/2012	13/01/2013	08/02/2013	08/03/2013	04/05/2013	03/06/2013	02/07/2013	10/08/2013
Discharge (Flow)	L/s	97.1	84.31								207.927	128.34
Total Suspended Solids	mg/L	1.1	<1.0	<1.0	1.5	1.7	1.7	2	20.4	13.2	1.0	1.0
pH (field)	pH units	7.96	7.18	7.91	7.24	7.26	7.97	7.64	7.4	7.83	7.37	8.18
pH (lab)	pH units	8.21	8.2	8.14	8.2	8.09	8.34	8.26	7.96	7.87	8.01	8.21
Specific Conductance (field)	µS/cm	667.5	797.2		1091	750	945.4	448.7	1107	306	646.6	680.4
Specific Conductance (lab)	µS/cm	596	686	711	916	763	1080	770	1050	271	545	688
Temperature (field)	C	3	0	0	0.25	0.21	-0.1	0.7	-0.1	5	8.8	9
Dissolved Oxygen (field)	mg/L	12.76		12.6		12.99	13.8	10.96	10.25	12.09	11.69	12.66
Dissolved Oxygen (field)	%	94.6		87		89.2	93.8	75.5	69.1	92.9	100	106.9
ORP (field)	mV	116.5	145	395.8			145.8	77.4	155.3	36.9	74.9	143.3
Hardness (from total)	mg/L	293	356	374	496	439	598	402	624	143	324	402
Hardness (from dissolved)	mg/L	319	352	399	492	430	580	435	623	146	325	387
Alkalinity, total	mg/L								206	62.0	121	
Chloride	mg/L											
Fluoride	mg/L											
Sulphate, dissolved	mg/L	175	226	204	317	273	423	289	383	79.3	193	249
Ammonia (N)	mg/L											
Nitrite (N)	mg/L											
Nitrate (N)	mg/L											
Total Kjeldahl Nitrogen	mg/L								0.757		0.201	
Dissolved Organic Carbon	mg/L	3.38	3.69	1.4	3.54	0.58	4.35	1.14	9.48	6.49	5.10	1.75
Aluminum (Al), total	mg/L	0.00942	0.00275	0.00811	0.00493	0.00395	0.00696	0.00486	0.314	0.303	0.0365	0.0049
Antimony (Sb), total	mg/L	0.000263	0.000282	0.000294	0.00103	0.000657	0.00063	0.000358	0.00100	0.00178	0.00047	0.00043
Arsenic (As), total	mg/L	0.00291	0.00311	0.00206	0.00452	0.00266	0.00297	0.00211	0.00419	0.00696	0.00394	0.00359
Barium (Ba), total	mg/L	0.046	0.0514	0.0562	0.088	0.0673	0.0964	0.0555	0.0836	0.0380	0.0455	0.0522
Beryllium (Be), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000833	0.000719	0.000771	0.00175	0.000891	0.00213	0.000571	0.00220	0.00163	0.000810	0.000555
Calcium (Ca), total	mg/L	88	109	113	150	137	179	123	188	43.3	98.9	121
Chromium (Cr), total	mg/L	<0.00010	<0.00010	0.00011	0.00011	<0.00010	0.00037	<0.00010	0.00238	0.00062	0.00023	0.00013
Cobalt (Co), total	mg/L	0.000099	0.000078	0.000106	0.000333	0.000105	0.000035	0.000045	0.00034	0.00044	0.00010	<0.00010
Copper (Cu), total	mg/L	0.000804	0.000399	0.000885	0.00114	0.000558	0.000762	0.000757	0.0103	0.00349	0.00128	0.00069
Iron (Fe), total	mg/L	0.142	0.135	0.088	0.132	0.0819	0.0202	0.0682	0.655	0.810	0.174	0.088
Lead (Pb), total	mg/L	0.00284	0.00091	0.0031	0.00883	0.00625	0.000673	0.00627	0.0178	0.0378	0.00316	0.00128
Lithium (Li), total	mg/L	0.00598	0.00704	0.00763	0.0108	0.00926	0.0148	0.00997	0.0156	0.00206	0.00654	0.00786
Magnesium (Mg), total	mg/L	17.8	20.2	22.5	29.7	23.6	36.9	23.2	37.5	8.34	18.7	24.6
Manganese (Mn), total	mg/L	0.103	0.0996	0.175	0.334	0.103	0.0351	0.0599	0.193	0.184	0.0701	0.0444
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000327	0.000376	0.000324	0.000531	0.000364	0.000324	0.000387	0.000419	0.000333	0.000455	0.000487
Nickel (Ni), total	mg/L	0.00129	0.0011	0.00172	0.00249	0.00127	0.00124	0.00123	0.00246	0.00254	0.00133	0.00091
Phosphorus (P), total	mg/L	0.0037	0.0026	0.0023	0.0065	<0.0020	0.0048	0.0039	<0.050	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	0.393	0.434	0.429	0.958	0.524	1	0.457	1.68	0.46	0.32	0.39
Selenium (Se), total	mg/L	0.000511	0.000842	0.000816	0.00117	0.000955	0.00155	0.000928	0.00120	0.00031	0.00046	0.00068
Silicon (Si), total	mg/L	2.68	3.69	3.39	4.22	4.25	6.45	3.55	6.72	2.22	2.67	2.82

Station Name		KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8	KV-8
Sample Date		21/09/2012	11/10/2012	19/11/2012	07/12/2012	13/01/2013	08/02/2013	08/03/2013	04/05/2013	03/06/2013	02/07/2013	10/08/2013
Silver (Ag), total	mg/L	<0.0000050	<0.0000050	0.000025	0.000027	0.000006	0.000005	<0.0000050	0.000346	0.000599	0.000025	<0.000010
Sodium (Na), total	mg/L	1.19	1.33	1.49	2.24	1.73	3.23	1.54	3.23	0.611	1.23	1.51
Strontium (Sr), total	mg/L	0.199	0.229	0.237	0.338	0.276	0.4	0.264	0.398	0.0920	0.204	0.256
Sulphur (S), total	mg/L	63	85	88.6	121	99.2	135	92.9	142	26.0	68.0	83.7
Thallium (Tl), total	mg/L	<0.0000020	<0.0000020	0.000002	0.000002	<0.0000020	<0.0000020	0.000004	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00020	<0.00020	0.00021	<0.00020	<0.00020	<0.00020	0.00026	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010
Uranium (U), total	mg/L	0.0018	0.00199	0.00256	0.00391	0.00283	0.00271	0.00293	0.00316	0.000677	0.00201	0.00291
Vanadium (V), total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0013	<0.0010	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.117	0.113	0.136	0.287	0.114	0.232	0.0837	0.246	0.165	0.0944	0.0744
Zirconium (Zr), total	mg/L	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00288	0.00192	0.00172	0.00225	0.00125	0.00276	0.00071	0.0034	0.0189	0.0086	0.0033
Antimony (Sb), dissolved	mg/L	0.000262	0.00028	0.000235	0.000928	0.000641	0.000552	0.000332	0.00055	0.00057	0.00044	0.00041
Arsenic (As), dissolved	mg/L	0.00211	0.0025	0.00126	0.00414	0.00211	0.00277	0.00143	0.00260	0.00261	0.00332	0.00341
Barium (Ba), dissolved	mg/L	0.0462	0.0489	0.0532	0.0781	0.0687	0.091	0.0555	0.0682	0.0294	0.0444	0.0565
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000007	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000711	0.000643	0.000673	0.00162	0.000838	0.00193	0.000334	0.00177	0.000902	0.000713	0.000539
Calcium (Ca), dissolved	mg/L	97.4	107	122	151	132	172	134	188	44.9	99.8	116
Chromium (Cr), dissolved	mg/L	<0.00010	0.00061	<0.00010	<0.00010	<0.00010	0.00018	<0.00010	0.00104	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.000065	0.000065	0.000099	0.000318	0.000112	0.000035	0.000044	0.00011	<0.00010	<0.00010	<0.00010
Copper (Cu), dissolved	mg/L	0.000483	0.000417	0.000649	0.000542	0.000558	0.000653	0.000469	0.00628	0.00193	0.00114	0.00030
Iron (Fe), dissolved	mg/L	0.0479	0.0563	0.0242	0.123	0.0232	0.0129	0.0112	0.017	0.110	0.070	0.033
Lead (Pb), dissolved	mg/L	0.000275	0.000268	0.000395	0.00408	0.00134	0.00041	0.000891	0.00119	0.00455	0.00163	0.000365
Lithium (Li), dissolved	mg/L	0.0062	0.00733	0.00733	0.0113	0.0094	0.0146	0.0102	0.0142	0.00173	0.00663	0.00751
Magnesium (Mg), dissolved	mg/L	18.4	20.8	22.7	28.2	24.6	36.5	24.1	37.5	8.22	18.5	23.6
Manganese (Mn), dissolved	mg/L	0.0876	0.101	0.167	0.332	0.103	0.0335	0.0478	0.154	0.0526	0.0612	0.0433
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000367	0.000418	0.000377	0.000509	0.000391	0.00025	0.000347	0.000339	0.000280	0.000423	0.000412
Nickel (Ni), dissolved	mg/L	0.0012	0.00113	0.00184	0.00232	0.00131	0.00137	0.00114	0.00156	0.00154	0.00123	0.00087
Phosphorus (P), dissolved	mg/L	<0.0020	0.0031	0.0022	<0.0020	<0.0020	0.0041	<0.0020	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.346	0.414	0.482	0.626	0.521	0.955	0.458	1.62	0.40	0.30	0.37
Selenium (Se), dissolved	mg/L	0.000493	0.000865	0.000979	0.00108	0.000918	0.00151	0.000913	0.00122	0.00027	0.00048	0.00068
Silicon (Si), dissolved	mg/L	3.07	3.43	3.85	4.29	4.15	6.17	4.17	5.96	1.82	2.60	2.74
Silver (Ag), dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	0.000016	<0.0000050	<0.0000050	<0.0000050	<0.000010	0.000053	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.22	1.42	1.53	1.89	1.81	3.63	1.63	3.11	0.599	1.17	1.58
Strontium (Sr), dissolved	mg/L	0.204	0.231	0.228	0.312	0.283	0.389	0.268	0.391	0.0914	0.198	0.237
Sulphur (S), dissolved	mg/L	64	80	86.2	104	104	134	89.5	138	26.4	66.2	80.5
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00013	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00178	0.00223	0.0024	0.00291	0.00304	0.00272	0.00312	0.00306	0.000614	0.00195	0.00265
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.107	0.112	0.136	0.297	0.125	0.233	0.0824	0.210	0.120	0.0900	0.0758
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48
Sample Date		17/07/2007	11/09/2007	18/05/2008	27/05/2009	06/07/2009	08/10/2009	10/02/2010	04/05/2010	06/07/2010	05/10/2010	12/07/2011	25/10/2011	12/02/2012	04/05/2012	06/07/2012	16/10/2012	06/07/2013
Discharge (Flow)	L/s					1.5	1		3	6	7	7		0	9.1	0		0
Total Suspended Solids	mg/L			4	13	8	<1	1	<1	4	2	5	<1		4.2		<1.0	
pH (field)	pH units			7.30	6.75	8.08	8.82	8.13	7.54	8.02	7.63	7.98	9.03		7.52		7.43	
pH (lab)	pH units	6.81	7.09	6.35	6.9	7.7	7.7	7.9	7.5	7.67	7.49	7.73	7.75		7.47		7.81	
Specific Conductance (field)	µS/cm											1241	1764		1083.0		1761	
Specific Conductance (lab)	µS/cm	39	80	18	19	1600	1440	1630	587	1110	1440	1240	1630		1180		1610	
Temperature (field)	C			0	1.4	8.5	0.7	1	8.1	12.5	0.2	15.1	1.8		3.2		1.6	
Dissolved Oxygen (field)	mg/L												13.27		13.86		12.73	
Dissolved Oxygen (field)	%												96.4		103.60		97.4	
ORP (field)	mV												163.3		223.90		45.4	
Hardness (from total)	mg/L				11.7	952	853	1030	297	634	855	674	959		718		923	
Hardness (from dissolved)	mg/L			10	10.7	962	791	999	317	442	804	696	892		646		890	
Alkalinity, total	mg/L																	
Chloride	mg/L																	
Fluoride	mg/L																	
Sulphate, dissolved	mg/L							920				660						
Ammonia (N)	mg/L																	
Nitrite (N)	mg/L																	
Nitrate (N)	mg/L																	
Total Kjeldahl Nitrogen	mg/L																	
Dissolved Organic Carbon	mg/L																	
Aluminum (Al), total	mg/L	0.25	0.155	0.534	0.602	0.025	0.015	<0.01	0.582	0.096	0.014	0.032	0.01		0.096		0.012	
Antimony (Sb), total	mg/L	0.0002	0.0004	<0.0002	<0.0005	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002		0.00011		<0.00020	
Arsenic (As), total	mg/L	0.0004	0.001	0.0004	0.0009	0.0006	0.0004	<0.0004	0.0012	0.0006	0.0005	<0.0004	0.0006		0.00034		0.00026	
Barium (Ba), total	mg/L	0.049	0.053	0.034	0.036	0.0159	0.017	0.005	0.041	0.021	0.012	0.012	0.0069		0.0158		0.00684	
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001		<0.000050		<0.00010	
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.001	<0.00003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005		<0.000025		<0.000050	
Boron (B), total	mg/L	<0.002	0.014	<0.002	<0.05	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5		<0.25		<0.50	
Cadmium (Cd), total	mg/L	0.00016	0.00021	0.00025	0.0004	0.00791	0.0069	0.0046	0.0024	0.0077	0.0056	0.0077	0.0123		0.00275		0.0157	
Calcium (Ca), total	mg/L	6	11.6	3.4	3.67	344	307	362	105	222	298	237	332		256		321	
Chromium (Cr), total	mg/L	0.0009	0.001	0.0009	<0.001	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001		<0.00050		<0.0010	
Cobalt (Co), total	mg/L	0.0001	0.0001	0.0001	<0.0005	0.00032	0.0005	0.001	0.0009	0.0005	0.0007	<0.0005	0.00195		0.000309		0.00219	
Copper (Cu), total	mg/L	0.003	0.004	0.003	0.0034	<0.0003	<0.001	<0.001	0.003	<0.001	<0.001	0.011	<0.0005		0.00159		<0.00050	
Iron (Fe), total	mg/L	0.2	0.1	0.2	0.497	0.059	0.102	0.043	0.58	0.109	0.038	0.049	0.04		0.126		0.033	
Lead (Pb), total	mg/L	0.001	0.0046	0.0016	0.0042	0.00186	<0.0002	<0.0002	0.004	0.0027	<0.0002	0.0003	0.00015		0.000568		0.000125	
Lithium (Li), total	mg/L	<0.001	0.001	<0.001	<0.005	0.026	0.022	0.027	<0.01	0.017	0.025	0.017	0.026		0.0186		0.0245	
Magnesium (Mg), total	mg/L	1	1.6	0.5	0.6	22.9	21	30	9	19	27	20	31.3		19		29.5	
Manganese (Mn), total	mg/L	<0.005	0.01	<0.005	0.072	14.6	15.3	30.4	7.04	18.4	31.2	14.7	45.5		9.87		47.6	
Mercury (Hg), total	mg/L				<0.00002	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001		<0.000050		<0.00010	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005		<0.00025		0.0115	
Nickel (Ni), total	mg/L	0.001	0.0015	0.0016	0.002	0.0019	0.003	0.004	0.004	0.002	0.002	0.004	0.0059		0.00211		0.0086	
Phosphorus (P), total	mg/L				0.045	<0.01							<0.02		0.017		<0.020	
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	0.16	0.64	<1	<1	<1	<1	<1	<1	0.7		0.61		0.6	
Selenium (Se), total	mg/L	0.0003	0.0008	<0.0002	0.0002	0.0003	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0004		0.00022		<0.00040	
Silicon (Si), total	mg/L	3.51	3.48	1.18	1.32	<0.5	<2	<2	<2	<2	<2	<2	<1		0.7		<1.0	

Station Name		KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48	KV-48
Sample Date		17/07/2007	11/09/2007	18/05/2008	27/05/2009	06/07/2009	08/10/2009	10/02/2010	04/05/2010	06/07/2010	05/10/2010	12/07/2011	25/10/2011	12/02/2012	04/05/2012	06/07/2012	16/10/2012	06/07/2013
Silver (Ag), total	mg/L	<0.0001	0.0001	0.00006	0.00011	0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005		<0.000025		<0.000050	
Sodium (Na), total	mg/L	0.5	0.6	<0.4	0.18	1.72	2	1	<1	1	2	1	1.7		1.3		1.86	
Strontium (Sr), total	mg/L	0.022	0.039	0.013	0.012	0.63	0.528	0.569	0.194	0.415	0.531	0.387	0.538		0.492		0.531	
Sulphur (S), total	mg/L	2.2	4.8	0.3	<3	293	280	344	94	214	316	229	311		215		340	
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.00059	0.00022	0.00059	0.00024	0.00067	0.00047	0.00026	0.00065		0.000369		0.000493	
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.005	<0.00005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0001		<0.0010		<0.0020	
Titanium (Ti), total	mg/L	0.0458	0.0045	0.0032	0.009	<0.003	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.005		0.0068		<0.0050	
Uranium (U), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0001	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001		0.000079		0.000105	
Vanadium (V), total	mg/L	0.0004	0.0006	0.0003	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002		<0.0010		<0.0020	
Zinc (Zn), total	mg/L	0.011	0.018	0.018	0.03	0.0826	0.158	0.147	0.166	0.165	0.145	0.065	0.104		0.11		0.424	
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001		<0.00050		<0.0010	
Aluminum (Al), dissolved	mg/L	0.166	0.065	0.444	0.275	0.01	0.013	<0.01	0.219	0.046	<0.02	0.029	0.007		0.0586		0.0067	
Antimony (Sb), dissolved	mg/L	0.0003	0.0012		<0.0005	0.0001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	0.0002		0.00014		<0.00020	
Arsenic (As), dissolved	mg/L	0.0004	0.0005	0.0004	0.0004	0.0003	0.0007	0.0007	0.0005	<0.0004	<0.0008	<0.0004	0.0004		0.00032		0.0006	
Barium (Ba), dissolved	mg/L	0.048	0.045	0.034	0.024	0.0149	0.016	0.005	0.029	0.014	0.012	0.013	0.0066		0.0122		0.00637	
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004	<0.0002	<0.00005		<0.000050		<0.00010	
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.001	<0.00003	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.00003		<0.000025		<0.000050	
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.05	<0.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<0.25		<0.50	
Cadmium (Cd), dissolved	mg/L	0.00015	0.00012	0.00024	0.00036	0.00675	0.0064	0.0045	0.0021	0.0043	0.0059	0.0079	0.0119		0.0027		0.0154	
Calcium (Ca), dissolved	mg/L	6.5	12.1	3.3	3.42	348	284	351	113	155	279	245	311		230		310	
Chromium (Cr), dissolved	mg/L	0.0007	<0.0005	0.0006	<0.001	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.0005		<0.00050		<0.0010	
Cobalt (Co), dissolved	mg/L	<0.0001	0.0001	0.0001	<0.0005	0.00029	<0.0005	0.0011	0.0007	<0.0005	<0.001	<0.0005	0.00177		0.000205		0.00229	
Copper (Cu), dissolved	mg/L	0.002	0.002	0.004	0.0028	<0.0003	<0.001	<0.001	0.002	<0.001	<0.002	<0.001	<0.0003		0.00151		0.001	
Iron (Fe), dissolved	mg/L	0.11	0.02	0.14	0.139	0.014	0.045	0.064	0.168	0.027	<0.04	0.021	0.034		0.0584		0.022	
Lead (Pb), dissolved	mg/L	0.0004	0.001	0.0012	0.0019	0.00025	<0.0002	<0.0002	0.0007	<0.0002	<0.0004	<0.0002	<0.00003		0.000588		0.000056	
Lithium (Li), dissolved	mg/L	<0.001	0.001	<0.001	<0.005	0.027	0.021	0.027	<0.01	0.013	0.022	0.018	0.026		0.0184		0.0239	
Magnesium (Mg), dissolved	mg/L	1	1.6	0.5	0.52	22.7	20	30	8	13	26	21	28		17.3		28.2	
Manganese (Mn), dissolved	mg/L	<0.005	<0.005	<0.005	0.068	14.3	14.7	28.3	7.14	12.6	30.1	14.9	43.2		9.11		46.1	
Mercury (Hg), dissolved	mg/L				<0.00002	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004	<0.0002			<0.000050		<0.000010	
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0003	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.0003		<0.00025		<0.00050	
Nickel (Ni), dissolved	mg/L	0.0011	0.0009	0.0015	0.001	0.002	0.005	0.005	0.003	0.002	0.003	0.002	0.0056		0.00175		0.00711	
Phosphorus (P), dissolved	mg/L				0.017	0.01							0.01		0.011		<0.020	
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	0.14	0.63	<1	<1	<1	<1	<2	<1	0.6		0.57		<0.50	
Selenium (Se), dissolved	mg/L	0.0002	0.0007	<0.0002	0.0001	0.0003	<0.0008	<0.0008	<0.0008	<0.0008	<0.002	<0.0008	<0.0002		0.00037		0.0008	
Silicon (Si), dissolved	mg/L	3.25	3.49	1.15	0.994	<0.5	<2	<2	<2	<2	<4	<2	<0.5		0.61		<1.0	
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	0.00001	0.00004	<0.00003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.00003		<0.000025		<0.000050	
Sodium (Na), dissolved	mg/L	0.5	0.6	<0.4	0.19	1.75	1	2	<1	<1	<2	1	1.6		1.26		1.45	
Strontium (Sr), dissolved	mg/L	0.021	0.034	0.012	0.011	0.628	0.529	0.536	0.203	0.291	0.556	0.414	0.521		0.472		0.517	
Sulphur (S), dissolved	mg/L	2.2	5	0.4	<3	302	274	351	101	153	297	233	307		229		321	
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.00059	0.00022	0.00062	0.00021	0.00045	0.0005	0.00032	0.00061		0.000335		0.000441	
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.005	<0.00005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.00005		<0.0010		<0.0020	
Titanium (Ti), dissolved	mg/L	0.0462	0.0008	0.0025	<0.005	<0.003	0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.003		<0.0025		<0.0050	
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0001	0.00007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	0.00009		0.000043		0.000032	
Vanadium (V), dissolved	mg/L	0.0002	0.0003	0.0002	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.001		<0.0010		<0.0020	
Zinc (Zn), dissolved	mg/L	0.009	0.006	0.017	0.05	0.0409	0.153	0.137	0.11	0.035	0.124	0.049	0.0745		0.073		0.403	
Zirconium (Zr), dissolved	mg/L				<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.0005		<0.00050		<0.0010	

Data omitted from calculation of summary statistics.

Station Name		KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49
Sample Date		17/07/2007	11/09/2007	18/05/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	26/05/2011	16/08/2011	22/09/2011	31/10/2011	26/11/2011	20/12/2011	12/01/2012
Discharge (Flow)	L/s	3									0		0	0	0	0
Total Suspended Solids	mg/L			<3	6	3	<1	<1	1	<1		8				
pH (field)	pH units	7.38		7.31	7.52	6.64	7.43	8.33	6.65	7.71		8.24				
pH (lab)	pH units	7.01	7	6.77	7.19	6.6	6.9	6.7	7.1	6.62		7.03				
Specific Conductance (field)	µS/cm											715				
Specific Conductance (lab)	µS/cm	71	104	30	119	87	960	982	941	375		709				
Temperature (field)	C	5.5		2	0	2.5	4.1	0.8	6	3.1		2.9				
Dissolved Oxygen (field)	mg/L															
Dissolved Oxygen (field)	%															
ORP (field)	mV															
Hardness (from total)	mg/L					38.9	535	536	488	187		357				
Hardness (from dissolved)	mg/L			19	61	40.2	522	542	530	185		359				
Alkalinity, total	mg/L									3.7		9.6				
Chloride	mg/L															
Fluoride	mg/L															
Sulphate, dissolved	mg/L									150		320				
Ammonia (N)	mg/L															
Nitrite (N)	mg/L															
Nitrate (N)	mg/L															
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L									8.6		4.7				
Aluminum (Al), total	mg/L	0.088	0.083	0.119	0.051	0.161	0.0193	0.0198	0.0535	0.0416		0.0313				
Antimony (Sb), total	mg/L	<0.0002	0.0002	<0.0002	<0.0002	0.00016	0.0001	0.00012	0.00043	0.00014		0.00016				
Arsenic (As), total	mg/L	0.0004	0.0006	0.0004	0.0003	0.00056	0.00018	0.00024	0.00275	0.0002		0.00066				
Barium (Ba), total	mg/L	0.034	0.044	0.017	0.043	0.0425	0.118	0.0578	0.0407	0.0468		0.0419				
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001				
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005		<0.000005				
Boron (B), total	mg/L	<0.002	<0.002	<0.002	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05				
Cadmium (Cd), total	mg/L	0.0001	0.00015	0.00011	0.0002	0.000098	0.000708	0.000704	0.000705	0.000227		0.000419				
Calcium (Ca), total	mg/L	11.4	15.7	5.5	18.1	12.3	175	174	160	62.2		116				
Chromium (Cr), total	mg/L	0.0005	0.0009	0.0007	0.0005	0.0005	0.0002	0.0003	0.0008	0.0004		0.0004				
Cobalt (Co), total	mg/L	<0.0001	0.0018	0.0001	0.00008	0.000151	0.000065	0.000066	0.000201	0.000058		0.000096				
Copper (Cu), total	mg/L	0.002	0.002	0.002	0.002	0.00181	0.00054	0.00049	0.0017	0.00104		0.00093				
Iron (Fe), total	mg/L	<0.1	<0.1	0.2	0.05	0.101	0.042	0.297	0.256	0.033		0.917				
Lead (Pb), total	mg/L	<0.0001	0.0001	0.0002	0.0002	0.00031	0.00024	0.000227	0.0115	0.000714		0.00103				
Lithium (Li), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	0.0021	0.0014	0.0018	0.0019		0.0012				
Magnesium (Mg), total	mg/L	2.1	2.8	1.1	3.64	1.96	23.7	24.9	21.7	7.76		16.5				
Manganese (Mn), total	mg/L	<0.005	<0.005	0.014	0.0028	0.028	0.0194	0.0219	0.084	0.00697		0.0155				
Mercury (Hg), total	mg/L					<0.00001	<0.00001		<0.00001	<0.00001		<0.00001				
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	0.00002	0.00006	<0.00005	<0.00005	<0.00005	<0.00005		0.00013				
Nickel (Ni), total	mg/L	0.001	0.0024	0.0017	0.001	0.00131	0.00199	0.00203	0.00274	0.00105		0.00115				
Phosphorus (P), total	mg/L				<0.01	0.026	0.004		0.024	0.007		0.015				
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<0.1	0.36	0.09	0.19	0.2	0.22		0.18				
Selenium (Se), total	mg/L	0.0003	0.0003	<0.0002	<0.0006	0.00015	0.00013	0.00015	0.0001	0.00021		0.00011				
Silicon (Si), total	mg/L	2.88	3.6	1.39	3.33	1.14	2.18	3.16	2.29	1.9		3.2				

Station Name		KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49
Sample Date		17/07/2007	11/09/2007	18/05/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	26/05/2011	16/08/2011	22/09/2011	31/10/2011	26/11/2011	20/12/2011	12/01/2012
Silver (Ag), total	mg/L	<0.0001	<0.0001	0.00002	0.00004	0.00002	<0.000005	<0.000005	0.000031	0.000014		0.000016				
Sodium (Na), total	mg/L	0.4	0.4	<0.4	0.52	0.25	1.26	1.69	1.52	0.65		1.24				
Strontium (Sr), total	mg/L	0.031	0.045	0.017	0.042	0.0293	0.35	0.325	0.314	0.111		0.211				
Sulphur (S), total	mg/L	3.4	5.4	0.7		9	173	183	175	63		121				
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00001	<0.000002	<0.000002	<0.000002	0.000007	<0.000002		<0.000002				
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.0001	<0.00001	<0.00001	<0.00001	0.00012	<0.00001		0.00014				
Titanium (Ti), total	mg/L	0.0439	0.0011	0.0012	0.0012	0.0017	<0.0005	<0.0005	0.002	<0.0005		<0.0005				
Uranium (U), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0004	0.000031	0.00001	0.000005	0.000021	0.000011		0.000008				
Vanadium (V), total	mg/L	0.0001	0.0003	0.0002	0.00006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		0.0002				
Zinc (Zn), total	mg/L	0.01	0.016	0.02	0.015	0.0145	0.0693	0.0515	0.0657	0.0237		0.0281				
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001				
Aluminum (Al), dissolved	mg/L	0.088	0.101	0.106	0.044	0.168	0.0178	0.0135	0.0162	0.0423		0.011				
Antimony (Sb), dissolved	mg/L	0.0002	0.0013		0.0009	0.0002	0.0001	0.00012	0.00016	0.00014		0.00014				
Arsenic (As), dissolved	mg/L	0.0004	0.0003	0.0004	0.0002	0.00064	0.00013	0.00015	0.00024	0.00025		0.00015				
Barium (Ba), dissolved	mg/L	0.034	0.038	0.016	0.04	0.0413	0.115	0.0554	0.036	0.0457		0.0405				
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001				
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005		<0.000005	<0.000005	<0.000005	<0.000005	<0.000005		<0.000005				
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.002	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05				
Cadmium (Cd), dissolved	mg/L	0.0001	0.0001	0.00006	0.00012	0.000087	0.000662	0.000649	0.000409	0.000228		0.000387				
Calcium (Ca), dissolved	mg/L	12.2	16.6	5.7	18.4	12.8	171	176	175	61.4		117				
Chromium (Cr), dissolved	mg/L	0.0005	0.0006	0.0005	0.0005	0.0006	0.0002	0.0004	0.0004	0.0004		0.0002				
Cobalt (Co), dissolved	mg/L	<0.0001	0.0002	<0.0001	0.00015	0.000168	0.000066	0.000046	0.000065	0.000063		0.000031				
Copper (Cu), dissolved	mg/L	0.002	0.002	0.002	0.002	0.002	0.0005	0.00048	0.00072	0.00107		0.00062				
Iron (Fe), dissolved	mg/L	0.05	0.06	0.07	0.059	0.111	0.036	0.038	0.054	0.028		0.018				
Lead (Pb), dissolved	mg/L	<0.0001	0.0004	0.0002	0.0004	0.000778	0.000126	0.000044	0.000434	0.000313		0.000045				
Lithium (Li), dissolved	mg/L	<0.001	0.002	<0.001	<0.001	0.0011	0.0025	0.0015	0.0017	0.0019		0.0014				
Magnesium (Mg), dissolved	mg/L	2	3	1.1	3.67	2	23.3	25	22.4	7.79		15.9				
Manganese (Mn), dissolved	mg/L	<0.005	0.006	<0.005	0.0018	0.0322	0.0175	0.0122	0.0162	0.00674		0.00257				
Mercury (Hg), dissolved	mg/L					0.00002	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001				
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	0.00003	0.00006	<0.00005	<0.00005	<0.00005	0.00006		<0.00005				
Nickel (Ni), dissolved	mg/L	0.0011	0.001	0.0016	0.001	0.00129	0.00188	0.002	0.00176	0.00103		0.00102				
Phosphorus (P), dissolved	mg/L				<0.01	0.019	0.003	0.007	0.006	0.007		0.007				
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.1	0.39	0.09	0.2	0.12	0.19		0.16				
Selenium (Se), dissolved	mg/L	0.0003	0.0003	<0.0002	<0.0006	0.0002	0.00013	0.00016	0.0001	0.0002		0.0001				
Silicon (Si), dissolved	mg/L	2.82	3.71	1.39	3.33	1.21	2.06	3.22	2.63	1.89		3.2				
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	0.000027	<0.000005	<0.000005	<0.000005	0.000006		<0.000005				
Sodium (Na), dissolved	mg/L	<0.4	0.4	<0.4	0.5	0.26	1.23	1.68	1.5	0.66		1.16				
Strontium (Sr), dissolved	mg/L	0.03	0.044	0.016	0.041	0.0285	0.353	0.328	0.306	0.108		0.217				
Sulphur (S), dissolved	mg/L	3.4	5.6	0.7		11	162	182	176	59		120				
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00001	0.000002	<0.000002	<0.000002	<0.000002	<0.000002		<0.000002				
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.0001	0.00003	<0.00001	<0.00001	0.00003	<0.00001		0.00005				
Titanium (Ti), dissolved	mg/L	0.0446	0.0011	0.0008	0.0008	0.0017	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005				
Uranium (U), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0004	0.000031	0.000009	0.000004	0.00001	0.000006		0.000006				
Vanadium (V), dissolved	mg/L	0.0001	0.0003	0.0002	0.00008	0.0005	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002				
Zinc (Zn), dissolved	mg/L	0.011	0.011	0.021	0.013	0.0183	0.0684	0.0459	0.035	0.0247		0.0275				
Zirconium (Zr), dissolved	mg/L				0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001		0.0002				

Station Name		KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49
Sample Date		12/02/2012	11/03/2012	08/04/2012	03/05/2012	03/06/2012	03/07/2012	01/08/2012	03/09/2012	14/10/2012	19/11/2012	10/12/2012	12/02/2013	06/07/2013
Discharge (Flow)	L/s	0	0	0		6.741					0	0	0	
Total Suspended Solids	mg/L				<1.0	<1.0	3.2	25.2	2.9	5.3				1.8
pH (field)	pH units					6.68	6.21	7.04	8.43	6.58				6.46
pH (lab)	pH units				6.91	6.75	6.88	7.04	7.43	7.24				6.85
Specific Conductance (field)	µS/cm					540.6	572.8	760	570.3	1325				606.7
Specific Conductance (lab)	µS/cm				506	492	702	670	712	1270				671
Temperature (field)	C					1.8	6.5	8	1.8	-0.1				7
Dissolved Oxygen (field)	mg/L					15.7	5.56	6	11.94	6.29				5.02
Dissolved Oxygen (field)	%					113	45.3	51	85.8	43.3				41.5
ORP (field)	mV					314.3	132.6	24.6	12.9					127.3
Hardness (from total)	mg/L				252	219	386	360	336	745				361
Hardness (from dissolved)	mg/L				253	213	371	359	360	743				370
Alkalinity, total	mg/L				9.83	6.34	11.9	14.2	15.3	29.7				15.0
Chloride	mg/L				<0.50	0.57	<0.50	<0.50	0.71	<0.50				<0.50
Fluoride	mg/L													0.022
Sulphate, dissolved	mg/L				210	193	336	300	309	701				348
Ammonia (N)	mg/L													
Nitrite (N)	mg/L													<0.0010
Nitrate (N)	mg/L													<0.0050
Total Kjeldahl Nitrogen	mg/L													
Dissolved Organic Carbon	mg/L				13.9	5.51	7.44	5.65	5.42	3.26				6.46
Aluminum (Al), total	mg/L				0.0516	0.0218	0.0402	0.0197	0.0111	0.0686				0.0406
Antimony (Sb), total	mg/L				0.000122	0.000124	0.000288	0.000128	0.000112	0.00016				0.00022
Arsenic (As), total	mg/L				0.000407	0.000313	0.00144	0.000253	0.000153	0.00065				0.00043
Barium (Ba), total	mg/L				0.0755	0.0441	0.0497	0.0438	0.0323	0.0685				0.0553
Beryllium (Be), total	mg/L				<0.000010	0.00001	0.000011	<0.000010	<0.000010	<0.000050				<0.00010
Bismuth (Bi), total	mg/L				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025				<0.00050
Boron (B), total	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.25				<0.010
Cadmium (Cd), total	mg/L				0.000325	0.000131	0.000485	0.000366	0.000304	0.000774				0.000539
Calcium (Ca), total	mg/L				83.1	70.9	126	117	107	241				117
Chromium (Cr), total	mg/L				<0.00010	<0.00010	0.00017	<0.00010	<0.00010	<0.00050				0.00019
Cobalt (Co), total	mg/L				0.000133	0.0000366	0.000121	0.000064	0.000033	0.000394				0.00010
Copper (Cu), total	mg/L				0.00154	0.000874	0.00149	0.00103	0.000595	0.00145				0.00186
Iron (Fe), total	mg/L				0.0984	0.02	0.246	0.114	0.0225	0.699				0.128
Lead (Pb), total	mg/L				0.000419	0.000469	0.00806	0.00125	0.000176	0.00747				0.00127
Lithium (Li), total	mg/L				0.00182	0.002	0.0017	0.00147	0.00125	<0.0025				0.00178
Magnesium (Mg), total	mg/L				10.8	10.3	17.7	16.6	16.9	34.8				16.8
Manganese (Mn), total	mg/L				0.0437	0.00272	0.0311	0.00518	0.00396	0.0632				0.0204
Mercury (Hg), total	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050				<0.000010
Molybdenum (Mo), total	mg/L				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00096				<0.000050
Nickel (Ni), total	mg/L				0.0013	0.000888	0.00161	0.00126	0.000825	0.00255				0.00144
Phosphorus (P), total	mg/L				0.0169	0.0044	0.0197	0.0029	0.0041	0.014				<0.050
Potassium (K), total	mg/L				0.585	0.196	0.077	<0.050	0.13	0.26				<0.10
Selenium (Se), total	mg/L				0.000123	0.000254	0.000098	0.000109	0.000103	<0.00020				<0.00010
Silicon (Si), total	mg/L				1.59	1.79	3.38	2.94	2.72	3.87				2.76

Station Name		KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49	KV-49
Sample Date		12/02/2012	11/03/2012	08/04/2012	03/05/2012	03/06/2012	03/07/2012	01/08/2012	03/09/2012	14/10/2012	19/11/2012	10/12/2012	12/02/2013	06/07/2013
Silver (Ag), total	mg/L				0.00001	0.0000131	0.0000329	0.000008	<0.0000050	<0.000025				<0.000010
Sodium (Na), total	mg/L				0.774	0.785	1.21	1.16	1.2	1.96				0.936
Strontium (Sr), total	mg/L				0.155	0.14	0.217	0.22	0.2	0.43				0.220
Sulphur (S), total	mg/L				81	83	134	118	120	271				113
Thallium (Tl), total	mg/L				<0.0000020	<0.0000020	0.0000028	<0.0000020	<0.0000020	<0.000010				<0.000010
Tin (Sn), total	mg/L				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010				0.00012
Titanium (Ti), total	mg/L				<0.00050	<0.00050	0.00106	<0.00050	<0.00050	<0.0025				<0.010
Uranium (U), total	mg/L				0.00002	0.0000086	0.0000153	0.000012	0.000004	0.000035				<0.000010
Vanadium (V), total	mg/L				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010				<0.0010
Zinc (Zn), total	mg/L				0.0333	0.0212	0.0499	0.0348	0.0234	0.0585				0.0458
Zirconium (Zr), total	mg/L				0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050				<0.00080
Aluminum (Al), dissolved	mg/L				0.0502	0.0208	0.0181	0.0147	0.0101	0.0096				0.0207
Antimony (Sb), dissolved	mg/L				0.000114	0.000123	0.000116	0.000135	0.000109	0.00014				0.00013
Arsenic (As), dissolved	mg/L				0.000443	0.000309	0.000264	0.00023	0.00014	<0.00010				0.00024
Barium (Ba), dissolved	mg/L				0.0764	0.0421	0.0478	0.0425	0.0332	0.0585				0.0560
Beryllium (Be), dissolved	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050				<0.00010
Bismuth (Bi), dissolved	mg/L				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025				<0.00050
Boron (B), dissolved	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.25				<0.010
Cadmium (Cd), dissolved	mg/L				0.000298	0.000113	0.000373	0.000335	0.000294	0.000615				0.000533
Calcium (Ca), dissolved	mg/L				83.6	68.2	122	116	115	238				120
Chromium (Cr), dissolved	mg/L				0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050				<0.00010
Cobalt (Co), dissolved	mg/L				0.000131	0.0000413	0.0000906	0.000195	0.000032	0.000053				<0.00010
Copper (Cu), dissolved	mg/L				0.00157	0.000886	0.00167	0.000673	0.000571	0.00062				0.00101
Iron (Fe), dissolved	mg/L				0.0921	0.0139	0.04	0.23	0.0142	0.015				0.037
Lead (Pb), dissolved	mg/L				0.00034	0.0000653	0.000149	0.00022	0.000086	0.000096				0.000114
Lithium (Li), dissolved	mg/L				0.00263	0.00215	0.00154	0.00159	0.00113	<0.0025				0.00162
Magnesium (Mg), dissolved	mg/L				10.7	10.4	16.3	16.6	17.4	36.3				17.1
Manganese (Mn), dissolved	mg/L				0.0438	0.00185	0.0159	0.0256	0.00304	0.00676				0.00817
Mercury (Hg), dissolved	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050				<0.000010
Molybdenum (Mo), dissolved	mg/L				<0.000050	0.000055	<0.000050	0.000074	<0.000050	<0.00025				<0.000050
Nickel (Ni), dissolved	mg/L				0.00128	0.000992	0.00133	0.00113	0.000959	0.0021				0.00131
Phosphorus (P), dissolved	mg/L				0.0125	0.0047	0.0104	<0.0020	<0.0020	<0.010				<0.050
Potassium (K), dissolved	mg/L				0.598	0.191	<0.050	<0.050	0.158	<0.25				<0.10
Selenium (Se), dissolved	mg/L				0.000186	0.000259	0.000102	0.000103	0.000101	<0.00020				<0.00010
Silicon (Si), dissolved	mg/L				1.53	1.73	3.15	2.88	2.87	3.85				2.77
Silver (Ag), dissolved	mg/L				0.000008	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025				<0.000010
Sodium (Na), dissolved	mg/L				0.763	0.81	1.05	1.14	1.24	1.65				0.897
Strontium (Sr), dissolved	mg/L				0.158	0.138	0.218	0.214	0.211	0.411				0.208
Sulphur (S), dissolved	mg/L				82	84	120	118	128	282				114
Thallium (Tl), dissolved	mg/L				<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010				<0.000010
Tin (Sn), dissolved	mg/L				<0.00020	<0.00020	0.00072	<0.00020	<0.00020	<0.0010				<0.00010
Titanium (Ti), dissolved	mg/L				0.00055	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025				<0.010
Uranium (U), dissolved	mg/L				0.000018	0.0000057	0.0000092	0.000012	0.000006	0.000041				<0.000010
Vanadium (V), dissolved	mg/L				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010				<0.0010
Zinc (Zn), dissolved	mg/L				0.0337	0.021	0.0376	0.0308	0.0248	0.059				0.0432
Zirconium (Zr), dissolved	mg/L				0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050				<0.00080

Station Name		KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50
Sample Date		17/07/2007	11/09/2007	18/05/2008	05/07/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	07/10/2010	26/05/2011	22/06/2011	17/08/2011	22/09/2011	31/10/2011
Discharge (Flow)	L/s	2.5									10			2	31.4265	34
Total Suspended Solids	mg/L			13	3	17	25	13	2900	14	63	9	20	<1	1300	97
pH (field)	pH units	7.74	7.39	7.22	7.19	7.32	6.54	7.44	7.52	7.38	7.14	7.3	7.57	8.31	7.51	7.34
pH (lab)	pH units	7.33		7.33	7.86	7.38	7.7	7.9	7.5	7.62	7.61	7.65	7.68	7.31	7.72	7.27
Specific Conductance (field)	µS/cm													395	1417	1229
Specific Conductance (lab)	µS/cm	440		209	753	471	430	890	981	904	932	891	1090	401	1090	1160
Temperature (field)	C	0.9	5	0	5	1	5	3.6	1	7.5	0.3	5.7	3	3	1.9	0.1
Dissolved Oxygen (field)	mg/L															8.46
Dissolved Oxygen (field)	%															58.6
ORP (field)	mV															166.4
Hardness (from total)	mg/L						206	492	617	501	515	455	665	192	606	657
Hardness (from dissolved)	mg/L			100	410	287	210	489	523	549	520	503	636	208	586	645
Alkalinity, total	mg/L										110	110	120	84	120	120
Chloride	mg/L															
Fluoride	mg/L															
Sulphate, dissolved	mg/L										460	370	460	120	480	509
Ammonia (N)	mg/L															
Nitrite (N)	mg/L															
Nitrate (N)	mg/L															
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L										1.2	3.7	2.3	7.9	1.5	1.8
Aluminum (Al), total	mg/L	0.302	0.187	0.31	<0.005	0.612	0.134	0.115	7.95	0.0665	0.237	0.022	0.145	0.742	7.96	0.72
Antimony (Sb), total	mg/L	0.0003	0.0003	0.0002	<0.0002	0.0004	0.00031	0.00036	0.00126	0.00029	0.00022	0.00017	0.00036	0.00073	0.00171	0.00033
Arsenic (As), total	mg/L	0.0052	0.0065	0.0057	0.0016	0.0136	0.0104	0.00607	0.096	0.0146	0.0323	0.0157	0.0272	0.0159	0.0541	0.0347
Barium (Ba), total	mg/L	0.042	0.036	0.022	0.036	0.05	0.0327	0.0466	0.264	0.0293	0.0635	0.0267	0.0354	0.0568	0.181	0.0424
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	0.00001	<0.00001	0.00088	<0.00001	0.00002	<0.00001	<0.00001	0.00003	0.00023	0.00004
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.000005	<0.000005	0.000035	<0.000005	0.000006	<0.000005	0.000006	<0.00002	0.00019	<0.000005
Boron (B), total	mg/L	0.003	0.002	<0.002	0.003	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.00024	0.00043	0.00026	0.00038	0.00052	0.00044	0.000623	0.00384	0.00032	0.000839	0.000237	0.000413	0.00119	0.00133	0.000503
Calcium (Ca), total	mg/L	67.7	85	31	123	85.3	63.9	154	198	158	163	145	211	59.7	192	208
Chromium (Cr), total	mg/L	0.0012	0.0009	0.0012	<0.0005	0.0012	0.0005	0.0003	0.016	0.0004	0.0007	0.0003	0.0005	0.0015	0.0135	0.0014
Cobalt (Co), total	mg/L	0.0012	0.0016	0.0008	0.0009	0.00197	0.00131	0.00169	0.0294	0.00493	0.00892	0.00473	0.00702	0.00291	0.0155	0.0107
Copper (Cu), total	mg/L	0.002	0.002	0.003	<0.001	0.004	0.00184	0.00117	0.0668	0.00093	0.00474	0.00047	0.00186	0.0036	0.0331	0.00523
Iron (Fe), total	mg/L	1	1.2	1.4	0.39	3.01	1.62	1.01	50.8	2.57	4.32	2.79	5.77	2.86	23	7.6
Lead (Pb), total	mg/L	0.0007	0.0006	0.0006	<0.0001	0.002	0.00112	0.00115	0.119	0.00109	0.00319	0.000573	0.00198	0.00208	0.0327	0.00758
Lithium (Li), total	mg/L	0.009	0.012	0.004	0.016	0.009	0.0077	0.0172	0.0368	0.024	0.0236	0.0185	0.0235	0.0084	0.0363	0.0243
Magnesium (Mg), total	mg/L	14.6	16.6	5.8	24.8	16.7	11.2	26.1	29.9	25.9	25.9	22.5	33.9	10.5	30.4	33.8
Manganese (Mn), total	mg/L	0.222	0.321	0.168	0.238	0.302	0.293	0.413	2.94	1.32	1.66	1.23	1.69	0.425	2.15	2.2
Mercury (Hg), total	mg/L						<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.00023	0.00019	0.0002	0.00197	0.00022	0.00037	0.00017	0.00018	0.00036	0.00177	0.0003
Nickel (Ni), total	mg/L	0.0027	0.0056	0.0028	0.0071	0.006	0.00391	0.00532	0.0689	0.00776	0.0137	0.00848	0.0125	0.0069	0.0313	0.0178
Phosphorus (P), total	mg/L					0.035	0.027	0.014		0.019		0.014	0.06	0.06	0.44	0.09
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<0.4	0.4	0.26	0.38	0.97	0.34	0.39	0.35	0.43	<0.3	1.2	0.47
Selenium (Se), total	mg/L	0.0003	0.0005	<0.0002	0.0006	0.0007	0.00034	0.0004	0.00041	0.00025	0.00021	0.00017	0.00035	0.00093	0.00071	0.00027
Silicon (Si), total	mg/L	3.93	3.6	2.31	3.77	4.68	2.94	4.28	14.5	3.84	4.17	4.03	5.27	5.1	14.1	5.1

Station Name		KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50
Sample Date		17/07/2007	11/09/2007	18/05/2008	05/07/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	07/10/2010	26/05/2011	22/06/2011	17/08/2011	22/09/2011	31/10/2011
Silver (Ag), total	mg/L	<0.0001	<0.0001	0.00004	<0.00001	0.00004	0.000008	0.00001	0.000036	0.000006	0.000009	0.000007	0.000018	0.000039	0.000484	0.000006
Sodium (Na), total	mg/L	1	1.2	0.5	1.4	1.15	0.7	1.42	1.29	1.26	1.43	1.19	2.31	1	1.7	1.71
Strontium (Sr), total	mg/L	0.158	0.167	0.067	0.259	0.165	0.12	0.266	0.305	0.267	0.248	0.217	0.306	0.148	0.295	0.308
Sulphur (S), total	mg/L	46.2	59.7	20.4	96.9		49	117	133	143	156	136	187	<50	152	194
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.00003	0.000014	0.000014	0.0002	0.000012	0.000032	0.000007	0.000018	0.00005	0.000116	0.000027
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001	0.00001	<0.0002	0.0003	0.00028
Titanium (Ti), total	mg/L	0.0556	0.0083	0.0125	0.0105	0.0152	0.0043	0.0031	0.25	0.0022	0.0101	0.0007	0.0062	0.019	0.192	0.0201
Uranium (U), total	mg/L	0.0017	0.0026	0.0006	0.0037	0.0022	0.0017	0.00553	0.00608	0.00184	0.00412	0.00176	0.00301	0.00042	0.00353	0.00243
Vanadium (V), total	mg/L	0.0007	0.0008	0.0006	<0.0001	0.0014	0.0003	0.0002	0.0365	0.0002	0.0011	<0.0002	0.0005	0.0017	0.02	0.0022
Zinc (Zn), total	mg/L	0.094	0.143	0.061	0.148	0.133	0.0885	0.147	0.669	0.106	0.256	0.133	0.196	0.078	0.261	0.205
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.0005	0.0002	<0.0001	0.0022	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0012	<0.0001
Aluminum (Al), dissolved	mg/L	0.041	0.031	0.135	0.006	0.033	0.0465	0.0039	0.0122	0.0036	0.0049	0.0075	0.0015	0.0274	0.0036	0.0596
Antimony (Sb), dissolved	mg/L	0.0003	0.0014		0.0012	0.0008	0.00024	0.00033	0.00061	0.00023	0.00017	0.00017	0.00019	0.00064	0.00038	0.00024
Arsenic (As), dissolved	mg/L	0.0028	0.0025	0.0017	0.0013	0.0022	0.00338	0.00311	0.0189	0.0121	0.0135	0.0148	0.0131	0.0124	0.0189	0.0281
Barium (Ba), dissolved	mg/L	0.037	0.028	0.019	0.035	0.03	0.0276	0.0414	0.0277	0.0257	0.021	0.0284	0.0284	0.0385	0.0254	0.0205
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005		0.000008	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	0.003	<0.002	<0.002	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00015	0.00028	0.00016	0.0003	0.00028	0.000279	0.000505	0.000023	0.000206	0.00015	0.000215	0.000283	0.000806	0.000016	0.000108
Calcium (Ca), dissolved	mg/L	72	86.6	32	122	87.1	65.5	154	171	175	166	159	201	65.2	190	204
Chromium (Cr), dissolved	mg/L	<0.0005	0.0006	0.0005	<0.0005	0.0005	0.0002	0.0002	0.0003	0.0004	0.0003	0.0003	0.0002	0.0003	0.0002	0.0001
Cobalt (Co), dissolved	mg/L	0.001	0.0014	0.0005	0.0009	0.00118	0.000973	0.0015	0.00423	0.00505	0.00585	0.00548	0.00645	0.00223	0.00623	0.00915
Copper (Cu), dissolved	mg/L	0.001	<0.001	0.003	<0.001	<0.001	0.0015	0.00034	0.00022	0.00028	0.00046	0.00031	0.00021	0.00114	0.00005	0.00056
Iron (Fe), dissolved	mg/L	0.41	0.44	0.38	0.23	0.32	0.509	0.364	2.97	1.84	2.15	2.58	2.49	1.14	2.29	4.72
Lead (Pb), dissolved	mg/L	0.0002	0.0002	0.0006	<0.0001	0.0002	0.00108	0.000431	0.00018	0.000118	0.000336	0.000204	0.000063	0.000096	0.000037	0.000673
Lithium (Li), dissolved	mg/L	0.008	0.017	0.003	0.015	0.008	0.008	0.0184	0.0252	0.0239	0.0266	0.0203	0.0246	0.0084	0.0287	0.0324
Magnesium (Mg), dissolved	mg/L	13.7	16.4	5.9	25.5	16.9	11.4	25.5	23.5	27.4	25.3	25.6	32.7	11	26.8	32.9
Manganese (Mn), dissolved	mg/L	0.224	0.302	0.143	0.231	0.221	0.27	0.412	1.14	1.34	1.6	1.36	1.55	0.401	1.67	2.07
Mercury (Hg), dissolved	mg/L						<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001		<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	0.00016	0.0002	0.00035	0.00113	0.00023	0.00025	0.00018	0.00018	0.00028	0.00076	0.00025
Nickel (Ni), dissolved	mg/L	0.0023	0.0022	0.0021	0.0033	0.004	0.00314	0.00463	0.00556	0.00785	0.00902	0.00982	0.0115	0.00518	0.00854	0.0136
Phosphorus (P), dissolved	mg/L					<0.01	0.008	0.004	0.007	0.006		0.009	0.003	0.01	0.007	0.016
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	0.3	0.27	0.39	0.38	0.37	0.39	0.36	0.38	0.25	0.4	0.4
Selenium (Se), dissolved	mg/L	<0.0002	0.0005	<0.0002	<0.0002	<0.0006	0.00035	0.00039	0.00026	0.00025	0.00018	0.00018	0.00032	0.00097	0.00052	0.00025
Silicon (Si), dissolved	mg/L	3.64	4.05	2.1	4.05	3.91	2.73	3.95	4.72	4.18	4.45	4.32	4.71	4.6	4.2	4.2
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	0.00001	<0.000005	<0.000005	<0.000005	0.000012	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1	1.2	0.5	1.4	1.1	1.98	1.41	1.25	1.41	1.39	1.38	2.26	1.05	1.46	1.67
Strontium (Sr), dissolved	mg/L	0.144	0.169	0.059	0.247	0.144	0.121	0.267	0.246	0.258	0.252	0.235	0.321	0.163	0.281	0.306
Sulphur (S), dissolved	mg/L	46.6	59.5	21.1	96		50	115	140	150	153	142	169	43	166	186
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	0.000008	0.00001	<0.000002	0.000002	<0.000002	0.00001	0.000011	0.000034	<0.000002	0.000003
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	0.00004	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	0.00001	0.00006
Titanium (Ti), dissolved	mg/L	0.0485	0.0036	0.0016	0.0029	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0017
Uranium (U), dissolved	mg/L	0.0016	0.0022	0.0005	0.0038	0.002	0.00169	0.00558	0.002	0.00184	0.0022	0.00202	0.00318	0.00037	0.0027	0.00229
Vanadium (V), dissolved	mg/L	0.0002	0.0004	0.0002	<0.0001	0.0001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.084	0.113	0.05	0.138	0.089	0.0786	0.143	0.0543	0.103	0.124	0.146	0.17	0.0726	0.0809	0.152
Zirconium (Zr), dissolved	mg/L					<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0004	<0.0001

Station Name		KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50
Sample Date		26/11/2011	20/12/2011	12/01/2012	12/02/2012	11/03/2012	08/04/2012	03/05/2012	03/06/2012	03/07/2012	01/08/2012	03/09/2012	14/10/2012	19/11/2012	10/12/2012	12/02/2013
Discharge (Flow)	L/s	34.6		28.3		21.2	19.5	38.9	28.525	32.23	38.24	28.8	27.8387			19.8
Total Suspended Solids	mg/L	29.8	15.3	18.2	14.7	10.6	12.7	30.8	21.7	18.2	19.3	20	20	14.2	14.2	17.3
pH (field)	pH units	7.37	6.9	7.02	6.94	6.95	7.38		7.02	7.27	7.61	8.58	6.7	7.85	6.88	6.92
pH (lab)	pH units	7.28	7.6	7.38	7.86	7.83	7.47	7.46	7.74	7.68	7.52	7.81	7.75	7.82	7.77	7.96
Specific Conductance (field)	µS/cm		1182	1121	1195	1218	1313		1364	1134	1164	1278	1195	1072	983	1036
Specific Conductance (lab)	µS/cm	1160	1140	1160	1180	1180	1200	698	1210	1110	1100	1080	1130	1100	1100	1120
Temperature (field)	C	0	0.1	0.1	0.1	0	0.5	1.0	3.2	4.1	4.9	2	0.2	2.4	0.28	0.1
Dissolved Oxygen (field)	mg/L	9.2	9.32	8.5	9.89	10.47	10.07		11.8	10.15	10.64	9.91	8.16	1.8	9.51	9.63
Dissolved Oxygen (field)	%	63.3	64.1	58	68.2	72.2	70.1		89	78.2	83.7	72	55.5	75	65.8	67.3
ORP (field)	mV				1.3	-2.6	18.6		299.1	-6.3	-31.5	-33.4	-14.7	267		49.2
Hardness (from total)	mg/L	703	663	662	655	690	667	370	621	651	666	559	629	614	595	617
Hardness (from dissolved)	mg/L	671	647	696	687	660	685	363	608	648	648	582	623	626	585	612
Alkalinity, total	mg/L	118	115	115	119	118	116	72	111	111	113	112	109	114	114	114
Chloride	mg/L							0.61	0.95	0.82	0.76	1.2	1.5	<0.50	<0.50	0.92
Fluoride	mg/L															
Sulphate, dissolved	mg/L	518	487	498	528	552	530	311	581	524	498	452	511	505	540	545
Ammonia (N)	mg/L															
Nitrite (N)	mg/L															
Nitrate (N)	mg/L															
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L	0.89	0.9	1.15	<0.50	0.53	<0.50	10.5	0.96	1.06	1.49	1.47	1.12	0.73	0.92	0.77
Aluminum (Al), total	mg/L	0.245	0.083	0.0407	0.028	0.0326	0.0304	0.119	0.0978	0.0927	0.0996	0.115	0.0754	0.0615	0.0457	0.0225
Antimony (Sb), total	mg/L	0.0003	0.00023	0.00018	0.00016	0.00015	0.00022	0.000297	0.00018	0.000285	0.000248	0.000268	0.000236	0.000264	0.00023	0.000169
Arsenic (As), total	mg/L	0.0309	0.0312	0.032	0.0304	0.0345	0.0355	0.0212	0.0273	0.0222	0.0222	0.0214	0.0263	0.0291	0.0284	0.0293
Barium (Ba), total	mg/L	0.0307	0.0222	0.0224	0.0225	0.0224	0.0231	0.0243	0.0289	0.0286	0.0293	0.0266	0.0275	0.0264	0.0255	0.0226
Beryllium (Be), total	mg/L	0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	0.000016	<0.000050	0.000013	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), total	mg/L	0.000013	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000011	<0.000025	0.0000078	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.000372	0.000324	0.000307	0.000275	0.000269	0.000331	0.000273	0.00028	0.000245	0.000296	0.0003	0.000264	0.000452	0.000402	0.000258
Calcium (Ca), total	mg/L	224	209	212	209	218	211	116	189	206	211	178	203	193	187	195
Chromium (Cr), total	mg/L	0.0006	0.0001	<0.0001	<0.0001	0.0001	0.0002	0.00025	<0.00050	0.00023	0.0002	0.00018	0.00016	<0.00010	<0.00010	0.0001
Cobalt (Co), total	mg/L	0.00995	0.00993	0.00922	0.0096	0.0101	0.0106	0.00564	0.00957	0.00868	0.00895	0.00816	0.00904	0.00887	0.00897	0.0094
Copper (Cu), total	mg/L	0.00227	0.00094	0.00053	0.0004	0.00049	0.00157	0.0211	0.00131	0.00113	0.00105	0.000881	0.00109	0.00138	0.00068	0.00034
Iron (Fe), total	mg/L	6.25	4.82	5.09	5.18	5.33	5.71	3.8	4.81	3.94	4.22	4.55	4.77	5.11	4.76	4.74
Lead (Pb), total	mg/L	0.00218	0.00222	0.000535	0.000878	0.00066	0.00498	0.00365	0.00152	0.000947	0.00114	0.00137	0.000875	0.00106	0.00289	0.00058
Lithium (Li), total	mg/L	0.033	0.0339	0.0343	0.0332	0.035	0.0345	0.0151	0.0357	0.0332	0.0329	0.0301	0.0344	0.0299	0.0295	0.0362
Magnesium (Mg), total	mg/L	34.7	34.3	32.2	32.1	35.6	34.1	19.1	36.3	33.1	33.5	27.7	29.9	31.9	31	31.5
Manganese (Mn), total	mg/L	2.14	2.46	2.21	2.22	2.4	2.38	1.31	2.47	2.15	2.18	1.84	2.15	2.08	2.07	2.23
Mercury (Hg), total	mg/L	<0.000020	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	0.00001	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00029	0.00025	0.00023	0.00021	0.00021	0.00018	0.000225	<0.00025	0.000296	0.000241	0.000243	0.000347	0.000243	0.00022	0.00022
Nickel (Ni), total	mg/L	0.0169	0.0173	0.0157	0.0164	0.017	0.0191	0.0104	0.0166	0.0152	0.0163	0.0144	0.0169	0.0161	0.0165	0.0165
Phosphorus (P), total	mg/L	0.045	0.017	0.029	0.023	0.032	0.028	0.0477	0.027	0.032	0.019	0.0174	0.0186	0.0203	0.0172	0.0141
Potassium (K), total	mg/L	0.47	0.4	0.4	0.4	0.45	0.54	0.445	0.4	0.375	0.375	0.333	0.394	0.479	0.419	0.389
Selenium (Se), total	mg/L	0.00027	0.00029	0.00031	0.00026	0.00022	0.00021	0.00009	0.00031	0.000323	0.000438	0.000299	0.000283	0.000307	0.00031	0.000289
Silicon (Si), total	mg/L	5	4.3	4.9	4.1	4.5	4.3	2.94	3.8	4.85	5.04	3.9	4.65	3.96	3.77	4.33

Station Name		KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50	KV-50
Sample Date		26/11/2011	20/12/2011	12/01/2012	12/02/2012	11/03/2012	08/04/2012	03/05/2012	03/06/2012	03/07/2012	01/08/2012	03/09/2012	14/10/2012	19/11/2012	10/12/2012	12/02/2013
Silver (Ag), total	mg/L	0.000033	0.000016	<0.000005	<0.000005	<0.000005	<0.000005	0.000017	<0.000025	0.0000179	0.000005	0.00001	<0.0000050	<0.0000050	0.000011	<0.0000050
Sodium (Na), total	mg/L	1.71	1.72	1.52	1.52	1.78	1.89	1.14	1.87	1.82	1.69	1.39	1.47	1.76	1.62	1.59
Strontium (Sr), total	mg/L	0.299	0.31	0.291	0.293	0.291	0.294	0.168	0.317	0.297	0.314	0.29	0.31	0.288	0.3	0.31
Sulphur (S), total	mg/L	187	189	227	185	218	204	105	210	185	190	165	211	189	196	177
Thallium (Tl), total	mg/L	0.00002	0.000018	0.000015	0.000016	0.000014	0.000013	0.000014	0.000014	0.0000133	0.000017	0.000013	0.000016	0.000021	0.000018	0.000013
Tin (Sn), total	mg/L	0.00006	<0.00001	<0.0002	<0.0002	<0.0002	<0.0002	0.00126	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), total	mg/L	0.0076	0.0024	0.0017	0.001	0.0015	0.0009	0.00394	0.0041	0.0032	0.00364	0.0024	0.00331	0.00246	0.00151	0.00097
Uranium (U), total	mg/L	0.00244	0.00217	0.00202	0.00214	0.00167	0.00199	0.00115	0.00255	0.00221	0.00217	0.00193	0.00226	0.00238	0.00267	0.00208
Vanadium (V), total	mg/L	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00037	<0.0010	0.00032	0.00031	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	0.19	0.204	0.193	0.202	0.211	0.219	0.135	0.226	0.169	0.17	0.159	0.169	0.201	0.206	0.208
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00018	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010
Aluminum (Al), dissolved	mg/L	0.0016	0.001	0.001	0.0015	0.0007	0.0014	0.0241	0.005	0.00156	0.00295	0.00831	0.00215	0.0021	0.00183	0.00165
Antimony (Sb), dissolved	mg/L	0.00019	0.00019	0.00016	0.00012	0.00012	0.00014	0.000224	0.00018	0.000236	0.000212	0.00024	0.00021	0.000235	0.000172	0.000131
Arsenic (As), dissolved	mg/L	0.0251	0.0242	0.0283	0.0244	0.0271	0.0265	0.0159	0.0226	0.0169	0.0163	0.018	0.0182	0.021	0.021	0.0224
Barium (Ba), dissolved	mg/L	0.021	0.0223	0.0211	0.0213	0.0209	0.0208	0.0195	0.0222	0.026	0.0249	0.0245	0.0234	0.0232	0.0225	0.0202
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000050	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.000154	0.000196	0.000212	0.0002	0.000182	0.000244	0.000149	0.00015	0.0000934	0.000107	0.000162	0.000099	0.000287	0.000263	0.000182
Calcium (Ca), dissolved	mg/L	211	209	220	220	210	218	115	185	204	205	182	199	199	184	192
Chromium (Cr), dissolved	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00941	0.00913	0.00973	0.00914	0.00985	0.0101	0.00517	0.00885	0.00869	0.00864	0.00886	0.00913	0.00861	0.00919	0.00964
Copper (Cu), dissolved	mg/L	0.00012	0.00024	0.00011	0.0002	<0.00005	0.0007	0.00106	0.00026	0.000139	0.000191	<0.000050	0.000278	0.000777	0.000112	0.000052
Iron (Fe), dissolved	mg/L	4.38	3.85	4.19	3.8	4.34	4.16	2.56	3.7	2.82	2.83	3.2	3.21	3.45	3.76	3.73
Lead (Pb), dissolved	mg/L	0.000052	0.000106	0.000011	0.000006	0.000006	0.000108	0.000425	0.000556	0.0000215	0.00003	0.000088	0.000027	0.000184	0.000062	0.000005
Lithium (Li), dissolved	mg/L	0.034	0.0353	0.0333	0.0355	0.0334	0.0355	0.0177	0.0319	0.0335	0.0315	0.0305	0.0331	0.0305	0.0313	0.0344
Magnesium (Mg), dissolved	mg/L	35	30.5	35.5	33.4	33	34.1	18.5	35.7	33.3	33.4	30.8	30.8	31.3	30.2	32
Manganese (Mn), dissolved	mg/L	2.14	2.23	2.37	2.23	2.3	2.29	1.27	2.37	2.14	2.17	2.06	2.16	2.05	2.14	2.25
Mercury (Hg), dissolved	mg/L	<0.000020	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00025	0.00025	0.00026	0.0002	0.00019	0.00018	0.000181	<0.00025	0.000236	0.000232	0.000277	0.00025	0.000273	0.000207	0.000224
Nickel (Ni), dissolved	mg/L	0.0158	0.0152	0.0166	0.015	0.0169	0.0176	0.00943	0.0151	0.0151	0.0154	0.0157	0.017	0.0156	0.0168	0.0168
Phosphorus (P), dissolved	mg/L	0.012	<0.002	0.009	0.009	0.009	0.009	0.0154	<0.010	0.0145	<0.0020	0.0031	<0.0020	0.0049	<0.0020	<0.0020
Potassium (K), dissolved	mg/L	0.42	0.4	0.44	0.44	0.41	0.54	0.422	0.39	0.377	0.365	0.413	0.384	0.541	0.375	0.377
Selenium (Se), dissolved	mg/L	0.00025	0.00034	0.00034	0.00023	0.00022	0.0002	0.000174	0.00024	0.000294	0.000363	0.000319	0.000247	0.000289	0.000351	0.000263
Silicon (Si), dissolved	mg/L	4.4	4	4.8	4.6	4.3	4.4	2.8	3.6	4.52	4.64	4.24	4.48	4.33	3.75	4.5
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1.73	1.61	1.61	1.6	1.64	1.89	1.1	1.84	1.83	1.68	1.61	1.57	1.74	1.64	1.57
Strontium (Sr), dissolved	mg/L	0.297	0.314	0.302	0.304	0.297	0.284	0.169	0.285	0.301	0.295	0.303	0.305	0.288	0.296	0.29
Sulphur (S), dissolved	mg/L	190	177	233	212	199	203	106	192	186	189	183	209	186	170	173
Thallium (Tl), dissolved	mg/L	0.000002	0.000004	0.000006	0.000009	0.000008	0.000008	0.000007	<0.000010	0.0000025	0.000003	0.000004	0.000008	0.000008	0.000009	0.000008
Tin (Sn), dissolved	mg/L	0.00005	<0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	0.00032	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.00235	0.00209	0.00218	0.00184	0.00229	0.002	0.00112	0.00221	0.00218	0.00203	0.00209	0.00223	0.00237	0.00247	0.00202
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	0.0011	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.173	0.188	0.203	0.199	0.199	0.203	0.123	0.211	0.161	0.157	0.159	0.161	0.187	0.207	0.209
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00019	<0.00010

Station Name		KV-50	KV-50	KV-50
Sample Date		03/05/2013	06/07/2013	09/08/2013
Discharge (Flow)	L/s		28.238	
Total Suspended Solids	mg/L	32.4	19.4	10.4
pH (field)	pH units	6.83	6.77	6.93
pH (lab)	pH units	7.78	7.79	7.23
Specific Conductance (field)	µS/cm	1294	892	1184
Specific Conductance (lab)	µS/cm	1180	1090	1100
Temperature (field)	C	0.2	4.5	4.1
Dissolved Oxygen (field)	mg/L	10.49	9.28	6.25
Dissolved Oxygen (field)	%	72.7	71.8	48.5
ORP (field)	mV	99	69	-59.2
Hardness (from total)	mg/L	712	647	649
Hardness (from dissolved)	mg/L	712	640	663
Alkalinity, total	mg/L	129	123	102
Chloride	mg/L	<5.0	<5.0	<5.0
Fluoride	mg/L	0.33	<0.20	0.31
Sulphate, dissolved	mg/L	578	535	567
Ammonia (N)	mg/L			
Nitrite (N)	mg/L	<0.010	<0.010	<0.010
Nitrate (N)	mg/L	0.100	0.116	<0.050
Total Kjeldahl Nitrogen	mg/L			
Dissolved Organic Carbon	mg/L	0.80	1.44	0.90
Aluminum (Al), total	mg/L	0.450	0.323	0.150
Antimony (Sb), total	mg/L	0.00051	0.00041	0.00037
Arsenic (As), total	mg/L	0.0436	0.0286	0.0258
Barium (Ba), total	mg/L	0.0318	0.0349	0.0247
Beryllium (Be), total	mg/L	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000377	0.000392	0.000385
Calcium (Ca), total	mg/L	225	199	206
Chromium (Cr), total	mg/L	0.00088	0.00063	0.00036
Cobalt (Co), total	mg/L	0.0113	0.00891	0.0104
Copper (Cu), total	mg/L	0.00199	0.00190	0.00081
Iron (Fe), total	mg/L	7.76	5.32	6.55
Lead (Pb), total	mg/L	0.00768	0.00317	0.000944
Lithium (Li), total	mg/L	0.0493	0.0315	0.0357
Magnesium (Mg), total	mg/L	36.1	36.4	32.5
Manganese (Mn), total	mg/L	2.87	2.23	2.60
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000325	0.000249	0.000324
Nickel (Ni), total	mg/L	0.0212	0.0171	0.0185
Phosphorus (P), total	mg/L	<0.050	<0.050	<0.050
Potassium (K), total	mg/L	0.53	0.47	0.40
Selenium (Se), total	mg/L	0.00018	0.00031	<0.00010
Silicon (Si), total	mg/L	5.31	4.93	5.13

Station Name		KV-50	KV-50	KV-50
Sample Date		03/05/2013	06/07/2013	09/08/2013
Silver (Ag), total	mg/L	0.000097	0.000032	0.000011
Sodium (Na), total	mg/L	1.71	1.91	1.30
Strontium (Sr), total	mg/L	0.372	0.308	0.300
Sulphur (S), total	mg/L	197	174	181
Thallium (Tl), total	mg/L	0.000028	0.000021	0.000018
Tin (Sn), total	mg/L	<0.00010	<0.00010	<0.00010
Titanium (Ti), total	mg/L	0.013	0.013	<0.010
Uranium (U), total	mg/L	0.00282	0.00337	0.000525
Vanadium (V), total	mg/L	0.0012	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.271	0.201	0.172
Zirconium (Zr), total	mg/L	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.0023	0.0016	0.0034
Antimony (Sb), dissolved	mg/L	0.00019	0.00022	0.00031
Arsenic (As), dissolved	mg/L	0.0228	0.0147	0.0204
Barium (Ba), dissolved	mg/L	0.0208	0.0255	0.0215
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000189	0.000167	0.000082
Calcium (Ca), dissolved	mg/L	226	197	211
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	0.00024
Cobalt (Co), dissolved	mg/L	0.0103	0.00784	0.0104
Copper (Cu), dissolved	mg/L	0.00079	0.00020	<0.00020
Iron (Fe), dissolved	mg/L	3.98	2.27	5.28
Lead (Pb), dissolved	mg/L	0.000118	0.000097	<0.000050
Lithium (Li), dissolved	mg/L	0.0362	0.0296	0.0351
Magnesium (Mg), dissolved	mg/L	35.9	35.7	32.8
Manganese (Mn), dissolved	mg/L	2.65	2.02	2.62
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000203	0.000199	0.000317
Nickel (Ni), dissolved	mg/L	0.0189	0.0149	0.0181
Phosphorus (P), dissolved	mg/L	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.45	0.39	0.38
Selenium (Se), dissolved	mg/L	0.00017	0.00029	<0.00010
Silicon (Si), dissolved	mg/L	4.35	4.29	4.91
Silver (Ag), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.67	1.79	1.33
Strontium (Sr), dissolved	mg/L	0.302	0.297	0.300
Sulphur (S), dissolved	mg/L	193	168	178
Thallium (Tl), dissolved	mg/L	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	0.00012	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00207	0.00303	0.000481
Vanadium (V), dissolved	mg/L	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.233	0.167	0.155
Zirconium (Zr), dissolved	mg/L	<0.00080	<0.00080	<0.00080

Station Name		KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51
Sample Date		17/07/2007	11/09/2007	18/05/2008	05/07/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	07/10/2010	26/05/2011	31/10/2011	12/02/2012	03/05/2012	03/07/2012
Discharge (Flow)	L/s	5.6									10		35.26	23.1	41.2	31.60
Total Suspended Solids	mg/L			10	<3	31	8	15	2100	10	66	5	83	11	33	14.4
pH (field)	pH units	7.16		7.16	7.07	7.4	7.72	7.51	7.47	7.39	7.28	7.87	7.5	6.99		7.08
pH (lab)	pH units	7.36	7.55	7.28	7.82	7.31	7.4	7.9	7.5	7.7	7.62	7.33	7.34	7.88	7.33	7.61
Specific Conductance (field)	µS/cm												1235	1196		1231
Specific Conductance (lab)	µS/cm	417	532	214	751	447	230	900	996	931	950	528	1160	1170	652	1110
Temperature (field)	C	5.7		0	5	1	3.5	3.5	1	7.8	0.2	4.1	0.7	0.1	1.0	3.4
Dissolved Oxygen (field)	mg/L												9.39	11.15		10.45
Dissolved Oxygen (field)	%												64.8	76.9		78.8
ORP (field)	mV												156.8	1.8		5.1
Hardness (from total)	mg/L						109	507	617	511	531	271	665	630	345	657
Hardness (from dissolved)	mg/L			100	407	260	112	494	533	531	537	265	651	687	347	648
Alkalinity, total	mg/L										110	35	120	119	64.3	111
Chloride	mg/L														<0.50	0.74
Fluoride	mg/L															
Sulphate, dissolved	mg/L										450	200	515	531	269	521
Ammonia (N)	mg/L										0.035	0.017	0.067	0.055	0.0054	0.19
Nitrite (N)	mg/L										<0.005	<0.005	0.05	0.005	<0.050	<0.050
Nitrate (N)	mg/L										0.08	0.1	0.7	0.06	0.56	0.21
Total Kjeldahl Nitrogen	mg/L															
Dissolved Organic Carbon	mg/L										1.3	7	1.2	<0.50	10.8	1.36
Aluminum (Al), total	mg/L	0.51	0.129	0.306	0.006	0.529	0.156	0.289	5.96	0.0572	0.273	0.0412	0.641	0.0184	0.129	0.0801
Antimony (Sb), total	mg/L	0.0004	0.0003	0.0002	<0.0002	0.0004	0.00026	0.00045	0.00167	0.00026	0.00022	0.00017	0.00034	0.00015	0.000289	0.000258
Arsenic (As), total	mg/L	0.007	0.0057	0.0051	0.0019	0.0112	0.00559	0.0208	0.093	0.0119	0.0297	0.00513	0.0343	0.0286	0.0195	0.0178
Barium (Ba), total	mg/L	0.049	0.036	0.024	0.035	0.048	0.0396	0.0678	0.232	0.029	0.0582	0.0414	0.0398	0.0232	0.0304	0.027
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	0.00001	0.00003	0.00069	<0.00001	0.00002	<0.00001	0.00003	<0.00001	0.000014	<0.000010
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	0.00002	0.00001	0.000127	<0.000005	0.00001	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050
Boron (B), total	mg/L	0.003	<0.002	<0.002	0.003	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.00032	0.0004	0.00025	0.00035	0.00045	0.000381	0.00126	0.00385	0.00031	0.000843	0.000237	0.000494	0.000287	0.000308	0.000191
Calcium (Ca), total	mg/L	63.5	80.7	32.7	120	78.2	33.9	160	199	163	169	88.5	209	200	109	208
Chromium (Cr), total	mg/L	0.0014	0.0007	0.0011	<0.0005	0.0011	0.0006	0.0005	0.0121	0.0004	0.0008	0.0004	0.0012	<0.0001	0.00027	0.00017
Cobalt (Co), total	mg/L	0.0013	0.0015	0.0007	0.0009	0.00171	0.000767	0.00277	0.0244	0.0044	0.0087	0.00158	0.0106	0.00963	0.00489	0.00835
Copper (Cu), total	mg/L	0.003	0.001	0.003	<0.001	0.004	0.002	0.0029	0.0829	0.00078	0.00486	0.0009	0.00511	0.00033	0.00246	0.00098
Iron (Fe), total	mg/L	1.6	1	1.3	0.45	2.5	1.01	4.43	36.3	2.07	4.03	0.961	7.04	4.41	3.5	3.15
Lead (Pb), total	mg/L	0.0014	0.0003	0.0006	<0.0001	0.0017	0.000889	0.00297	0.1	0.000586	0.00355	0.000324	0.00595	0.000376	0.00259	0.000889
Lithium (Li), total	mg/L	0.009	0.012	0.005	0.017	0.009	0.0038	0.0158	0.0331	0.0214	0.0246	0.007	0.0247	0.0354	0.0133	0.033
Magnesium (Mg), total	mg/L	13.6	15.7	6.1	24.2	15.2	5.99	26	29.2	25.5	26.5	12.2	34.8	31.9	17.7	33.4
Manganese (Mn), total	mg/L	0.23	0.291	0.166	0.245	0.261	0.171	0.569	2.57	1.19	1.7	0.422	2.24	2.22	1.13	2.07
Mercury (Hg), total	mg/L						<0.00001	<0.00001		0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.00022	0.00011	0.00022	0.00256	0.0002	0.00036	0.00007	0.00034	0.00022	0.000198	0.00026
Nickel (Ni), total	mg/L	0.0034	0.0056	0.0028	0.0069	0.005	0.00265	0.00696	0.055	0.00725	0.0143	0.00347	0.0176	0.0167	0.00961	0.015
Phosphorus (P), total	mg/L					0.032	0.028	0.058		0.015		0.014	0.079	0.023	0.0471	0.0292
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	0.6	0.3	0.32	0.44	0.83	0.31	0.39	0.26	0.46	0.4	0.458	0.369
Selenium (Se), total	mg/L	0.0004	0.0006	<0.0002	0.0003	0.0007	0.00018	0.00041	0.00045	0.00024	0.00024	0.0002	0.00027	0.00025	0.000175	0.000304
Silicon (Si), total	mg/L	4.15	4.1	2.42	3.78	4.55	1.89	4.57	11	3.79	4.3	2.6	5.1	3.9	2.73	4.9

Station Name		KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51	KV-51
Sample Date		17/07/2007	11/09/2007	18/05/2008	05/07/2008	03/10/2008	28/05/2009	06/07/2009	08/10/2009	08/07/2010	07/10/2010	26/05/2011	31/10/2011	12/02/2012	03/05/2012	03/07/2012
Silver (Ag), total	mg/L	<0.0001	<0.0001	0.00004	<0.00001	<0.00001	0.000017	0.000024	0.000131	<0.000005	0.000015	0.000022	0.000008	<0.000005	0.000019	0.0000115
Sodium (Na), total	mg/L	1	1.1	0.5	1.6	1.07	0.44	1.48	1.32	1.32	1.43	0.81	1.75	1.49	1.09	1.86
Strontium (Sr), total	mg/L	0.152	0.162	0.07	0.264	0.15	0.0661	0.268	0.293	0.269	0.256	0.146	0.312	0.31	0.165	0.298
Sulphur (S), total	mg/L	42.8	56.5	21.9	94.9		28	129	145	148	157	84	200	188	101	187
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.00002	0.000009	0.000024	0.000165	0.00001	0.000033	0.000003	0.000024	0.000013	0.000012	0.0000124
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.00001	<0.00001	0.00006	<0.00001	<0.00001	<0.00001	0.00009	<0.0002	<0.00020	<0.00020
Titanium (Ti), total	mg/L	0.0609	0.0063	0.008	0.0101	0.012	0.0024	0.0099	0.201	0.0027	0.0094	0.0006	0.0188	0.0011	0.00454	0.00252
Uranium (U), total	mg/L	0.0015	0.0026	0.0006	0.0037	0.0019	0.000721	0.00524	0.00505	0.00168	0.00411	0.000597	0.00249	0.00231	0.00103	0.00219
Vanadium (V), total	mg/L	0.0013	0.0005	0.0005	<0.0001	0.00116	0.0002	0.0008	0.0278	<0.0002	0.0012	<0.0002	0.0021	<0.0002	0.0004	0.00021
Zinc (Zn), total	mg/L	0.099	0.133	0.06	0.154	0.114	0.0547	0.195	0.551	0.096	0.246	0.0599	0.2	0.202	0.127	0.162
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	0.0002	0.0002	<0.0001	0.0022	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00023	<0.00010
Aluminum (Al), dissolved	mg/L	0.044	0.037	0.143	0.006	0.045	0.117	0.0066	0.0077	0.0057	0.0036	0.0306	0.0034	0.0009	0.0259	0.00253
Antimony (Sb), dissolved	mg/L	0.0003	0.0013		0.0015	0.0012	0.0002	0.00031	0.00062	0.00024	0.00015	0.00015	0.00022	0.00013	0.000212	0.000244
Arsenic (As), dissolved	mg/L	0.0028	0.0025	0.0014	0.0017	0.0022	0.00167	0.0026	0.018	0.00931	0.0126	0.00424	0.0263	0.022	0.0126	0.0146
Barium (Ba), dissolved	mg/L	0.037	0.029	0.019	0.036	0.033	0.0355	0.0484	0.0288	0.0267	0.0207	0.0404	0.0206	0.0213	0.0255	0.0246
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005		<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	<0.002	0.002	<0.002	<0.002	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.00015	0.00028	0.00015	0.00037	0.00026	0.000405	0.000512	0.000026	0.000212	0.000069	0.000231	0.000068	0.000199	0.00016	0.0000772
Calcium (Ca), dissolved	mg/L	67.3	84.1	32.2	122	78.9	35.1	156	173	170	171	85.3	207	224	110	206
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	0.0005	0.0005	0.0007	0.0003	0.0002	0.0003	0.0003	0.0004	0.0003	<0.0001	<0.0001	0.0001	<0.00010
Cobalt (Co), dissolved	mg/L	0.0009	0.0013	0.0006	0.0009	0.00113	0.000637	0.00134	0.00434	0.00445	0.00608	0.00165	0.00884	0.00878	0.00456	0.0082
Copper (Cu), dissolved	mg/L	0.002	0.001	0.003	<0.001	0.001	0.00228	0.00039	0.00016	0.00047	0.00025	0.00093	<0.00005	<0.00005	0.00112	0.000176
Iron (Fe), dissolved	mg/L	0.42	0.42	0.42	0.32	0.316	0.26	0.267	2.78	1.37	1.89	0.724	4.06	3.42	2.12	2.32
Lead (Pb), dissolved	mg/L	0.0002	0.0012	0.0004	<0.0001	0.0012	0.00148	0.000755	0.000118	0.000441	0.000106	0.00132	0.000312	0.000207	0.00034	0.000486
Lithium (Li), dissolved	mg/L	0.007	0.015	0.004	0.015	0.008	0.0039	0.0169	0.022	0.0214	0.027	0.0071	0.0317	0.036	0.0152	0.0319
Magnesium (Mg), dissolved	mg/L	12.8	15.9	6.1	24.8	15.4	6.06	25.2	24.6	26	26.4	12.6	32.7	31.2	17.8	32.3
Manganese (Mn), dissolved	mg/L	0.218	0.294	0.142	0.258	0.208	0.256	0.375	1.14	1.18	1.69	0.415	2.05	2.16	1.08	2.06
Mercury (Hg), dissolved	mg/L						<0.00001	<0.00001	<0.00001	0.00001		<0.00001	<0.00001	<0.00001	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	0.00015	0.00015	0.00025	0.00118	0.00021	0.00024	0.00008	0.00027	0.00019	0.000143	0.00024
Nickel (Ni), dissolved	mg/L	0.0023	0.0018	0.0019	0.0031	0.006	0.00262	0.00448	0.00572	0.00692	0.00932	0.00379	0.013	0.0145	0.00853	0.0141
Phosphorus (P), dissolved	mg/L					<0.01	0.016	0.008	0.002	0.008		0.007	0.01	0.008	0.0156	0.0119
Potassium (K), dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	0.3	0.36	0.37	0.37	0.34	0.37	0.25	0.38	0.42	0.446	0.361
Selenium (Se), dissolved	mg/L	0.0004	0.0004	<0.0002	0.0003	<0.0006	0.00021	0.00038	0.00026	0.00023	0.00018	0.00019	0.00027	0.00023	0.0001	0.00032
Silicon (Si), dissolved	mg/L	3.56	4.02	2.1	4.07	3.86	1.83	3.94	4.54	4.1	4.49	2.41	4.2	4.5	2.58	4.65
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	0.000013	<0.000005	<0.000005	<0.000005	<0.000005	0.00001	<0.000005	<0.000005	0.000006	<0.0000050
Sodium (Na), dissolved	mg/L	1	1.1	0.5	1.4	1	0.52	1.4	1.33	1.38	1.43	0.85	1.63	1.49	1.07	1.79
Strontium (Sr), dissolved	mg/L	0.136	0.167	0.062	0.248	0.137	0.0674	0.275	0.246	0.264	0.259	0.146	0.304	0.297	0.164	0.299
Sulphur (S), dissolved	mg/L	43	57.5	21.4	94.3		27	121	149	143	159	80	186	204	103	179
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	0.000005	0.000009	<0.000002	0.000002	<0.000002	0.000003	<0.000002	0.000011	0.000003	0.0000038
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00006	<0.0002	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	0.0485	0.0037	0.0016	0.0028	0.001	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.0014	0.0022	0.0006	0.0036	0.0018	0.0007	0.00504	0.00195	0.00171	0.00247	0.000662	0.00233	0.00186	0.000968	0.00223
Vanadium (V), dissolved	mg/L	0.0002	0.0004	0.0002	<0.0001	0.00015	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.079	0.109	0.05	0.14	0.092	0.18	0.134	0.0548	0.0911	0.121	0.0616	0.143	0.188	0.109	0.152
Zirconium (Zr), dissolved	mg/L					<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010

Station Name		KV-51	KV-51	KV-51	KV-51
Sample Date		14/10/2012	12/02/2013	03/05/2013	06/07/2013
Discharge (Flow)	L/s	39.73654	22.3		40.7
Total Suspended Solids	mg/L	18.5	9.4	39.6	10.8
pH (field)	pH units	6.8	6.92	6.81	6.81
pH (lab)	pH units	7.67	7.78	7.77	7.65
Specific Conductance (field)	µS/cm	1195	1044	1017	995
Specific Conductance (lab)	µS/cm	1140	1130	1190	1080
Temperature (field)	C	0.1	0.1	0.1	3.9
Dissolved Oxygen (field)	mg/L	10.78	10.13	10.39	8.99
Dissolved Oxygen (field)	%	74.3	70.6	71.5	68.9
ORP (field)	mV	-23.6	40.2	138.4	81.7
Hardness (from total)	mg/L	620	622	731	633
Hardness (from dissolved)	mg/L	642	588	719	634
Alkalinity, total	mg/L	108	113	128	118
Chloride	mg/L	0.9	0.9	<5.0	<5.0
Fluoride	mg/L			0.30	0.20
Sulphate, dissolved	mg/L	534	545	584	539
Ammonia (N)	mg/L	0.059	0.039	0.0298	0.0109
Nitrite (N)	mg/L	<0.050	<0.0050	<0.010	<0.010
Nitrate (N)	mg/L	<0.20	0.08	0.096	0.112
Total Kjeldahl Nitrogen	mg/L				
Dissolved Organic Carbon	mg/L	0.86	<0.50	0.92	1.42
Aluminum (Al), total	mg/L	0.0653	0.019	0.531	0.134
Antimony (Sb), total	mg/L	0.000221	0.000146	0.00039	0.00033
Arsenic (As), total	mg/L	0.024	0.0281	0.0447	0.0181
Barium (Ba), total	mg/L	0.0282	0.0212	0.0329	0.0294
Beryllium (Be), total	mg/L	<0.000010	<0.000010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000247	0.000238	0.000409	0.000295
Calcium (Ca), total	mg/L	198	197	232	195
Chromium (Cr), total	mg/L	0.00012	<0.00010	0.00103	0.00029
Cobalt (Co), total	mg/L	0.00913	0.00918	0.0117	0.00822
Copper (Cu), total	mg/L	0.000709	0.000268	0.00227	0.00095
Iron (Fe), total	mg/L	4.23	4.39	8.27	3.06
Lead (Pb), total	mg/L	0.000791	0.000313	0.00753	0.00247
Lithium (Li), total	mg/L	0.0336	0.0355	0.0360	0.0303
Magnesium (Mg), total	mg/L	30.3	31.4	36.8	35.6
Manganese (Mn), total	mg/L	2.12	2.2	2.91	2.08
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000184	0.000209	0.000280	0.000233
Nickel (Ni), total	mg/L	0.0165	0.0165	0.0216	0.0158
Phosphorus (P), total	mg/L	0.0172	0.0126	<0.050	<0.050
Potassium (K), total	mg/L	0.394	0.384	0.55	0.43
Selenium (Se), total	mg/L	0.000219	0.00024	0.00021	0.00026
Silicon (Si), total	mg/L	4.52	4.45	5.60	4.51

Station Name		KV-51	KV-51	KV-51	KV-51
Sample Date		14/10/2012	12/02/2013	03/05/2013	06/07/2013
Silver (Ag), total	mg/L	<0.0000050	<0.0000050	0.000073	0.000025
Sodium (Na), total	mg/L	1.52	1.53	1.72	1.84
Strontium (Sr), total	mg/L	0.316	0.306	0.302	0.313
Sulphur (S), total	mg/L	208	176	201	172
Thallium (Tl), total	mg/L	0.000016	0.000014	0.000024	0.000016
Tin (Sn), total	mg/L	<0.00020	<0.00020	0.00016	<0.00010
Titanium (Ti), total	mg/L	0.00253	0.00095	0.016	<0.010
Uranium (U), total	mg/L	0.00221	0.00208	0.00235	0.00327
Vanadium (V), total	mg/L	<0.00020	<0.00020	0.0015	<0.0010
Zinc (Zn), total	mg/L	0.168	0.203	0.278	0.184
Zirconium (Zr), total	mg/L	<0.00010	<0.00010	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00168	0.00149	0.0019	0.0037
Antimony (Sb), dissolved	mg/L	0.000199	0.000126	0.00020	0.00021
Arsenic (As), dissolved	mg/L	0.0166	0.0216	0.0233	0.0144
Barium (Ba), dissolved	mg/L	0.024	0.02	0.0210	0.0261
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000087	0.000191	0.000204	0.000163
Calcium (Ca), dissolved	mg/L	203	185	229	195
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00904	0.009	0.0105	0.00788
Copper (Cu), dissolved	mg/L	0.000197	<0.000050	<0.00020	0.00024
Iron (Fe), dissolved	mg/L	2.81	3.48	3.90	2.18
Lead (Pb), dissolved	mg/L	0.000016	<0.0000050	0.000076	0.000234
Lithium (Li), dissolved	mg/L	0.033	0.0359	0.0348	0.0290
Magnesium (Mg), dissolved	mg/L	31	30.8	36.0	35.4
Manganese (Mn), dissolved	mg/L	2.14	2.1	2.78	2.00
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000216	0.000229	0.000191	0.000207
Nickel (Ni), dissolved	mg/L	0.0164	0.0163	0.0193	0.0150
Phosphorus (P), dissolved	mg/L	0.0046	<0.0020	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.382	0.358	0.46	0.38
Selenium (Se), dissolved	mg/L	0.000209	0.000136	0.00014	0.00027
Silicon (Si), dissolved	mg/L	4.51	4.38	4.36	4.24
Silver (Ag), dissolved	mg/L	<0.0000050	<0.0000050	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.56	1.46	1.65	1.78
Strontium (Sr), dissolved	mg/L	0.304	0.298	0.293	0.301
Sulphur (S), dissolved	mg/L	210	166	194	167
Thallium (Tl), dissolved	mg/L	0.00001	0.00001	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	0.00014	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.00050	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.00216	0.00202	0.00208	0.00311
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.157	0.193	0.242	0.170
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00010	<0.00080	<0.00080

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	24/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005
Discharge (Flow)	L/s		1450	280	840			4168	2662								
Total Suspended Solids	mg/L		<2	<3	<3	9	1	13	<2	1	<1	<2	<1	1	<2	<2	4
pH (field)	pH units	7.18		7.62	7.71		8.3	7.85	8.4	7.8	7.3	7.1	6.95	7.35	7.18	8.99	8.4
pH (lab)	pH units		7.3	7.72	7.81	7.8	8.22	7.95	8	8.16	8.04	7.8	7.85	7.66	7.6	7.6	7.67
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm		418	451	408	283	299	300	340	350	361	410	400	470	445	440	410
Temperature (field)	C	0.1	0.1	0.1	0.1		16.7	11.8	14.5	1.4	0.1	0.1	0.5	0.1	0.2	0	0.2
Dissolved Oxygen (field)	mg/L							8.6									
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L												228				
Hardness (from dissolved)	mg/L		236	238	207	141	157	151	202	184	204	205	214	255	211	240	201
Alkalinity, total	mg/L		147	158	152	89	97	91	102	113	126	133	137	168	152	152	143
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L		75.9	83.2	80.6	49.2		59.6	64.2	68.8	66.4	71.5	73.9				
Ammonia (N)	mg/L							<0.05									
Nitrite (N)	mg/L							<0.05									
Nitrate (N)	mg/L							<0.1									
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L		<0.01	0.08	<0.01	0.19	0.18	0.969	0.13	0.072	0.03	0.031		0.027	0.018	0.03	0.03
Antimony (Sb), total	mg/L		<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), total	mg/L		<0.04	<0.04	<0.04	<0.04	0.0014	0.0022	<0.04	0.0013	0.0012	0.0013	0.0016	0.0019	0.0017	0.002	0.001
Barium (Ba), total	mg/L		0.076	0.0833	0.0676	0.0432	0.053	0.056	0.0467	0.048	0.056	0.066	0.073	0.084	0.08	0.074	0.063
Beryllium (Be), total	mg/L		<0.0006	<0.0006	<0.0006	<0.0006	<0.0001	<0.0001	<0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		<0.02	0.09	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L						0.004	0.034		<0.002	0.002	0.002	0.003	0.004	0.003	0.004	0.003
Cadmium (Cd), total	mg/L		<0.0006	0.0033	<0.0006	<0.0006	0.00008	0.00013	0.0008	0.00009	0.00004	0.00008	0.00009	0.00006	0.00007	0.00006	0.00006
Calcium (Ca), total	mg/L		63.9	59.8	31.4	38.4	40.2	39.7	44.5	46.5	50.6	50.3		63.4	59.5	58.8	55
Chromium (Cr), total	mg/L		<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt (Co), total	mg/L		<0.001	<0.001	<0.001	<0.001	0.0003	0.0013	<0.001	0.0003	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	<0.0001
Copper (Cu), total	mg/L		<0.001	0.006	<0.001	0.011	0.004	0.006	0.004	0.001	0.015	0.002	0.002	0.009	<0.001	0.001	<0.001
Iron (Fe), total	mg/L		0.159	0.261	0.158	0.22	0.1	0.5	0.122	0.2	0.2	0.2		0.3	0.2	0.2	0.2
Lead (Pb), total	mg/L		0.044	0.037	<0.01	0.022	0.0005	0.0009	<0.01	<0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.0006
Lithium (Li), total	mg/L		<0.007	<0.007	<0.007	<0.007	0.006	0.006	0.186	0.005	0.005	0.004		0.005	0.005	0.005	0.004
Magnesium (Mg), total	mg/L		20.6	19.8	12.5	11.2	13.6	12.9	12	15.8	17.1	17.2		22	20.1	19.7	18.2
Manganese (Mn), total	mg/L		0.0351	0.0411	0.0144	0.0474	0.036	0.09	0.151	0.046	0.049	0.061		0.057	0.046	0.053	0.04
Mercury (Hg), total	mg/L												<0.0002				
Molybdenum (Mo), total	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Nickel (Ni), total	mg/L		0.006	0.007	0.003	0.008	0.0065	0.0089	0.006	0.0069	0.0063	0.0054	0.007	0.0068	0.0046	0.0052	0.004
Phosphorus (P), total	mg/L		<0.06	0.12	<0.06	<0.06			0.18								
Potassium (K), total	mg/L		<1	<1	<1	<1	0.4	0.5	1.5	0.6	0.6	0.6		1.2	0.6	0.6	
Selenium (Se), total	mg/L		<0.1	<0.1	<0.1	<0.1	0.001	0.0004	<0.1	0.0005	0.0004	0.0004	0.0003	0.0002	0.0004	0.0003	0.0004
Silicon (Si), total	mg/L		3	3.4	3	1.6	1.28	2.42	1.5	1.59	1.74	2.09		3.2	3.11	3	2.7

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	24/08/2004	21/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	27/02/2005	22/03/2005	21/04/2005
Silver (Ag), total	mg/L		<0.002	<0.002	<0.002	<0.002	0.0009	0.0004	<0.002	<0.0001	<0.0001	0.0013	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), total	mg/L		3.3	3.19	1.48	1.08	1.5	1.6	1.45	1.8	1.9	2.5		3.7	3	3	5.2
Strontium (Sr), total	mg/L		0.244	0.254	0.26	0.16	0.19	0.152	0.219	0.222	0.225	0.252		0.238	0.252	0.255	0.238
Sulphur (S), total	mg/L		26.7	32.2	27.8	14.4	18.6	19.3	19.7	22.1	21.3	23.9	26.5	28.4	27.4	26	24
Thallium (Tl), total	mg/L						<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L		<0.004	0.013	<0.004	<0.004	0.0018	0.006	<0.004	0.0016	0.0019	0.0017	0.0019	0.002	0.0017	0.002	0.001
Uranium (U), total	mg/L		<0.07	<0.07	<0.07	<0.07	0.0007	0.0008	<0.07	0.0008	0.0009	0.0009	0.0009	0.0008	0.0008	0.0009	0.0008
Vanadium (V), total	mg/L		<0.001	<0.001	<0.001	<0.001	0.0002	0.0007	<0.001	0.0002	0.0005	0.0003		0.0002	0.0017	0.0002	0.0001
Zinc (Zn), total	mg/L		0.013	0.027	0.016	0.029	0.03	0.064	0.13	0.02	0.013	0.02	0.031	0.021	0.016	0.02	0.029
Zirconium (Zr), total	mg/L		<0.006	<0.006	<0.006	<0.006	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L		<0.01	<0.01	<0.01	0.1	0.151	0.083	0.11	0.036	0.008	0.008	<0.005	<0.005	<0.005	0.005	0.03
Antimony (Sb), dissolved	mg/L		<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), dissolved	mg/L		<0.04	<0.04	<0.04	<0.04	0.0014	0.0014	<0.04	0.0012	0.001	0.0012	0.0013	0.0012	0.0014	0.001	0.001
Barium (Ba), dissolved	mg/L		0.0751	0.077	0.067	0.0428	0.048	0.047	0.048	0.049	0.058	0.062	0.072	0.082	0.072	0.073	0.062
Beryllium (Be), dissolved	mg/L		<0.0006	<0.0006	<0.0006	<0.0006	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L		<0.02	<0.02	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L						<0.002	0.003	0.0035	0.002	<0.002	<0.002	<0.002	0.004	<0.002	0.003	0.002
Cadmium (Cd), dissolved	mg/L		<0.0006	0.0022	<0.0006	<0.0006	0.00008	0.00004	59.2	0.00007	0.00005	0.00003	0.00007	0.00005	0.00006	0.00005	0.00001
Calcium (Ca), dissolved	mg/L		61.9	59.2	27.7	38.1	40.1	39.3		47	53.1	53	55.1	65.5	54.9	62.7	52.5
Chromium (Cr), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0003	0.0005	<0.001	0.0003	0.0002	0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001
Copper (Cu), dissolved	mg/L		<0.001	0.003	<0.001	0.011	0.002	0.003	0.006	0.009	0.003	0.001	0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe), dissolved	mg/L		0.038	0.033	0.1	0.028	0.11	0.19	0.141	0.08	0.04	0.08	0.088	0.02	0.05	0.06	0.15
Lead (Pb), dissolved	mg/L		0.044	0.032	<0.01	<0.01	0.0003	0.0002	<0.01	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.0005
Lithium (Li), dissolved	mg/L		<0.007	<0.007	<0.007	<0.007	0.005	0.004	0.006	0.004	0.004	0.004		0.005	0.005	0.004	0.004
Magnesium (Mg), dissolved	mg/L		19.7	19.6	10.5	11.1	13.8	12.8	13	16.1	17.4	17.6	18.5	22.2	18	20.4	17
Manganese (Mn), dissolved	mg/L		0.0342	0.0297	0.0143	0.0441	0.036	0.065	0.818	0.042	0.039	0.053	0.054	0.057	0.035	0.058	0.04
Mercury (Hg), dissolved	mg/L												<0.0001				
Molybdenum (Mo), dissolved	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L		0.005	<0.002	0.003	0.008	0.006	0.0059	0.006	0.0066	0.0014	0.0046	0.0048	0.0032	0.0037	0.004	0.004
Phosphorus (P), dissolved	mg/L		<0.06	0.11	<0.06	<0.06			0.32								
Potassium (K), dissolved	mg/L		<1	<1	<1	<1	<0.4	0.5	1.7	0.5	0.5	0.9		1.1	0.8	0.6	<0.4
Selenium (Se), dissolved	mg/L		<0.1	<0.1	<0.1	<0.1	0.0004	0.0004	<0.1	0.0006	0.0004	0.0004	0.0003	<0.0002	0.0005	<0.0002	0.0004
Silicon (Si), dissolved	mg/L		3	3.4	2.9	1.4	1.43	2.22	1.6	1.63	2.04	2.14	2.72	3.44	2.39	3.2	2.8
Silver (Ag), dissolved	mg/L		<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L		3.27	3.15	1.47	1.07	1.6	1.6	2.41	1.9	1.9	2.6	2.8	3.8	3.3	3	2
Strontium (Sr), dissolved	mg/L		0.242	0.252	0.252	0.158	0.179	0.149	0.223	0.206	0.209	0.226	0.23	0.241	0.256	0.263	0.237
Sulphur (S), dissolved	mg/L		25.3	30.3	26.9	14.3	19.4	19.9	23.7	22.9	22.1	24.6	24.6	30.8	21.6	28	24
Thallium (Tl), dissolved	mg/L						<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L		<0.004	<0.004	<0.004	<0.004	0.0015	0.0013	0.004	0.0022	0.0017	0.0012	0.0014	0.0016	0.0011	0.001	0.001
Uranium (U), dissolved	mg/L		<0.06	<0.06	<0.06	<0.06	0.0006	0.0006	<0.06	0.0007	0.0008	0.0008	0.0009	0.0008	0.0008	0.0007	0.0007
Vanadium (V), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0002	0.0002	<0.001	0.0005	0.0002	0.0001	0.0001	0.0007	0.0001	0.0001	<0.0001
Zinc (Zn), dissolved	mg/L		0.013	0.026	0.026	0.029	0.015	0.018	0.709	0.015	0.01	0.021	0.021	0.016	0.016	0.018	0.03
Zirconium (Zr), dissolved	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005				<0.001				

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		27/05/2005	30/06/2005	20/07/2005	23/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	25/10/2006
Discharge (Flow)	L/s						2900	1890	528						5025		
Total Suspended Solids	mg/L	23	3	<2	<2	2	4	14	2	<2	<2	36					
pH (field)	pH units	8.9	8.1	7.94	7.99	7.8	7.84	7.29	7.26	7.59	7.45		6.55		7.2	7.3	7.6
pH (lab)	pH units	7.49	7.66	7.94	7.99	7.87	7.84	7.68	7.64	7.48	7.61	7.29	7.36	8.22	8.17	8.01	7.98
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	238	311	311	332	354	369	465	460	529	432	151	280	329	340	340	318
Temperature (field)	C	10.4	17.7	15.4	10.8	1.4	0.2	0.1	0.2	0.1	0.1		12.1				
Dissolved Oxygen (field)	mg/L				9.9												
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L	110	140	156	175	172		233	240	243	220	72					
Alkalinity, total	mg/L	68	95	104	107	115	115	148	150	165	156	50					
Chloride	mg/L											0.27					
Fluoride	mg/L											0.05					
Sulphate, dissolved	mg/L					66			103	96	82	23.1					
Ammonia (N)	mg/L			0.008	0.003	<0.05	0.014										
Nitrite (N)	mg/L			<0.03	<0.03							<0.03					
Nitrate (N)	mg/L			<0.03	<0.03		<0.03					<0.03					
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L	0.417	0.164	0.162	0.138	0.165	0.142	0.09	0.026	0.023	<0.005	0.508	0.435	0.259	0.467	0.652	0.355
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0004	<0.0002	<0.0004
Arsenic (As), total	mg/L	0.0015	0.0011	0.0013	0.0015	0.0011	0.0011	0.0019	0.0015	0.0019	0.0012	0.0018	0.0012	0.0011	0.002	0.0012	0.0009
Barium (Ba), total	mg/L	0.047	0.05	0.051	0.051	0.053	0.054	0.083	0.075	0.086	0.069	0.037	0.046	0.058	0.056	0.05	0.053
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001
Boron (B), total	mg/L	0.003	<0.002	0.007	<0.002	<0.002	0.003	0.004	0.003	0.004	0.004	<0.002	0.003	0.006	<0.004	<0.002	<0.004
Cadmium (Cd), total	mg/L	0.00018	0.00012	0.00012	0.00012	0.00023	0.00019	0.00019	0.00016	0.0001	0.00008	0.00024	0.00038	0.00027	0.00064	0.00082	0.00063
Calcium (Ca), total	mg/L	28.4	37.7	40.9	44.3	44.1	50.1	60.6	64.7	64.8	58.5	20	39.6	44.1	44	44.8	49.4
Chromium (Cr), total	mg/L	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.001	<0.0005	<0.001
Cobalt (Co), total	mg/L	0.0012	0.0005	0.0005	0.0005	0.0011	0.001	0.0006	0.0001	0.0001	<0.0001	0.0012	0.0018	0.0016	0.0045	0.0053	0.0036
Copper (Cu), total	mg/L	0.003	0.002	0.002	0.002	0.003	0.008	0.002	<0.001	<0.001	<0.001	0.004	0.004	0.004	0.006	0.009	0.005
Iron (Fe), total	mg/L	0.8	0.2	0.2	0.2	0.2	0.2	0.4	0.2	0.2	<0.1	1	0.4	0.2	0.3	0.3	<0.2
Lead (Pb), total	mg/L	0.0008	0.0002	0.0002	0.0003	0.0003	0.0001	0.0009	0.0003	0.0004	<0.0001	0.0021	0.0005	0.0003	0.0003	0.0006	<0.0002
Lithium (Li), total	mg/L	0.003	0.004	0.005	0.005	0.004	0.006	0.005	0.006	0.006	0.004	0.002	0.004	0.006	0.006	0.006	0.007
Magnesium (Mg), total	mg/L	9	11.8	12.9	14.2	13.1	15	18.6	18.6	21.9	17.7	5.4	11.7	13.6	15	14.1	16
Manganese (Mn), total	mg/L	0.088	0.056	0.051	0.196	0.063	0.069	0.104	0.154	0.055	0.052	0.097	0.095	0.08	0.19	0.164	0.14
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002
Nickel (Ni), total	mg/L	0.0087	0.007	0.0079	0.006	0.0112	0.0103	0.0085	0.0059	0.0059	0.0064	0.0088	0.0139	0.0136	0.0286	0.0282	0.0244
Phosphorus (P), total	mg/L					<0.1											
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	0.4	0.4	0.8	0.8	0.8	1	0.9	0.6	<0.4	<0.4	<0.8	0.4	<0.8
Selenium (Se), total	mg/L	0.0005	0.0005	0.0006	0.0008	0.0006	0.0007	0.0004	0.0006	0.0004	0.0006	0.0003	0.0004	0.0005	<0.0004	0.0004	<0.0004
Silicon (Si), total	mg/L	2.43	1.84	1.85	1.9	1.87	2.13	2.94	3.21	3.75	3.02	1.8	2.06	1.56	2.12	2.04	2.05

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		27/05/2005	30/06/2005	20/07/2005	23/08/2005	22/09/2005	25/10/2005	25/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	28/06/2006	31/07/2006	31/08/2006	21/09/2006	25/10/2006
Silver (Ag), total	mg/L	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002
Sodium (Na), total	mg/L	0.8	1.1	1.6	1.4	1.5	2	3.1	3.1	3.6	2.6	0.9	1.1	1.5	1	0.9	2
Strontium (Sr), total	mg/L	0.12	0.186	0.189	0.188	0.205	0.236	0.266	0.239	0.258	0.248	0.071	0.163	0.2	0.17	0.181	0.212
Sulphur (S), total	mg/L	12.6	16.6	18.6	21	20.3	22.6	27	29.1	30.7	25.9	7.1	19.2	22.6	24.8	23.5	23.6
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005								
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002
Titanium (Ti), total	mg/L	0.0104	0.0028	0.0017	0.0018	0.0098	0.0036	0.0036	0.0018	0.0022	0.001	0.0125	0.0052	0.0455	0.0041	0.0059	0.0025
Uranium (U), total	mg/L	<0.0005	0.0006	0.0006	0.0008	0.0007	0.0007	0.001	0.0008	0.0008	0.0007	<0.0005	0.0007	<0.0005	<0.001	0.0008	<0.001
Vanadium (V), total	mg/L	0.0011	0.0003	0.0003	0.0003	0.0003	0.0004	0.0002	<0.0001	0.0003	0.0002	0.0012	0.0004	0.0003	0.0003	0.0005	0.0003
Zinc (Zn), total	mg/L	0.044	0.02	0.02	0.031	0.045	0.049	0.047	0.038	0.03	0.03	0.048	0.073	0.043	0.12	0.153	0.11
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002
Aluminum (Al), dissolved	mg/L	0.26	0.094	0.129	0.076	0.068	0.033	0.008	0.006	<0.005	<0.005	0.079	0.114	0.135	0.137	0.151	0.07
Antimony (Sb), dissolved	mg/L	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), dissolved	mg/L	<0.002	0.001	0.0012	0.0014	0.001	0.0009	0.0012	0.0011	0.0012	0.0012	0.0008	0.0009	0.001	0.0013	0.0008	0.0006
Barium (Ba), dissolved	mg/L	0.04	0.048	0.048	0.052	0.051	0.052	0.083	0.074	0.076	0.071	0.027	0.042	0.05	0.049	0.046	0.05
Beryllium (Be), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L	<0.02	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.003	0.004	0.003	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L	<0.0001	0.00006	0.00012	0.00009	0.00017	0.00014	0.00012	0.00009	0.00011	0.00008	0.0001	0.00025	0.00024	0.00044	0.00059	0.0005
Calcium (Ca), dissolved	mg/L	28.8	38	41.4	44.9	45.9	49	62.2	62	62.4	58.7	19.9	38	44	44.4	43.1	50.8
Chromium (Cr), dissolved	mg/L	<0.005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	0.0008	0.0006	<0.0005	<0.0005	0.0023
Cobalt (Co), dissolved	mg/L	0.001	0.0003	0.0005	0.0004	0.0007	0.0007	0.0002	0.0001	<0.0001	0.0001	0.0004	0.0014	0.0012	0.0039	0.0044	0.0034
Copper (Cu), dissolved	mg/L	<0.01	0.001	0.002	0.002	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.003	0.004	0.006	0.004
Iron (Fe), dissolved	mg/L	0.54	<0.10	0.08	0.03	0.04	0.05	0.05	0.05	0.03	0.17	0.2	0.05	0.06	0.05	0.05	0.05
Lead (Pb), dissolved	mg/L	<0.001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0004	0.0003	0.0004	<0.0001	0.0002	0.0002	0.0002	0.0002	0.001	0.0002
Lithium (Li), dissolved	mg/L	<0.01	0.004	0.004	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.002	0.004	0.004	0.006	0.006	0.005
Magnesium (Mg), dissolved	mg/L	9.1	11	12.9	15.4	13.9	14.9	18.9	20.7	21.2	18	5.5	12.2	14.8	15.2	13.7	17
Manganese (Mn), dissolved	mg/L	0.088	<0.05	0.037	0.028	0.046	0.06	0.067	0.051	0.051	0.106	0.038	0.069	0.074	0.193	0.142	0.134
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	0.008	0.0061	0.007	0.0061	0.0095	0.0079	0.0079	0.0057	0.0033	0.0056	0.0051	0.0132	0.0106	0.0234	0.0246	0.0222
Phosphorus (P), dissolved	mg/L																
Potassium (K), dissolved	mg/L	0.5	0.5	<0.4	<0.4	0.5	0.6	1	0.8	1	0.8	0.5	<0.4	<0.4	0.4	<0.4	0.4
Selenium (Se), dissolved	mg/L	<0.002	0.0005	0.0003	0.0006	0.0006	0.0004	0.0004	0.0004	0.0003	0.0004	<0.0002	0.0004	<0.0002	0.0004	0.0005	0.0004
Silicon (Si), dissolved	mg/L	0.76	<0.5	1.8	1.94	1.9	2.1	3.03	3.3	3.61	2.9	1.21	2.06	1.67	1.94	1.85	2.09
Silver (Ag), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L	1.1	1.5	1.4	1.3	1.6	2	3.1	2.9	3.6	3	1.3	1.2	1.3	1.5	0.9	1.5
Strontium (Sr), dissolved	mg/L	0.12	0.182	0.177	0.204	0.194	0.222	0.292	0.257	0.243	0.247	0.071	0.18	0.158	0.18	0.172	0.207
Sulphur (S), dissolved	mg/L	12.1	14	18.8	21.6	21.2	22.7	27.8	28.7	28.8	27	7.3	18.1	22.4	26.2	22.1	25.8
Thallium (Tl), dissolved	mg/L	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005								
Tin (Sn), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	<0.005	0.001	0.0016	<0.0005	0.0013	0.0015	0.0018	0.0015	0.0017	0.0013	0.0008	0.0014	0.0566	<0.0005	0.0015	0.0016
Uranium (U), dissolved	mg/L	<0.005	<0.0005	0.0006	0.0006	0.0007	0.0008	0.001	0.0009	0.0007	0.0008	<0.0005	0.0005	0.0007	0.0007	0.0007	0.0008
Vanadium (V), dissolved	mg/L	<0.001	0.0002	0.0003	0.0016	0.0004	0.0002	<0.0001	0.0002	0.0002	0.0009	0.0002	<0.0001	0.0003	0.0005	0.0004	0.0006
Zinc (Zn), dissolved	mg/L	0.04	0.014	0.02	0.013	0.029	0.034	0.04	0.033	0.027	0.026	0.021	0.048	0.021	0.07	0.098	0.095
Zirconium (Zr), dissolved	mg/L																

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		30/11/2006	22/01/2007	28/02/2007	18/04/2007	29/05/2007	16/06/2007	13/07/2007	18/08/2007	05/09/2007	31/10/2007	12/11/2007	27/11/2007	23/01/2008	29/02/2008	17/05/2008	20/06/2008
Discharge (Flow)	L/s																
Total Suspended Solids	mg/L											2	4	<3	<2	24	<5
pH (field)	pH units	7.35	7.73	7.78	7.59	8.04	7.97	8.04	8.05	7.68	8.27	7.23	8.02	7.18	7.45	7.6	
pH (lab)	pH units	7.62	7.68	7.99	7.97	7.74	7.84	7.83	8.17	8.15	8.08	7.7	7.84	7.86	8.17	8.04	8.08
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	451	689	503	441	217	289	296	336	352	398	449	421	362	525	316	347
Temperature (field)	C	0.4	0.4	0.4	0.6	8.5	16.0	4.5	16.1	10.4	0.2	0.2	0.1	0.2		5.5	
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L											200	226	254	314	165	172
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L																
Ammonia (N)	mg/L																
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L															6.5	
Aluminum (Al), total	mg/L	0.111	0.058	0.082	1.08	1.27	0.687	1.15	0.485	0.461	0.301	0.151	0.491	0.188	0.023	0.627	0.51
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	0.0005	<0.0004	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), total	mg/L	0.0014	0.0017	0.0019	0.0033	0.003	0.0012	0.0011	0.0011	0.0014	0.0011	0.0022	0.0019	0.0018	0.0027	0.002	0.001
Barium (Ba), total	mg/L	0.074	0.112	0.086	0.122	0.061	0.05	0.05	0.052	0.054	0.064	0.084	0.075	0.083	0.106	0.057	0.053
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L	0.003	0.004	0.004	0.004	0.02	<0.002	0.002	<0.002	<0.002	<0.002	0.003	0.003	0.004	0.007	<0.002	0.002
Cadmium (Cd), total	mg/L	0.00033	0.00044	0.00025	0.0006	0.00049	0.00063	0.00089	0.00072	0.00086	0.00063	0.00056	0.00079	0.00048	0.00015	0.00045	0.0009
Calcium (Ca), total	mg/L	64.6	98	65.7	63.9	32.5	37.7	39	44	45.6	55.1	71	60.7	63.5	71.5	42.9	44.5
Chromium (Cr), total	mg/L	<0.0005	<0.0005	<0.0005	0.003	0.0021	0.0007	<0.0005	<0.0005	<0.0005	0.0007	0.0007	0.0009	0.0007	<0.0005	0.001	<0.0005
Cobalt (Co), total	mg/L	0.001	0.0014	0.0005	0.0028	0.0032	0.004	0.0062	0.0041	0.0056	0.0042	0.0029	0.0037	0.0015	0.0004	0.0026	0.008
Copper (Cu), total	mg/L	0.002	0.002	0.009	0.005	0.006	0.006	0.009	0.006	0.006	0.004	0.002	0.01	0.002	0.002	0.004	0.006
Iron (Fe), total	mg/L	0.3	0.2	0.3	1.9	2	0.4	0.4	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.8	0.14
Lead (Pb), total	mg/L	0.0002	0.0004	0.0005	0.0059	0.002	0.0004	0.0008	0.0056	0.0002	0.0007	0.0002	0.0003	0.0003	0.0005	0.0009	0.0001
Lithium (Li), total	mg/L	0.007	0.012	0.006	0.008	0.004	0.005	0.006	0.007	0.006	0.007	0.007	0.007	0.008	0.006	0.005	0.007
Magnesium (Mg), total	mg/L	21.2	31.9	22.7	23.2	9.2	12	13.1	14	14.9	17.4	21.9	19.2	20.5	24.5	13.4	15.1
Manganese (Mn), total	mg/L	0.124	0.147	0.099	0.28	0.2	0.157	0.224	0.19	0.222	0.204	0.255	0.237	0.167	0.157	0.161	0.321
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Nickel (Ni), total	mg/L	0.0215	0.0294	0.0158	0.0316	0.017	0.025	0.0338	0.027	0.0363	0.0309	0.0311	0.0336	0.0261	0.007	0.0166	0.0409
Phosphorus (P), total	mg/L																
Potassium (K), total	mg/L	0.7	1.1	1	1.2	<0.8	0.5	0.4	<0.4	0.5	0.4	0.9	0.7	0.8	1.6	0.6	0.4
Selenium (Se), total	mg/L	0.0006	0.0009	0.0003	0.0009	<0.0004	0.0006	0.0005	<0.0002	0.0007	0.0008	0.0007	0.0007	0.0005	0.0004	0.0003	0.0003
Silicon (Si), total	mg/L	2.94	4.68	3.42	5.08	3.16	2.02	2.37	1.87	2.21	2.48	3.33	3.17	3.12	4	2.82	1.6

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		30/11/2006	22/01/2007	28/02/2007	18/04/2007	29/05/2007	16/06/2007	13/07/2007	18/08/2007	05/09/2007	31/10/2007	12/11/2007	27/11/2007	23/01/2008	29/02/2008	17/05/2008	20/06/2008
Silver (Ag), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00001	0.00036
Sodium (Na), total	mg/L	2.3	3.8	3.4	2.4	<0.8	1	1.2	1.4	1.7	1.8	4.1	3.1	3.7	7	1.2	1.4
Strontium (Sr), total	mg/L	0.272	0.445	0.303	0.223	0.14	0.174	0.18	0.222	0.193	0.256	0.272	0.267	0.304	0.302	0.193	0.21
Sulphur (S), total	mg/L	34.1	49.8	32.6	38.4	13	19.4	22.4	25	27.6	30.6	39.2	33.2	34.4	35	19.6	29.1
Thallium (Tl), total	mg/L		<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L	0.0024	0.0033	0.0043	0.0556	0.082	0.0568	0.0469	0.0026	0.0019	0.0029	0.0024	0.006	0.004	0.0026	0.0127	0.0026
Uranium (U), total	mg/L	0.0009	0.0014	0.0007	0.0009	<0.001	0.0006	0.0006	0.0007	0.0008	0.0008	0.0009	0.001	0.0009	0.001	0.0007	0.0007
Vanadium (V), total	mg/L	0.0007	0.0002	0.0002	0.0035	0.003	0.0007	0.0004	0.0003	0.0002	0.0002	0.0002	0.0004	0.0003	0.0002	0.0013	0.0002
Zinc (Zn), total	mg/L	0.09	0.124	0.071	0.154	0.096	0.111	0.173	0.102	0.126	0.127	0.146	0.172	0.132	0.046	0.082	0.144
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L	0.015	0.014	0.007	0.212	0.094	0.169	0.279	0.244	0.154	0.064	0.009	0.044	0.011	<0.02	0.061	0.245
Antimony (Sb), dissolved	mg/L	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0011	0.0012	0.0014	0.0002	0.0004	0.0004	<0.001		0.0008
Arsenic (As), dissolved	mg/L	0.0013	0.0016	0.0013	0.0021	0.001	0.0008	0.001	0.0011	0.001	0.0009	0.001	0.0012	0.0018	0.001	0.0008	0.0009
Barium (Ba), dissolved	mg/L	0.081	0.116	0.087	0.088	0.039	0.046	0.049	0.052	0.051	0.066	0.056	0.068	0.108	0.052	0.05	0.054
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005
Boron (B), dissolved	mg/L	<0.002	0.004	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.004	<0.01	<0.002	<0.002
Cadmium (Cd), dissolved	mg/L	0.00036	0.00044	0.00024	0.00048	0.00024	0.00042	0.00081	0.00061	0.00072	0.00057	0.00041	0.00061	0.00054	0.0001	0.00023	0.00089
Calcium (Ca), dissolved	mg/L	71	99.8	67.3	63.4	30.5	37.4	42.1	43.8	46.7	55.2	52.2	59	66.2	81.4	43.8	43.9
Chromium (Cr), dissolved	mg/L	<0.0005	0.0006	<0.0005	0.0011	0.0009	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	0.0006	0.0007	<0.0005	<0.002	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L	0.0011	0.0013	0.0005	0.0024	0.0014	0.0031	0.0059	0.004	0.0061	0.0037	0.0015	0.0028	0.002	<0.0005	0.0014	0.0085
Copper (Cu), dissolved	mg/L	0.002	0.002	0.003	0.007	0.005	0.004	0.006	0.005	0.005	0.003	0.001	0.003	0.002	<0.005	0.002	0.004
Iron (Fe), dissolved	mg/L	0.09	0.04	0.02	0.44	0.17	0.06	0.05	0.04	0.04	0.06	0.03	0.06	0.31	0.02	0.13	0.03
Lead (Pb), dissolved	mg/L	0.0002	0.0004	0.0003	0.0035	0.004	0.0003	0.001	0.0016	0.0002	0.0002	0.0002	<0.0001	0.0001	<0.0005	0.0008	<0.0001
Lithium (Li), dissolved	mg/L	0.008	0.011	0.005	0.006	0.003	0.005	0.006	0.007	0.006	0.006	0.005	0.008	0.01	<0.005	0.004	0.007
Magnesium (Mg), dissolved	mg/L	22.8	31.8	21.9	21.7	9.3	11.7	12.7	14.1	15.2	17.7	16.8	19.2	21.5	26.8	13.5	15
Manganese (Mn), dissolved	mg/L	0.131	0.143	0.096	0.258	0.12	0.127	0.216	0.168	0.222	0.195	0.18	0.194	0.183	0.166	0.121	0.308
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.005	<0.001	<0.001
Nickel (Ni), dissolved	mg/L	0.022	0.0282	0.0135	0.03	0.0094	0.0194	0.0336	0.0282	0.0358	0.0273	0.02	0.03	0.0341	0.0067	0.0116	0.0398
Phosphorus (P), dissolved	mg/L																
Potassium (K), dissolved	mg/L	0.7	1.2	0.6	1.1	0.5	0.4	0.4	<0.4	0.5	0.4	0.7	0.7	0.8	1.7	0.5	<0.4
Selenium (Se), dissolved	mg/L	0.0006	0.001	0.0003	0.0009	<0.0002	0.0003	0.0005	0.0003	0.0005	0.0005	0.0005	0.0004	0.0008	<0.001	<0.0002	0.0003
Silicon (Si), dissolved	mg/L	3.14	4.69	3.46	3.47	1.68	1.72	1.85	1.88	2.12	2.35	2.47	2.76	2.99	4.39	2.21	1.66
Silver (Ag), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001	0.00004
Sodium (Na), dissolved	mg/L	2.8	4.2	3.3	2.6	0.8	1	1.2	1.4	1.7	1.9	3.2	3	3.7	7.5	1.2	1.2
Strontium (Sr), dissolved	mg/L	0.269	0.471	0.254	0.238	0.128	0.176	0.183	0.204	0.205	0.256	0.201	0.258	0.404	0.29	0.189	0.194
Sulphur (S), dissolved	mg/L	38.3	51.6	33.1	39.2	12.4	19.3	23	25.2	27.8	30.8	28.7	32.4	35.5	37.4	19.9	28.5
Thallium (Tl), dissolved	mg/L		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0002	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Titanium (Ti), dissolved	mg/L	0.003	0.0045	0.0031	0.0089	0.0727	0.0457	0.0419	0.0018	0.0019	0.0027	<0.0005	0.0028	0.0028	<0.002	0.0007	0.0012
Uranium (U), dissolved	mg/L	0.0008	0.0014	0.0008	0.0007	<0.0005	<0.0005	0.0006	0.0007	0.0007	0.0008	0.0006	0.0008	0.0011	<0.002	0.0007	0.0006
Vanadium (V), dissolved	mg/L	0.0001	0.0012	0.0003	0.0011	0.0008	0.0003	0.0002	0.0002	0.0005	0.0003	0.0014	0.001	0.0004	<0.0005	0.0004	0.0001
Zinc (Zn), dissolved	mg/L	0.091	0.114	0.06	0.15	0.038	0.058	0.094	0.07	0.088	0.105	0.108	0.136	0.154	0.04	0.045	0.095
Zirconium (Zr), dissolved	mg/L																

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		03/07/2008	13/08/2008	18/09/2008	03/10/2008	12/11/2008	20/12/2008	01/02/2009	10/03/2009	27/05/2009	05/06/2009	06/07/2009	11/08/2009	08/09/2009	09/10/2009	03/12/2009	13/01/2010
Discharge (Flow)	L/s																
Total Suspended Solids	mg/L	25	33	14	20	20	5	6	40	24	23	<1	<4	9	24	5	
pH (field)	pH units	7.01	7.23	7.41	7.41					7.1	7.49	8		7.39	7.75	7.87	8.03
pH (lab)	pH units	8.14	7.87	8.01	7.83	7.95	8.13	7.62	7.64	7.8	8	8.1	8.2	7.9	8.1	8	8
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	358	328	347	331	424	432	537	564	150	260	310	378	332	359	414	475
Temperature (field)	C	13	11	8	8					6.5	14.7	17.6		12	1.6	0.1	1
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L									73	125	160	191	182	180	216	
Hardness (from dissolved)	mg/L	179	162	186	186	203	229	312	306	75.3	129	163	194	176	181	298	305
Alkalinity, total	mg/L																
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L												92	79	72	93	87
Ammonia (N)	mg/L																
Nitrite (N)	mg/L																
Nitrate (N)	mg/L																
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L		5.4	6.2		5.7	4.2	3		7.5	6	5	4.2	4.1	4.8	4.2	5.9
Aluminum (Al), total	mg/L	0.423	1.55	0.926	1.39	0.946	0.674	0.121	0.463	0.503	1.09	0.693	0.359	1.24	0.893	0.305	
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	<0.0002	<0.0002	<0.0002	0.00014	0.00013	0.00011	0.00008	0.0001	0.00009	0.00015	
Arsenic (As), total	mg/L	0.0012	0.0013	0.001	0.0017	0.0023	0.002	0.002	0.0033	0.00149	0.00133	0.00102	0.00124	0.00095	0.00108	0.00121	
Barium (Ba), total	mg/L	0.055	0.052	0.043	0.052	0.068	0.069	0.089	0.105	0.0307	0.0455	0.0466	0.0511	0.0449	0.047	0.0637	
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.00004	0.00005	<0.00004	<0.0001	<0.00004	0.00005	0.00004	0.00005	0.00003	0.00002	0.00005	0.00004	0.00002	
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	
Boron (B), total	mg/L	0.006	0.002	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Cadmium (Cd), total	mg/L	0.00094	0.00126	0.00105	0.00116	0.00059	0.00079	0.00048	0.00103	0.000642	0.00132	0.000714	0.000855	0.0016	0.00106	0.00091	
Calcium (Ca), total	mg/L	47.7	45	45.2	47.5	56.2	58.2	82.4	68.4	19.7	33.2	42.3	48.2	46.7	47.2	59.4	
Chromium (Cr), total	mg/L	0.0006	0.0009	0.0006	0.0007	0.0014	0.0012	0.0006	0.0006	0.0005	0.0004	0.0002	<0.0001	0.0003	0.0003	<0.0001	
Cobalt (Co), total	mg/L	0.0075	0.0096	0.00674	0.00638	0.0033	0.0042	0.00138	0.00459	0.00294	0.00541	0.00372	0.00403	0.0077	0.00511	0.00255	
Copper (Cu), total	mg/L	0.005	0.012	0.008	0.011	0.008	0.006	0.002	0.003	0.00515	0.0083	0.0063	0.00434	0.0096	0.00719	0.00389	
Iron (Fe), total	mg/L	0.19	0.62	0.48	0.8	1.06	0.75	0.41	0.87	0.63	0.632	0.192	0.168	0.338	0.457	0.212	
Lead (Pb), total	mg/L	0.0001	0.0004	0.0005	0.0008	0.0015	0.001	0.0002	0.0004	0.00566	0.00174	0.000609	0.000387	0.000488	0.000545	0.000509	
Lithium (Li), total	mg/L	0.008	0.01	0.006	0.006	0.019	0.007	0.006	0.006	0.0024	0.0053	0.0056	0.0068	0.0075	0.0059	0.0069	
Magnesium (Mg), total	mg/L	16.3	15.2	14.6	15.8	18.4	18.5	27.3	25.6	5.78	10.3	13.2	17.2	15.9	15.2	16.4	
Manganese (Mn), total	mg/L	0.314	0.278	0.248	0.214	0.196	0.242	0.181	0.394	0.227	0.235	0.157	0.182	0.283	0.198	0.165	
Mercury (Hg), total	mg/L									<0.00001	0.00002	<0.00001		<0.00001		<0.00001	
Molybdenum (Mo), total	mg/L	<0.001	<0.001	0.0004	0.00042	0.0004	<0.001	0.00079	0.00102	0.0004	0.0004	0.00039	0.00053	0.00043	0.00042	0.00047	
Nickel (Ni), total	mg/L	0.0445	0.0521	0.038	0.038	0.025	0.031	0.022	0.037	0.0187	0.0316	0.027	0.0346	0.0473	0.032	0.027	
Phosphorus (P), total	mg/L			0.02	0.014	0.034		<0.01	0.023	0.027	0.022	0.007		0.009		0.008	
Potassium (K), total	mg/L	0.5	<0.4	0.44	0.5	1.8	0.5	1.1	1.2	0.47	0.54	0.36	0.43	0.41	0.4	0.71	
Selenium (Se), total	mg/L	0.0007	0.0006	<0.0006	<0.0006	<0.0006	0.0005	<0.0006	<0.0006	0.00026	0.00039	0.0004	0.0005	0.00047	0.00047	0.00054	
Silicon (Si), total	mg/L	1.66	2.02	2.21	2.49	2.8	2.99	3.91	3.96	1.38	2.01	1.55	1.59	2.04	2.11	2.28	

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		03/07/2008	13/08/2008	18/09/2008	03/10/2008	12/11/2008	20/12/2008	01/02/2009	10/03/2009	27/05/2009	05/06/2009	06/07/2009	11/08/2009	08/09/2009	09/10/2009	03/12/2009	13/01/2010
Silver (Ag), total	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.00011	<0.00001	<0.00001	<0.00001	0.000032	0.000008	<0.000005	0.000006	<0.000005	0.000007	<0.000005	
Sodium (Na), total	mg/L	1.7	1.1	1.3	1.44	2.22	3.5	4.43	4.35	0.64	0.99	1.2	1.82	1.38	1.36	1.83	
Strontium (Sr), total	mg/L	0.219	0.207	0.168	0.191	0.238	0.256	0.287	0.274	0.0737	0.138	0.177	0.198	0.184	0.192	0.242	
Sulphur (S), total	mg/L	31.3	28.4				32.6	38.6	38.8	10	18	23	32	32	29	37	
Thallium (Tl), total	mg/L	<0.00005	<0.00005	0.00002	<0.00001	<0.00001		<0.00001	<0.00001	0.000005	0.000005	0.000002	<0.000002	0.000004	0.000002	<0.000002	
Tin (Sn), total	mg/L	<0.001	<0.001	0.0018	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	0.00002	<0.00001	0.00001	<0.00001	0.00001	<0.00001	0.00001	
Titanium (Ti), total	mg/L	0.0034	0.0078	0.0027	0.0068	0.006	0.0081	0.0022	0.0049	0.0033	0.0046	0.0014	<0.0005	0.0012	0.0021	0.0006	
Uranium (U), total	mg/L	0.0006	0.0007	0.0008	0.0009	0.0008	0.0009	0.0008	0.0009	0.000308	0.000586	0.00069	0.000763	0.000782	0.000911	0.000809	
Vanadium (V), total	mg/L	0.0001	0.0006	0.00033	0.00061	0.00067	0.0009	0.00019	0.00042	0.0004	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Zinc (Zn), total	mg/L	0.129	0.247	0.183	0.222	0.156	0.156	0.105	0.19	0.141	0.153	0.114	0.0936	0.235	0.177	0.134	
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.0001	0.0001		<0.001	<0.0001	0.0001	0.0003	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aluminum (Al), dissolved	mg/L	0.183	0.201	0.304	0.204	0.041	0.022	0.008	0.014	0.163	0.214	0.216	0.147	0.233	0.119	0.0277	0.0443
Antimony (Sb), dissolved	mg/L	0.0007	0.001	0.0015	0.0009	0.002	<0.0002	0.0007	0.0011	0.0001	0.00012	0.0001	0.00009	0.00018	0.0001	0.00011	0.00011
Arsenic (As), dissolved	mg/L	0.001	0.0007	0.0009	0.0005	0.0008	0.0009	0.0011	0.0016	0.00075	0.00061	0.00074	0.00108	0.00095	0.00054	0.00099	0.00118
Barium (Ba), dissolved	mg/L	0.05	0.048	0.044	0.041	0.055	0.065	0.087	0.106	0.0268	0.0413	0.0453	0.0501	0.0453	0.0453	0.0843	0.0749
Beryllium (Be), dissolved	mg/L	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	<0.0001	<0.00004	<0.00004	0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005	<0.0005				<0.0005	<0.0001	<0.0001	0.000007	0.000073	<0.000005	<0.000005	0.00001	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.002	<0.004	<0.004	<0.004	<0.002	0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00084	0.00093	0.00081	0.00076	0.00036	0.00061	0.00034	0.00068	0.000313	0.000651	0.00057	0.000666	0.00122	0.000707	0.000937	0.000719
Calcium (Ca), dissolved	mg/L	45	41	48.9	48.1	52.1	60.2	80.1	75.8	20.2	34	43.1	48.9	44.6	48.1	82.8	79.3
Chromium (Cr), dissolved	mg/L	<0.0005	<0.0005	0.0009	0.0006	0.0006	<0.0005	0.0005	0.0005	0.0005	0.0003	0.0001	0.0001	0.0004	0.0003	<0.0001	0.0003
Cobalt (Co), dissolved	mg/L	0.0071	0.0075	0.00676	0.00491	0.00151	0.0018	0.0012	0.00177	0.00225	0.00419	0.00318	0.0038	0.00719	0.00365	0.00298	0.00188
Copper (Cu), dissolved	mg/L	0.005	0.006	0.006	0.005	0.003	0.002	<0.001	0.001	0.00324	0.0047	0.00423	0.00344	0.00493	0.00384	0.0034	0.00292
Iron (Fe), dissolved	mg/L	0.04	0.06	0.08	0.049	0.078	0.02	0.06	0.07	0.238	0.098	0.045	0.032	0.068	0.039	0.051	0.081
Lead (Pb), dissolved	mg/L	<0.0001	0.0006	0.0015	0.0003	0.001	<0.0001	0.0001	<0.0001	0.00223	0.000594	0.00012	0.000366	0.00116	0.00021	0.000058	0.000254
Lithium (Li), dissolved	mg/L	0.007	0.007	0.007	0.006	0.019	0.006	0.007	0.007	0.0024	0.0051	0.0058	0.0069	0.0073	0.0064	0.0094	0.0072
Magnesium (Mg), dissolved	mg/L	16.3	14.5	15.6	16	17.7	19.1	27.1	28.4	6.04	10.8	13.5	17.4	15.6	14.8	22.3	25.9
Manganese (Mn), dissolved	mg/L	0.296	0.217	0.25	0.168	0.0954	0.131	0.182	0.255	0.135	0.188	0.14	0.177	0.258	0.142	0.206	0.176
Mercury (Hg), dissolved	mg/L									0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	<0.001	0.0004	0.00045	0.00069	<0.001	0.00085	0.0012	0.00035	0.00039	0.00037	0.00054	0.00046	0.00042	0.00068	0.00087
Nickel (Ni), dissolved	mg/L	0.0407	0.042	0.037	0.03	0.02	0.0262	0.024	0.035	0.0143	0.0268	0.0237	0.0325	0.0449	0.0266	0.0345	0.0296
Phosphorus (P), dissolved	mg/L			0.01	<0.01	<0.01		<0.01	<0.01	0.01	0.007	0.003			0.006	0.005	0.006
Potassium (K), dissolved	mg/L	0.5	<0.4	0.48	0.5	1.8	0.6	1.3	1.4	0.45	0.44	0.36	0.45	0.41	0.41	0.89	1.02
Selenium (Se), dissolved	mg/L	<0.0002	0.0003	0.0029	<0.0006	<0.0006	0.0005	0.0008	0.0008	0.00032	0.00039	0.00044	0.00044	0.00041	0.00049	0.00074	0.00063
Silicon (Si), dissolved	mg/L	1.65	1.65	2.1	2.18	2.26	2.64	3.7	3.88	1.2	1.77	1.79	1.69	1.85	2.12	3.05	3.47
Silver (Ag), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000008	0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000015
Sodium (Na), dissolved	mg/L	1.9	1.2	1.43	1.4	2.2	2.4	4.6	4.7	0.63	0.95	1.21	1.87	1.42	1.32	2.44	3.63
Strontium (Sr), dissolved	mg/L	0.212	0.185	0.185	0.171	0.23	0.247	0.286	0.334	0.0741	0.141	0.18	0.195	0.184	0.196	0.333	0.302
Sulphur (S), dissolved	mg/L	30.6	28.8				33.3	40.2	43.5	11	19	26	32	32	30	51	47
Thallium (Tl), dissolved	mg/L	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	0.000003	0.000003	<0.000002	<0.000002	0.000003	<0.000002	<0.000002	0.000003
Tin (Sn), dissolved	mg/L	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	0.00002	<0.00001	<0.00001	0.00001	0.00003	<0.00001	<0.00001	<0.00001
Titanium (Ti), dissolved	mg/L	0.0006	0.0024	0.0004	0.0005	0.0008	0.0012	0.0003	0.0004	0.0009	0.0005	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.0006	<0.0005	0.0006	0.0007	0.0006	0.0008	0.0008	0.0009	0.000246	0.000414	0.000613	0.000704	0.000584	0.000744	0.00096	0.000876
Vanadium (V), dissolved	mg/L	0.0001	0.0001	0.00025	0.00012	<0.00004	0.0008	0.00006	0.00005	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.09	0.123	0.115	0.114	0.093	0.101	0.108	0.153	0.0585	0.0695	0.0531	0.0526	0.121	0.0885	0.14	0.103
Zirconium (Zr), dissolved	mg/L			<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		12/03/2010	08/04/2010	28/05/2010	08/06/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	17/11/2010	07/12/2010	09/02/2011	22/03/2011	25/05/2011	22/06/2011	20/07/2011	19/08/2011
Discharge (Flow)	L/s							2934									
Total Suspended Solids	mg/L	2	1	10	17	6	9	4	5	2	4	90	2	160	6	31	<1
pH (field)	pH units	7.98	8.07	8.07	7.66	8.01	8.04	7.45	8.18	8.19	7.82	7.72	7.69	8.24	8.23	8.06	8.31
pH (lab)	pH units	8.1	8.1	8.2	8	8.05	7.91	8.1	8.01	8	7.87	7.89	8	7.77	8.04	7.81	8.18
Specific Conductance (field)	µS/cm															301	
Specific Conductance (lab)	µS/cm	477	461	288	309	329	330	369	386	434	457	492	796	169	328	310	294
Temperature (field)	C	1	0.7	5.9	12.5	16.2	17	9.2	1.6	0	0	0	0.4	6.3	15	13.1	10.7
Dissolved Oxygen (field)	mg/L																
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L	253	217	146	153	162	176	186	199	239	234	238	450	79.6	172	153	159
Hardness (from dissolved)	mg/L	241	255	156	158	163	182	184	195	231	236	223	453	85	167	158	151
Alkalinity, total	mg/L							96	100	120	130	140		53		81	
Chloride	mg/L									1.2							
Fluoride	mg/L																
Sulphate, dissolved	mg/L	100	120	60	79	77	81	96	100	110	110	120	170	35	74	72	32
Ammonia (N)	mg/L						0.005										
Nitrite (N)	mg/L									<0.005							
Nitrate (N)	mg/L									0.02							
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L	3.1	3.7	5.8	6.3	4.4	4.8	4.2	6.9	3.5	3.5	3.3	3.3	11.5		5.7	
Aluminum (Al), total	mg/L	0.149	0.0861	0.637	1.7	0.648	0.955	0.748	0.38	0.233	0.25	2.91	0.0211	0.27	0.765	1.91	0.0031
Antimony (Sb), total	mg/L	0.00007	0.0001	0.0001	0.00011	0.0001	0.00009	0.00011	0.0001	<0.0005	0.00008	0.00014	0.00008	0.00015	0.0001	0.00031	0.00029
Arsenic (As), total	mg/L	0.00146	0.00143	0.00094	0.00103	0.00072	0.00089	0.00141	0.00092	0.0009	0.00136	0.00751	0.00311	0.00077	0.00086	0.00216	0.00757
Barium (Ba), total	mg/L	0.0692	0.0642	0.0433	0.0461	0.0432	0.0454	0.0486	0.0521	0.066	0.0718	0.0924	0.114	0.0341	0.0508	0.0597	0.0614
Beryllium (Be), total	mg/L	0.00001	<0.00001	0.00003	0.00008	0.00003	0.00004	0.00004	0.00002	<0.0001	0.00002	0.00012	<0.00001	0.00002	0.00004	0.00008	<0.00001
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00001	<0.000005	<0.000005	<0.001	<0.000005	<0.000005	<0.000005	<0.00002	<0.000005	<0.00002	<0.000005
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.000607	0.000501	0.00068	0.00146	0.000799	0.00107	0.00126	0.000959	0.0008	0.00085	0.00196	0.000313	0.000266	0.000936	0.00131	<0.000005
Calcium (Ca), total	mg/L	66.4	57.4	38.7	38	40.8	43.6	45.6	49.9	61.4	59.5	60.9	117	22.1	44.8	39.7	39.9
Chromium (Cr), total	mg/L	0.0005	0.0001	0.0003	0.0006	0.0004	0.0004	0.0006	0.0004	<0.001	0.0002	0.0016	0.0004	<0.0005	0.0002	0.0018	0.0002
Cobalt (Co), total	mg/L	0.00137	0.00101	0.00352	0.00942	0.00385	0.0065	0.00716	0.00578	0.0039	0.00369	0.0108	0.00121	0.00273	0.00457	0.00698	0.000038
Copper (Cu), total	mg/L	0.00225	0.00176	0.00506	0.0102	0.00553	0.00764	0.0066	0.0039	0.0048	0.00319	0.0115	0.001	0.0042	0.00586	0.012	0.00025
Iron (Fe), total	mg/L	0.229	0.216	0.397	0.773	0.224	0.29	0.517	0.274	0.254	0.279	2.37	0.346	0.311	0.285	1.9	0.036
Lead (Pb), total	mg/L	0.000233	0.000106	0.000475	0.000749	0.000277	0.000409	0.000477	0.000164	0.0003	0.000254	0.0117	0.00107	0.0005	0.000322	0.00179	0.000157
Lithium (Li), total	mg/L	0.0063	0.0061	0.0046	0.0071	0.0061	0.0079	0.0072	0.0072	0.007	0.0077	0.0077	0.0076	0.0026	0.0063	0.0069	0.0029
Magnesium (Mg), total	mg/L	21.2	17.9	11.9	14.2	14.6	16.3	17.6	18.2	20.9	20.7	21	38.2	5.9	14.7	13.1	14.4
Manganese (Mn), total	mg/L	0.134	0.105	0.171	0.352	0.153	0.257	0.305	0.272	0.256	0.267	0.706	0.313	0.185	0.22	0.278	0.0206
Mercury (Hg), total	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00002	0.00002	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	0.00071	0.00077	0.00042	0.00037	0.00037	0.00037	0.0004	0.0005	<0.001	0.00064	0.0008	0.0024	0.00054	0.00036	0.00053	0.00088
Nickel (Ni), total	mg/L	0.026	0.0224	0.0233	0.0507	0.0272	0.0394	0.0413	0.0359	0.031	0.0326	0.0513	0.0166	0.0156	0.0317	0.0417	0.00086
Phosphorus (P), total	mg/L	0.008	0.004	0.012	0.017	0.007	0.009	0.02			0.005	0.052	0.01	0.011	0.007	0.062	0.012
Potassium (K), total	mg/L	0.75	0.67	0.43	0.39	0.3	0.37	0.41	0.46	0.63	0.76	0.79	2.2	0.5	0.44	0.5	0.66
Selenium (Se), total	mg/L	0.00054	0.0005	0.00041	0.00049	0.00048	0.00051	0.0005	0.00046	0.0006	0.00049	0.00058	0.00022	0.00028	0.00048	0.00057	0.00006
Silicon (Si), total	mg/L	2.78	2.78	1.74	1.96	1.49	1.71	1.77	1.92	2.6	2.72	3.13	6.26	1.36	1.91	2.99	1.3

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		12/03/2010	08/04/2010	28/05/2010	08/06/2010	07/07/2010	04/08/2010	14/09/2010	05/10/2010	17/11/2010	07/12/2010	09/02/2011	22/03/2011	25/05/2011	22/06/2011	20/07/2011	19/08/2011
Silver (Ag), total	mg/L	<0.000005	<0.000005	0.000013	0.000005	0.000009	<0.000005	<0.000005	<0.000005	<0.00002	<0.000005	<0.000005	0.000006	0.000007	<0.000005	0.000041	<0.000005
Sodium (Na), total	mg/L	2.94	2.46	1.04	1.15	1.14	1.4	1.61	1.77	2.3	2.44	2.93	9.09	0.6	1.25	1.2	3.69
Strontium (Sr), total	mg/L	0.272	0.256	0.162	0.163	0.193	0.198	0.202	0.228	0.268	0.257	0.278	0.407	0.0841	0.196	0.157	0.211
Sulphur (S), total	mg/L	36	32	22	28	27	33	35	35	40	43	35	63	<50	30	<50	13
Thallium (Tl), total	mg/L	<0.000002	<0.000002	<0.000002	0.000004	<0.000002	0.000002	0.000003	0.000002	<0.00005	<0.000002	0.000007	0.000003	0.000004	0.000004	0.000014	<0.000002
Tin (Sn), total	mg/L	<0.00001	0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.005	<0.00001	0.00002	0.00001	<0.0002	0.00002	<0.0002	0.00002
Titanium (Ti), total	mg/L	0.0006	<0.0005	0.0016	0.0036	0.0006	0.0011	0.0032	0.0007	<0.005	<0.0005	0.009	<0.0005	<0.005	0.0009	0.022	<0.0005
Uranium (U), total	mg/L	0.000862	0.000833	0.000715	0.000722	0.000704	0.000766	0.000788	0.000807	0.0009	0.00088	0.00185	0.00146	0.000382	0.000681	0.000909	0.000065
Vanadium (V), total	mg/L	<0.0002	<0.0002	0.0003	0.0004	<0.0002	<0.0002	0.0005	<0.0002	<0.005	<0.0002	0.0008	<0.0002	0.0005	0.0002	0.0021	<0.0002
Zinc (Zn), total	mg/L	0.101	0.0905	0.105	0.25	0.112	0.17	0.183	0.141	0.142	0.156	0.377	0.0648	0.039	0.147	0.213	0.0013
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	0.0002	<0.0001	0.0003	<0.0001	0.0007	<0.0001
Aluminum (Al), dissolved	mg/L	0.0134	0.0202	0.212	0.249	0.179	0.26	0.136	0.0705	0.034	0.0231	0.0124	0.004	0.291	0.381	0.205	0.0025
Antimony (Sb), dissolved	mg/L	0.00007	0.00015	0.0001	0.00009	0.0001	0.00008	0.00008	0.00007	<0.0005	0.00007	0.00005	0.00006	0.00015	0.00012	0.00013	0.00028
Arsenic (As), dissolved	mg/L	0.00102	0.00127	0.00065	0.00046	0.00058	0.00068	0.00071	0.00074	0.0008	0.00089	0.00099	0.00202	0.00087	0.00112	0.00062	0.00729
Barium (Ba), dissolved	mg/L	0.0683	0.0694	0.0422	0.0417	0.0436	0.0427	0.0427	0.0479	0.061	0.0665	0.0693	0.119	0.0346	0.0538	0.044	0.0622
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	0.00001	0.00001	0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000485	0.00043	0.000475	0.00102	0.000616	0.000873	0.00078	0.000768	0.00065	0.000772	0.000552	0.000254	0.000264	0.000737	0.000702	<0.000005
Calcium (Ca), dissolved	mg/L	62.6	66.4	41.6	40.1	40.9	46.7	45.6	48.1	57.3	59.7	56.8	115	23.1	43.1	40.5	36.9
Chromium (Cr), dissolved	mg/L	0.0003	0.0002	0.0003	0.0003	0.0004	0.0005	0.0005	0.0004	<0.001	0.0002	0.0005	0.0004	0.0004	0.0005	0.0004	0.0003
Cobalt (Co), dissolved	mg/L	0.00115	0.00111	0.00289	0.0078	0.00348	0.00591	0.00543	0.00543	0.0036	0.00367	0.00234	0.0013	0.00292	0.00497	0.00429	0.000032
Copper (Cu), dissolved	mg/L	0.00145	0.00158	0.00349	0.00381	0.00374	0.00382	0.00327	0.00264	0.0021	0.00197	0.00121	0.00073	0.00464	0.00498	0.00412	0.00017
Iron (Fe), dissolved	mg/L	0.074	0.074	0.093	0.047	0.033	0.013	0.026	0.026	0.041	0.062	0.04	0.045	0.307	0.349	0.053	0.019
Lead (Pb), dissolved	mg/L	0.000054	0.000118	0.000191	0.000147	0.000249	0.000059	0.000508	0.00026	<0.0002	0.00007	0.000049	0.000577	0.000437	0.00126	0.000278	0.000082
Lithium (Li), dissolved	mg/L	0.0063	0.0065	0.0047	0.0071	0.0063	0.0077	0.0068	0.0073	0.008	0.0072	0.0062	0.0081	0.0027	0.006	0.0061	0.0029
Magnesium (Mg), dissolved	mg/L	20.7	21.7	12.8	14.1	14.8	16	17	18.2	21.3	21.2	19.8	40.3	6.65	14.5	13.9	14.4
Manganese (Mn), dissolved	mg/L	0.116	0.116	0.144	0.314	0.142	0.237	0.243	0.261	0.235	0.262	0.213	0.326	0.197	0.303	0.188	0.00301
Mercury (Hg), dissolved	mg/L	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001		<0.00002	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	
Molybdenum (Mo), dissolved	mg/L	0.00072	0.00075	0.00041	0.00036	0.00034	0.00037	0.00043	0.00046	<0.001	0.00066	0.00074	0.00243	0.00044	0.0004	0.00041	0.00094
Nickel (Ni), dissolved	mg/L	0.0247	0.0242	0.02	0.0413	0.0246	0.0336	0.0331	0.0338	0.03	0.0329	0.0289	0.0162	0.0167	0.0307	0.0283	0.00084
Phosphorus (P), dissolved	mg/L	0.003	0.004	0.004	0.003	0.003	0.003	0.004			<0.002	<0.002	0.005	0.01	0.014	0.003	0.007
Potassium (K), dissolved	mg/L	0.71	0.81	0.46	0.37	0.33	0.31	0.41	0.48	0.6	0.68	0.74	2.47	0.53	0.44	0.37	0.64
Selenium (Se), dissolved	mg/L	0.00054	0.00052	0.00037	0.00044	0.00047	0.00046	0.00045	0.00045	0.0005	0.00052	0.00046	0.00022	0.00032	0.00044	0.00046	0.00005
Silicon (Si), dissolved	mg/L	2.96	3.12	1.89	1.67	1.48	2.22	1.69	1.87	2.31	2.53	2.21	5.73	1.51	1.83	1.98	1.2
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00002	<0.000005	<0.000005	<0.000005	0.000009	0.00001	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	2.74	2.97	1.12	1.14	1.17	1.35	1.51	1.84	2.21	2.51	2.75	9.61	0.62	1.27	1.24	3.73
Strontium (Sr), dissolved	mg/L	0.26	0.265	0.166	0.164	0.19	0.191	0.194	0.214	0.253	0.251	0.24	0.428	0.0813	0.185	0.156	0.208
Sulphur (S), dissolved	mg/L	37	38	22	27	29	32	32	33	39	40	34	69	11	28	26	12
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	0.000003	<0.000002	0.000003	<0.000002	<0.000002	<0.00005	<0.000002	<0.000002	0.000002	<0.000002	0.000006	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	0.00001	0.00001	<0.00001	0.00001	0.00001	<0.00001	0.00007	<0.00001	<0.005	0.00001	<0.00001	<0.00001	0.00002	0.00001	<0.00001	<0.00001
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	0.0047	0.0035	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.000815	0.00083	0.000617	0.000479	0.000592	0.000636	0.000725	0.000762	0.0008	0.000714	0.00063	0.00154	0.000361	0.000665	0.000562	0.000079
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	0.0003	<0.0002	<0.0002	0.0004	0.0004	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.0899	0.0911	0.0533	0.116	0.0515	0.0668	0.0795	0.0972	0.116	0.14	0.115	0.0605	0.0489	0.1	0.0771	0.0012
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		24/09/2011	24/10/2011	24/11/2011	15/12/2011	13/01/2012	10/02/2012	10/03/2012	06/04/2012	05/05/2012	01/06/2012	05/07/2012	02/08/2012	21/09/2012	11/10/2012	19/11/2012	07/12/2012
Discharge (Flow)	L/s		3505							6154.8	8779.14		6315	2681.3	2266.875		
Total Suspended Solids	mg/L	7	3	65.7	1.8	1.7	1.4	3.6	11	34.4	42.2	57.9	3.3	2.7	4	1.9	1.7
pH (field)	pH units	7.39	7.01	8	7.58	7.65	7.47	7.61	7.56	7.85	7.91	7.97	7.98	8	7.08	7.99	7.09
pH (lab)	pH units	8.1	8.05	8.05	7.82	8.12	8.21	8.09	8.19	7.65	8.06	8.08	8.17	8.1	8.15	8.21	8.14
Specific Conductance (field)	µS/cm	351			445.5	411.3	483.7	486	550.1	286.5	244.8	359.1	357.9	424.1	463.7	390	600
Specific Conductance (lab)	µS/cm	356	391	425	436	473	513	479	482	273	288	327	335	380	403	462	531
Temperature (field)	C	7	0.3	-0.1	-0.1	0	-0.1	-0.1	-0.1	2.2	11.7	14.6	15.5	7	0	0	0.02
Dissolved Oxygen (field)	mg/L		10.91	10.23	10.23	9.3	10.11	12.06	9.88	13.21		9.53	9.35	11.51		5.1	
Dissolved Oxygen (field)	%		76.4	70	69.9	63	68.9	82.4	67.5	96.1		93.9	94	95		77	
ORP (field)	mV		273				86.3	69	56.1	44.0		113.6	120	115.7	160.9	412.6	
Hardness (from total)	mg/L	174	186	226	224	236	273	250	237	141	139	179	174	174	184	246	270
Hardness (from dissolved)	mg/L	165	200	237	224	245	275	239	253	138	128	149	173	191	196	254	261
Alkalinity, total	mg/L		110		126		154			76.8		87.7			109		
Chloride	mg/L									0.85		0.65			1.1		
Fluoride	mg/L																
Sulphate, dissolved	mg/L	83.7	83.4	102	98.1	102	121	113	109	52.5	56.9	78.7	76.7	95.9	103	115	130
Ammonia (N)	mg/L				0.055												
Nitrite (N)	mg/L		<0.005	<0.005	<0.005	<0.005	0.012	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.061	<0.0050
Nitrate (N)	mg/L		0.03	0.039	0.048	0.058	0.214	<0.20	0.101	0.33	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.062
Total Kjeldahl Nitrogen	mg/L		0.07	0.342	0.174	0.185	0.144	0.53	0.221	<0.20	0.28	0.24	0.22	0.23	0.26	1.01	0.293
Dissolved Organic Carbon	mg/L		3.9	3.81	3.52	3.49	4.23	3.9	2.98	11.8	4.84	4.49	5.15	4.04	5.33	3.46	3.11
Aluminum (Al), total	mg/L	0.597	0.354	0.352	0.233	0.163	0.109	0.141	0.253	0.636	0.774	0.869	0.491	0.488	0.318	0.247	0.108
Antimony (Sb), total	mg/L	0.0001	0.00007	0.00035	0.00008	0.00007	0.00012	0.00011	0.00011	0.000112	0.000133	0.000123	0.000086	0.000122	0.000082	0.000079	0.000064
Arsenic (As), total	mg/L	0.00095	0.00099	0.00161	0.00127	0.00157	0.00149	0.00158	0.00179	0.00192	0.00168	0.00092	0.000847	0.00206	0.0011	0.00144	0.00208
Barium (Ba), total	mg/L	0.0463	0.0522	0.0587	0.0633	0.0687	0.0782	0.0691	0.0694	0.0565	0.056	0.0476	0.0479	0.048	0.0478	0.066	0.0801
Beryllium (Be), total	mg/L	0.00004	0.00002	0.00002	0.00001	0.00002	<0.00001	0.00001	0.00001	0.000038	0.000051	0.000048	0.000025	0.000028	0.000014	0.00001	<0.000010
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000008	<0.0000050	<0.0000050	<0.0000050	0.000039	<0.0000050	<0.0000050	<0.0000050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), total	mg/L	0.000822	0.000629	0.000824	0.000664	0.00074	0.000814	0.000596	0.000756	0.000414	0.000787	0.000971	0.00073	0.00115	0.000702	0.000851	0.000677
Calcium (Ca), total	mg/L	45.1	49.1	58	57.9	62.5	71.8	65.1	61.7	37.2	34.9	47.9	44.7	43.7	48.4	63.5	69.2
Chromium (Cr), total	mg/L	0.0003	0.0001	0.0005	<0.0001	<0.0001	<0.0001	0.0003	0.0002	0.00047	0.00051	0.00022	0.00015	<0.00010	<0.00010	0.0001	0.00028
Cobalt (Co), total	mg/L	0.00392	0.00284	0.00366	0.00244	0.00199	0.0024	0.00154	0.00234	0.00191	0.00402	0.00463	0.00306	0.00517	0.00395	0.00355	0.00206
Copper (Cu), total	mg/L	0.00487	0.00304	0.00433	0.0027	0.00218	0.00232	0.00251	0.00264	0.00421	0.0064	0.0064	0.00438	0.00389	0.00305	0.00295	0.00194
Iron (Fe), total	mg/L	0.351	0.269	0.464	0.252	0.26	0.238	0.241	0.321	0.958	0.813	0.385	0.225	0.217	0.217	0.298	0.362
Lead (Pb), total	mg/L	0.000476	0.000161	0.00626	0.000231	0.000261	0.000376	0.000922	0.00185	0.00145	0.0014	0.000405	0.00024	0.000952	0.000107	0.000538	0.000631
Lithium (Li), total	mg/L	0.006	0.006	0.0069	0.0063	0.0063	0.0071	0.0066	0.0065	0.00329	0.00475	0.00633	0.00637	0.00751	0.00612	0.00708	0.00675
Magnesium (Mg), total	mg/L	14.9	15.4	19.6	19.3	19.5	22.9	21.3	20.3	11.7	12.7	14.4	15.2	15.7	15.4	21.2	23.5
Manganese (Mn), total	mg/L	0.178	0.166	0.241	0.18	0.183	0.226	0.162	0.202	0.201	0.222	0.181	0.144	0.222	0.202	0.252	0.244
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.000020	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.00042	0.00044	0.00053	0.00055	0.00067	0.00067	0.00066	0.00064	0.000368	0.000326	0.000418	0.000458	0.000482	0.000442	0.000517	0.000791
Nickel (Ni), total	mg/L	0.0265	0.022	0.0292	0.0261	0.0237	0.0313	0.0231	0.0286	0.012	0.0233	0.0307	0.0231	0.0313	0.0252	0.0313	0.0268
Phosphorus (P), total	mg/L	0.011	0.008	0.016	0.002	0.004	0.005	0.009	0.007	0.0332	0.0398	0.0077	0.0029	0.0022	0.0065	0.005	0.0039
Potassium (K), total	mg/L	0.43	0.49	0.73	0.6	0.75	0.92	0.93	0.77	0.797	0.547	0.359	0.365	0.423	0.477	0.69	0.88
Selenium (Se), total	mg/L	0.00048	0.00051	0.00056	0.00056	0.00058	0.00061	0.00056	0.00058	0.000281	0.000495	0.000569	0.000545	0.000598	0.000565	0.000656	0.000592
Silicon (Si), total	mg/L	1.9	2	2.6	2.5	3.1	3.3	3	2.9	2.57	1.9	2.38	1.73	1.55	2.1	2.7	3.21

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		24/09/2011	24/10/2011	24/11/2011	15/12/2011	13/01/2012	10/02/2012	10/03/2012	06/04/2012	05/05/2012	01/06/2012	05/07/2012	02/08/2012	21/09/2012	11/10/2012	19/11/2012	07/12/2012
Silver (Ag), total	mg/L	0.000009	<0.000005	0.000023	<0.000005	<0.000005	<0.000005	<0.000005	0.000009	0.000017	0.0000061	0.0000056	<0.0000050	0.00007	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), total	mg/L	1.33	1.58	2.46	2.39	2.64	3.17	2.99	2.87	1.25	1.15	1.32	1.33	1.49	1.55	2.52	3.62
Strontium (Sr), total	mg/L	0.194	0.218	0.232	0.247	0.253	0.276	0.252	0.257	0.142	0.156	0.171	0.2	0.21	0.199	0.26	0.287
Sulphur (S), total	mg/L	29	32	35	35	42	41	40	38	19	22	26	29	32	41	43.1	43.7
Thallium (Tl), total	mg/L	0.000003	<0.000002	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000007	0.000007	0.0000034	0.000002	0.000002	<0.0000020	0.000002	0.000002
Tin (Sn), total	mg/L	0.00013	0.00015	0.00093	0.00003	<0.0002	<0.0002	<0.0002	<0.0002	0.00025	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), total	mg/L	0.0016	0.0015	0.0024	<0.0005	<0.0005	<0.0005	0.0007	0.0009	0.0146	0.00559	0.00277	<0.00050	0.00054	<0.00050	0.00068	<0.00050
Uranium (U), total	mg/L	0.000898	0.000951	0.000892	0.00081	0.000839	0.000941	0.000669	0.000846	0.000818	0.000787	0.000778	0.000716	0.000998	0.000789	0.000837	0.000901
Vanadium (V), total	mg/L	0.0003	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00095	0.00076	0.00033	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), total	mg/L	0.137	0.106	0.148	0.122	0.113	0.149	0.112	0.138	0.0687	0.13	0.169	0.113	0.147	0.117	0.161	0.133
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00038	0.00044	<0.00010	<0.00010	0.0004	0.00016	<0.00010	<0.00010
Aluminum (Al), dissolved	mg/L	0.127	0.0674	0.0356	0.0254	0.0128	0.0123	0.0097	0.0111	0.0329	0.116	0.157	0.18	0.121	0.0763	0.021	0.01
Antimony (Sb), dissolved	mg/L	0.00011	0.0001	0.00012	0.00007	0.00008	0.00009	0.00008	0.00007	0.000093	0.000124	0.000108	0.000082	0.00009	0.000078	0.00007	0.000067
Arsenic (As), dissolved	mg/L	0.00073	0.00068	0.00088	0.00091	0.00106	0.00103	0.00093	0.00097	0.000993	0.000731	0.000633	0.000717	0.000788	0.0007	0.000905	0.00131
Barium (Ba), dissolved	mg/L	0.047	0.0506	0.0588	0.0625	0.0693	0.0803	0.0676	0.0666	0.0412	0.0416	0.0438	0.0471	0.0463	0.0475	0.0642	0.0794
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000013
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.000629	0.00052	0.000661	0.000571	0.000545	0.00079	0.000511	0.000195	0.000193	0.000413	0.000699	0.000583	0.000815	0.000632	0.000777	0.000603
Calcium (Ca), dissolved	mg/L	43.4	52.5	60.6	57.4	64.4	72.1	62.7	66.4	36.7	32	38.7	44.2	48.6	49.9	66.4	66.9
Chromium (Cr), dissolved	mg/L	0.0002	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00339	0.00288	0.00266	0.00232	0.00202	0.00229	0.00139	0.00143	0.000681	0.00244	0.00383	0.00286	0.00506	0.00409	0.0035	0.0021
Copper (Cu), dissolved	mg/L	0.00329	0.00251	0.00253	0.00172	0.00132	0.00153	0.00168	0.00132	0.00185	0.00297	0.00326	0.00295	0.00265	0.00233	0.0019	0.001
Iron (Fe), dissolved	mg/L	0.05	0.055	0.085	0.076	0.063	0.052	0.04	0.041	0.231	0.0652	0.0234	0.0406	0.0277	0.0301	0.0607	0.058
Lead (Pb), dissolved	mg/L	0.000403	0.000083	0.000256	0.000067	0.000022	0.000059	0.000091	0.000337	0.000643	0.000904	0.0000892	0.000036	0.000108	0.000049	0.000046	0.000072
Lithium (Li), dissolved	mg/L	0.006	0.0057	0.0071	0.0061	0.0065	0.0074	0.0063	0.0065	0.00314	0.0042	0.00592	0.00619	0.00667	0.00663	0.00703	0.00736
Magnesium (Mg), dissolved	mg/L	13.8	16.8	20.9	19.7	20.4	23	19.9	21.1	11.2	11.7	12.7	15.3	16.8	17.3	21.3	22.7
Manganese (Mn), dissolved	mg/L	0.163	0.16	0.19	0.179	0.184	0.224	0.153	0.148	0.127	0.144	0.166	0.135	0.225	0.223	0.248	0.243
Mercury (Hg), dissolved	mg/L	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00043	0.00042	0.00055	0.00053	0.00063	0.00079	0.0006	0.00065	0.000421	0.000441	0.000468	0.000347	0.000531	0.000472	0.000547	0.000798
Nickel (Ni), dissolved	mg/L	0.0236	0.0224	0.0269	0.0255	0.0247	0.03	0.0223	0.0251	0.00768	0.0172	0.0268	0.0215	0.0309	0.028	0.0306	0.0272
Phosphorus (P), dissolved	mg/L	0.004	0.004	0.005	<0.002	<0.002	0.002	0.004	<0.002	0.0079	0.0038	<0.0020	<0.0020	<0.0020	0.0033	<0.0020	<0.0020
Potassium (K), dissolved	mg/L	0.42	0.51	0.72	0.63	0.76	0.98	0.88	0.8	0.73	0.525	0.329	0.35	0.457	0.501	0.685	0.918
Selenium (Se), dissolved	mg/L	0.00043	0.00051	0.0006	0.00055	0.00058	0.00059	0.00052	0.00057	0.000352	0.000453	0.000557	0.000464	0.00049	0.00046	0.000536	0.000481
Silicon (Si), dissolved	mg/L	1.7	2.1	2.6	2.5	3.1	3.3	2.9	3.2	1.82	1.46	1.58	1.61	1.78	1.89	2.88	2.95
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L	1.26	1.8	2.57	2.37	2.7	3.24	2.8	2.95	1.21	1.2	1.18	1.34	1.67	1.77	2.52	3.53
Strontium (Sr), dissolved	mg/L	0.203	0.213	0.242	0.243	0.254	0.286	0.253	0.249	0.137	0.146	0.166	0.2	0.201	0.212	0.251	0.268
Sulphur (S), dissolved	mg/L	26	32	38	37	43	43	38	37	21	21	24	29	34	37	40.6	43.1
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.0000020	0.0000027	0.0000024	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn), dissolved	mg/L	0.00061	0.00006	0.00036	0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	0.00073	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.000811	0.000824	0.000846	0.000724	0.000845	0.000739	0.000824	0.000782	0.00059	0.000656	0.000624	0.000691	0.000875	0.000877	0.00075	0.000797
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.0737	0.0777	0.118	0.107	0.106	0.14	0.1	0.103	0.0248	0.0537	0.0676	0.0579	0.102	0.0951	0.141	0.126
Zirconium (Zr), dissolved	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Data omitted from calculation of summary statistics.

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		13/01/2013	08/03/2013	04/05/2013	03/06/2013	02/07/2013	10/08/2013
Discharge (Flow)	L/s					7636.625	2860
Total Suspended Solids	mg/L	1.9	116	<1.0	139	6.0	2.0
pH (field)	pH units	7.12	7.63	7.5	7.68	7.72	7.95
pH (lab)	pH units	8.08	8.19	8.08	8.04	7.92	8.06
Specific Conductance (field)	µS/cm	477	316.2	471.7	238.1	332.8	330.4
Specific Conductance (lab)	µS/cm	500	538	449	217	297	335
Temperature (field)	C	0.02	0	0	6.7	17.8	17.2
Dissolved Oxygen (field)	mg/L	11.84	10.1	8.97	10.68	9.36	9.06
Dissolved Oxygen (field)	%	81.2	67.6	60.6	86.7	97.4	93.3
ORP (field)	mV		84.7	147.2	39.3		130.7
Hardness (from total)	mg/L	265	273	242	123	154	172
Hardness (from dissolved)	mg/L	269	280	242	118	155	166
Alkalinity, total	mg/L			143	70.8	86.3	
Chloride	mg/L			0.98	<0.50	<0.50	<0.50
Fluoride	mg/L			0.130	0.084	0.113	0.143
Sulphate, dissolved	mg/L	121	134	105	43.8	68.6	82.1
Ammonia (N)	mg/L						
Nitrite (N)	mg/L	<0.0050	<0.0050	<0.0010	0.0017	<0.0010	<0.0010
Nitrate (N)	mg/L	0.063	0.14	0.0664	0.0094	0.0119	0.0067
Total Kjeldahl Nitrogen	mg/L	0.227	0.338	0.190	1.06	0.234	0.246
Dissolved Organic Carbon	mg/L	2.68	2.78	3.31	7.28	5.26	4.38
Aluminum (Al), total	mg/L	0.136	1.71	0.0384	3.88	0.521	0.378
Antimony (Sb), total	mg/L	0.000053	0.000086	<0.00010	0.00035	0.00011	0.00013
Arsenic (As), total	mg/L	0.0019	0.0089	0.00116	0.00794	0.00110	0.00130
Barium (Ba), total	mg/L	0.0826	0.108	0.0603	0.106	0.0468	0.0489
Beryllium (Be), total	mg/L	<0.000010	0.000092	<0.00010	0.00016	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000635	0.00216	0.000447	0.00184	0.000596	0.000564
Calcium (Ca), total	mg/L	70.1	70.1	62.8	31.5	40.8	42.9
Chromium (Cr), total	mg/L	<0.00010	0.00046	0.00011	0.00512	0.00025	0.00094
Cobalt (Co), total	mg/L	0.00143	0.0108	0.00097	0.0112	0.00305	0.00321
Copper (Cu), total	mg/L	0.00129	0.0089	0.00185	0.0172	0.00451	0.00410
Iron (Fe), total	mg/L	0.3	2.39	0.132	6.69	0.334	0.158
Lead (Pb), total	mg/L	0.000091	0.00204	0.00136	0.00459	0.000264	0.00123
Lithium (Li), total	mg/L	0.00697	0.00753	0.00607	0.00603	0.00510	0.00595
Magnesium (Mg), total	mg/L	21.7	23.9	20.8	10.7	12.5	15.8
Manganese (Mn), total	mg/L	0.189	0.86	0.112	0.473	0.167	0.194
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000766	0.000858	0.000572	0.000633	0.000369	0.000442
Nickel (Ni), total	mg/L	0.0235	0.0453	0.0194	0.0445	0.0225	0.0244
Phosphorus (P), total	mg/L	0.0052	0.0828	<0.050	0.278	<0.050	<0.050
Potassium (K), total	mg/L	0.932	1.14	0.68	1.09	0.49	0.46
Selenium (Se), total	mg/L	0.000602	0.000445	0.00053	0.00084	0.00043	0.00044
Silicon (Si), total	mg/L	3.56	3.99	2.49	5.70	1.85	1.58

Station Name		KV-1	KV-1	KV-1	KV-1	KV-1	KV-1
Sample Date		13/01/2013	08/03/2013	04/05/2013	03/06/2013	02/07/2013	10/08/2013
Silver (Ag), total	mg/L	<0.0000050	<0.0000050	<0.000010	0.000085	<0.000010	0.000023
Sodium (Na), total	mg/L	3.12	4.1	2.05	0.862	1.06	1.43
Strontium (Sr), total	mg/L	0.285	0.293	0.286	0.123	0.167	0.196
Sulphur (S), total	mg/L	44.5	43.6	36.9	13.8	23.5	27.4
Thallium (Tl), total	mg/L	<0.0000020	0.000005	<0.000010	0.000040	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00020	<0.00020	0.00018	0.00012	<0.00010	<0.00010
Titanium (Ti), total	mg/L	0.00118	0.00656	<0.010	0.078	<0.010	<0.010
Uranium (U), total	mg/L	0.000831	0.00144	0.000833	0.000969	0.000598	0.000659
Vanadium (V), total	mg/L	<0.00020	0.00087	<0.0010	0.0080	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.11	0.393	0.0832	0.286	0.0964	0.0854
Zirconium (Zr), total	mg/L	<0.00010	0.00012	<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.00824	0.008	0.0076	0.116	0.185	0.192
Antimony (Sb), dissolved	mg/L	0.000052	0.00007	<0.00010	0.00012	<0.00010	<0.00010
Arsenic (As), dissolved	mg/L	0.00131	0.00128	0.00086	0.00079	0.00071	0.00102
Barium (Ba), dissolved	mg/L	0.0793	0.0825	0.0592	0.0373	0.0457	0.0478
Beryllium (Be), dissolved	mg/L	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000508	0.000476	0.000407	0.000160	0.000443	0.000507
Calcium (Ca), dissolved	mg/L	69.1	71.5	62.9	31.2	41.3	41.9
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00154	0.00129	0.00089	0.00193	0.00254	0.00289
Copper (Cu), dissolved	mg/L	0.000827	0.00112	0.00148	0.00254	0.00319	0.00278
Iron (Fe), dissolved	mg/L	0.0603	0.0391	0.032	0.166	0.049	0.025
Lead (Pb), dissolved	mg/L	0.000016	0.000035	0.000053	0.000596	<0.000050	0.000090
Lithium (Li), dissolved	mg/L	0.00713	0.00624	0.00629	0.00224	0.00529	0.00598
Magnesium (Mg), dissolved	mg/L	23.4	24.5	20.6	9.70	12.6	15.0
Manganese (Mn), dissolved	mg/L	0.202	0.179	0.109	0.161	0.148	0.175
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000743	0.000958	0.000535	0.000337	0.000363	0.000411
Nickel (Ni), dissolved	mg/L	0.025	0.0239	0.0190	0.0117	0.0201	0.0222
Phosphorus (P), dissolved	mg/L	0.0024	0.0022	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.915	1.13	0.72	0.60	0.46	0.42
Selenium (Se), dissolved	mg/L	0.000594	0.000492	0.00054	0.00032	0.00041	0.00047
Silicon (Si), dissolved	mg/L	3.48	3.71	2.45	1.44	1.70	1.48
Silver (Ag), dissolved	mg/L	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	3.43	4.43	2.09	0.751	1.04	1.42
Strontium (Sr), dissolved	mg/L	0.288	0.282	0.260	0.121	0.167	0.192
Sulphur (S), dissolved	mg/L	44.8	41.1	36.0	14.6	23.4	26.5
Thallium (Tl), dissolved	mg/L	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00020	<0.00020	<0.00010	0.00018	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000847	0.00097	0.000750	0.000370	0.000551	0.000603
Vanadium (V), dissolved	mg/L	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.12	0.112	0.0771	0.0366	0.0524	0.0487
Zirconium (Zr), dissolved	mg/L	<0.00010	<0.00010	<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	24/08/2004	22/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	26/02/2005	22/03/2005	21/04/2005
Discharge (Flow)	L/s		1490	430	600		2842	5484		2804	2640						
Total Suspended Solids	mg/L		<2	<3	<3	10	1	8	<2	2	2	<2	2	<1	<2	<2	<2
pH (field)	pH units	7.52		7.62	7.74		8.1	7.61	8.5	7.66	7.72	6.9	7.7	7.52	7.18	8.76	8.5
pH (lab)	pH units		7.5	7.73	7.85	7.8	8.17	8.03	8	8.24	8	7.7	7.92	7.74	7.7	7.5	7.65
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm		485	477	426	299	333	315	375	378	380	440	443	493	475	468	448
Temperature (field)	C	0.2	0.1	0.1	0.1			11.8	13.1	3.8	0.1	0.2	0.2	0.2	0.2	0	
Dissolved Oxygen (field)	mg/L			11.3				8.1									
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L												246				
Hardness (from dissolved)	mg/L		281	252	238	136	184	168	242	199	217	218	238	268	248	261	225
Alkalinity, total	mg/L		168	156	154	95	108	99	115	126	137	144	150	170	163	165	150
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L		99	96.1	87.2	53		66.1	70.4	75.9	87.2	78.4	86				
Ammonia (N)	mg/L							<0.05									
Nitrite (N)	mg/L							<0.05									
Nitrate (N)	mg/L							<0.1									
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																
Aluminum (Al), total	mg/L		<0.01	<0.01	<0.01	0.2	0.116	0.686	0.09	0.055	0.033	0.018		0.012	0.013	0.02	0.01
Antimony (Sb), total	mg/L		<0.02	<0.02	<0.02	0.02	<0.0002	<0.0002	<0.02	<0.0002	<0.0002	0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), total	mg/L		<0.04	<0.04	<0.04	<0.04	0.0017	0.0023	<0.04	0.0016	0.0016	0.0015	0.0016	0.002	0.0019	0.002	0.001
Barium (Ba), total	mg/L		0.096	0.0922	0.0795	0.048	0.062	0.061	0.0511	0.056	0.064	0.072	0.081	0.093	0.088	0.088	0.072
Beryllium (Be), total	mg/L		<0.0006	0.0067	<0.0006	<0.0006	<0.0001	<0.0001	<0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L		<0.02	0.02	<0.02	0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005		<0.0005	0.0009	<0.0005	<0.0005
Boron (B), total	mg/L						0.003	0.032		0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.002
Cadmium (Cd), total	mg/L		<0.0006	0.0011	<0.0006	<0.0006	0.00014	0.00028	<0.0006	0.00016	0.00014	0.00013	0.00028	0.00016	0.00014	0.00009	0.0001
Calcium (Ca), total	mg/L		79.8	66.7	35.6	37.4	44.5	44.6	44.6	52	54.9	56		68.5	66	62.8	60.8
Chromium (Cr), total	mg/L		<0.001	0.008	<0.001	0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.002	<0.0005
Cobalt (Co), total	mg/L		<0.001	<0.001	<0.001	<0.001	0.0002	0.0007	<0.001	0.0003	0.0002	0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001
Copper (Cu), total	mg/L		0.001	0.003	<0.001	0.007	0.003	0.004	0.002	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.016	<0.001
Iron (Fe), total	mg/L		0.107	0.161	0.147	0.316	0.1	0.4	0.082	<0.2	0.1	0.2		0.2	0.2	0.2	0.2
Lead (Pb), total	mg/L		0.044	0.051	<0.01	0.022	0.0008	0.0018	<0.01	0.0005	0.0022	0.0005	0.0004	0.0049	0.0006	0.0003	0.0003
Lithium (Li), total	mg/L		<0.007	<0.007	<0.007	<0.007	0.006	0.006	<0.007	0.005	0.005	0.004		0.005	0.005	0.005	0.005
Magnesium (Mg), total	mg/L		24.2	21	11.8	10.7	14.2	13.6	12.5	15.9	18.1	17.8		22.1	20.7	20	19.1
Manganese (Mn), total	mg/L		0.186	0.227	0.118	0.0828	0.043	0.084	0.0489	0.064	0.074	0.07		0.075	0.064	0.057	0.052
Mercury (Hg), total	mg/L												<0.0002				
Molybdenum (Mo), total	mg/L		<0.01	0.02	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Nickel (Ni), total	mg/L		0.004	0.004	0.003	0.007	0.0055	0.0069	0.004	0.0057	0.0064	0.0043	0.0057	0.0049	0.0035	0.0069	0.003
Phosphorus (P), total	mg/L		<0.06	0.08	<0.06	0.06			0.12								
Potassium (K), total	mg/L		<1	<1	<1	1	0.4	0.6	<1	<1	0.7	0.7		0.9	0.5	0.6	
Selenium (Se), total	mg/L		<0.1	<0.1	<0.1	0.1	0.0005	0.0005	<0.1	0.0005	0.0005	0.0005	0.0004	<0.0002	0.0005	0.0003	0.0004
Silicon (Si), total	mg/L		3.6	3.5	3.1	1.7	1.54	2.42	1.6	1.71	1.94	2.36		3.2	3.17	3.2	2.8

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		24/01/2004	19/02/2004	23/03/2004	24/04/2004	15/06/2004	20/07/2004	30/07/2004	24/08/2004	22/09/2004	21/10/2004	29/11/2004	17/12/2004	25/01/2005	26/02/2005	22/03/2005	21/04/2005
Silver (Ag), total	mg/L		<0.002	<0.002	<0.002	<0.002	0.0005	0.0004	<0.002	<0.0001	<0.0001	0.0008	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), total	mg/L		3.44	2.93	1.89	1.02	1.5	1.6	1.2	1.8	2	2.8		3.2	2.7	3	4
Strontium (Sr), total	mg/L		0.256	0.243	0.252	0.151	0.184	0.157	0.211	0.222	0.225	0.243		0.227	0.238	0.264	0.242
Sulphur (S), total	mg/L		36.7	38	31.6	13.3	21.8	21.3	20.8	24	23.4	26.2	29.5	31.6	30.4	29	28
Thallium (Tl), total	mg/L					0.006	<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L		<0.01	0.013	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L		<0.004	<0.004	<0.004	0.004	0.0015	0.0069	<0.004	0.0016	0.0023	0.0016	0.0019	0.002	0.0021	0.002	0.002
Uranium (U), total	mg/L		<0.07	<0.07	<0.07	0.07	0.0007	0.0009	<0.07	0.0009	0.0009	0.001	0.0011	0.0009	0.001	0.001	0.001
Vanadium (V), total	mg/L		<0.001	<0.001	<0.001	0.001	0.0002	0.0006	<0.001	0.0001	0.0005	0.0003		<0.0001	0.0014	<0.0001	<0.0001
Zinc (Zn), total	mg/L		0.142	0.206	0.116	0.059	0.04	0.08	0.043	0.038	0.029	0.038	0.046	0.038	0.03	0.035	0.029
Zirconium (Zr), total	mg/L		<0.006	<0.006	<0.006	<0.006	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L		<0.01	<0.01	<0.01	0.07	0.051	0.073	0.11	0.029	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.009
Antimony (Sb), dissolved	mg/L		<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.02	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As), dissolved	mg/L		<0.04	<0.04	<0.04	<0.04	0.0018	0.0016	<0.04	0.0015	0.0013	0.0012	0.0015	0.0014	0.0015	0.001	0.002
Barium (Ba), dissolved	mg/L		0.0927	0.088	0.0773	0.0475	0.06	0.052	0.053	0.059	0.065	0.069	0.081	0.091	0.079	0.084	0.071
Beryllium (Be), dissolved	mg/L		<0.0006	0.0044	<0.0006	0.0006	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), dissolved	mg/L		<0.02	<0.02	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), dissolved	mg/L						0.003	0.002	0.0039	0.003	<0.002	<0.002	<0.002	0.004	<0.002	0.003	0.002
Cadmium (Cd), dissolved	mg/L		<0.0006	<0.0006	<0.0006	<0.0006	0.00007	0.0002	73.6	0.00012	0.00011	0.00007	0.00029	0.00014	0.0001	0.00005	0.00004
Calcium (Ca), dissolved	mg/L		75	66	30.3	37.1	48.5	44.9		52	57	57.2	62.6	70.7	65.8	69.5	59.4
Chromium (Cr), dissolved	mg/L		<0.001	0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt (Co), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0001	0.0003	0.001	0.0002	0.0002	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu), dissolved	mg/L		<0.001	<0.001	<0.001	0.007	0.001	0.002	0.006	0.013	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe), dissolved	mg/L		0.01	0.047	0.028	0.024	0.02	0.09	0.156	0.09	0.04	0.04	0.078	0.01	0.04	0.05	0.12
Lead (Pb), dissolved	mg/L		0.044	<0.01	<0.01	0.011	<0.0001	0.0003	<0.01	0.0001	0.0002	<0.0001	0.0003	<0.0001	<0.0001	0.0002	0.0003
Lithium (Li), dissolved	mg/L		<0.007	<0.007	<0.007	<0.007	0.005	0.004	<0.006	0.004	0.004	0.004		0.005	0.005	0.004	0.005
Magnesium (Mg), dissolved	mg/L		22.7	20.8	10.3	10.6	15.2	13.7	14.1	16.8	18.1	18.2	19.8	22.2	20.3	21.2	18.7
Manganese (Mn), dissolved	mg/L		0.179	0.212	0.116	0.0639	0.03	0.058	1.02	0.06	0.049	0.066	0.07	0.077	0.058	0.054	0.056
Mercury (Hg), dissolved	mg/L												<0.0001				
Molybdenum (Mo), dissolved	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni), dissolved	mg/L		0.004	0.002	0.003	0.007	0.0044	0.0047	0.006	0.0053	0.001	0.0036	0.004	0.0023	0.0028	0.003	0.002
Phosphorus (P), dissolved	mg/L		<0.06	0.08	<0.06	<0.06			0.17								
Potassium (K), dissolved	mg/L		<1	<1	<1	<3	<0.4	0.4	1.7	0.5	0.5	0.8		0.9	0.5	0.8	0.5
Selenium (Se), dissolved	mg/L		<0.1	<0.1	<0.1	<0.3	0.0004	0.0005	<0.1	0.0006	0.0004	0.0004	0.0003	<0.0002	0.0005	0.0003	0.0003
Silicon (Si), dissolved	mg/L		3.5	3.4	3	1.5	1.69	2.24	1.7	1.75	2.19	2.42	3	3.52	3.23	3.4	2.9
Silver (Ag), dissolved	mg/L		<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na), dissolved	mg/L		3.33	2.9	1.39	1.01	1.6	1.5	2.65	1.8	2	3	2.7	3.3	2.8	3	2
Strontium (Sr), dissolved	mg/L		0.246	0.241	0.24	0.15	0.184	0.156	0.234	0.199	0.208	0.216	0.233	0.226	0.234	0.255	0.242
Sulphur (S), dissolved	mg/L		33	36.7	30.3	13.2	23	22	26.6	25.3	29.1	26.7	28.6	33.3	30.7	31.4	28
Thallium (Tl), dissolved	mg/L						<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), dissolved	mg/L		<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), dissolved	mg/L		<0.004	<0.004	<0.004	<0.004	0.0014	0.0014	<0.004	0.0026	0.0018	0.0013	0.0017	0.0018	0.0014	0.002	0.002
Uranium (U), dissolved	mg/L		<0.06	<0.06	<0.06	<0.06	<0.0005	0.0007	<0.06	0.0008	0.0009	0.0009	0.001	0.0009	0.0009	0.0008	0.0008
Vanadium (V), dissolved	mg/L		<0.001	<0.001	<0.001	<0.001	0.0001	0.0002	<0.001	0.0006	0.0002	0.0001	0.0002	0.0007	0.0001	0.0001	0.0001
Zinc (Zn), dissolved	mg/L		0.139	0.204	0.115	0.036	0.012	0.035	0.895	0.03	0.021	0.037	0.042	0.036	0.031	0.03	0.027
Zirconium (Zr), dissolved	mg/L		<0.005	<0.005	<0.005	<0.005			<0.005				<0.001				

Data omitted from calculation of summary statistics.

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		27/05/2005	18/06/2005	30/06/2005	22/08/2005	22/09/2005	25/10/2005	24/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	31/07/2006	28/02/2007	12/07/2007	13/03/2008	14/05/2008
Discharge (Flow)	L/s		5965	5385	5949	2804											
Total Suspended Solids	mg/L	17	<2	4	<2	3	4	<2	<2	<2	<2	24				<5	38
pH (field)	pH units			8.05	7.59	7.66	7.8	6.81	7.26	7.62	7.45			7.73	8.07	7.4	7.37
pH (lab)	pH units	7.53		8.05	7.59	7.87	7.8	7.78	7.71	7.59	7.69	7.35	8.22	8.01	7.8	7.76	7.82
Specific Conductance (field)	µS/cm																
Specific Conductance (lab)	µS/cm	244	331	327	369	393	390	485	472	519	469	166	344	503	321	562	203
Temperature (field)	C	10	15.8	15.8	10.2	3.8	0.5	0.2	0.2	0.1	0.1				13.3	0.1	4
Dissolved Oxygen (field)	mg/L				10.3												
Dissolved Oxygen (field)	%																
ORP (field)	mV																
Hardness (from total)	mg/L																
Hardness (from dissolved)	mg/L	110	168	150	188	182		235	258	214	237	81				277	110
Alkalinity, total	mg/L	70	119	102	119	119	130	152	159	168	158	58					
Chloride	mg/L											0.28					
Fluoride	mg/L											0.05					
Sulphate, dissolved	mg/L					68			96	104	96	26.2					
Ammonia (N)	mg/L		0.006		<0.002	<0.05	0.015										
Nitrite (N)	mg/L		<0.03		<0.03							<0.03					
Nitrate (N)	mg/L		<0.03		<0.03		0.04					<0.03					
Total Kjeldahl Nitrogen	mg/L																
Dissolved Organic Carbon	mg/L																15
Aluminum (Al), total	mg/L	0.388	0.15	0.195	0.097	0.217	0.13	0.022	0.022	0.012	0.011	0.374	0.222	0.028	2.06	0.051	0.894
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Arsenic (As), total	mg/L	0.002	0.0018	0.0014	0.0017	0.0018	0.0016	0.0015	0.0017	0.0019	0.0018	0.0022	0.0015	0.002	0.0026	0.0022	0.003
Barium (Ba), total	mg/L	0.046	0.057	0.054	0.055	0.06	0.059	0.083	0.083	0.096	0.077	0.038	0.061	0.092	0.061	0.108	0.05
Beryllium (Be), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi), total	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B), total	mg/L	0.002	0.004	<0.002	<0.002	0.002	0.003	0.004	0.003	0.003	0.003	<0.002	0.005	0.004	0.004	0.014	0.002
Cadmium (Cd), total	mg/L	0.00034	0.0002	0.00018	0.00027	0.0004	0.00024	0.00013	0.00014	0.0002	0.00012	0.00038	0.00024	0.00019	0.00143	0.00032	0.0006
Calcium (Ca), total	mg/L	28.9	43	39.7	48	47.1	53.1	60.7	69.6	70.5	65.7	22.4	46	68.7	42.8	80.6	29.3
Chromium (Cr), total	mg/L	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	0.0006	0.0011
Cobalt (Co), total	mg/L	0.001	0.0004	0.0006	0.0004	0.001	0.0009	0.0001	<0.0001	<0.0001	<0.0001	0.0009	0.0008	0.0001	0.0066	0.0002	0.0028
Copper (Cu), total	mg/L	0.003	0.002	0.002	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.001	0.014	0.002	0.006
Iron (Fe), total	mg/L	0.8	0.2	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.8	0.1	0.2	0.8	0.2	1.2
Lead (Pb), total	mg/L	0.0044	0.0012	0.0014	0.0006	0.0019	0.0007	0.0007	0.0005	0.0006	0.0004	0.004	0.0008	0.0007	0.003	0.0004	0.0041
Lithium (Li), total	mg/L	0.003	0.005	0.004	0.004	0.004	0.006	0.005	0.005	0.005	0.004	0.002	0.006	0.005	0.007	0.008	0.003
Magnesium (Mg), total	mg/L	9	13.1	12.2	14.8	13.4	15.4	17.5	18.7	21.5	18.3	6	13.6	22.1	13.7	23	8.4
Manganese (Mn), total	mg/L	0.098	0.058	0.06	0.066	0.075	0.079	0.068	0.07	0.076	0.064	0.103	0.062	0.089	0.244	0.124	0.194
Mercury (Hg), total	mg/L																
Molybdenum (Mo), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Nickel (Ni), total	mg/L	0.0076	0.0066	0.0062	0.0054	0.0104	0.0089	0.005	0.0037	0.0036	0.0045	0.0061	0.0094	0.0094	0.0386	0.0041	0.0158
Phosphorus (P), total	mg/L					<0.1											
Potassium (K), total	mg/L	<0.4	<0.4	<0.4	<0.4	0.4	0.7	0.7	0.8	0.8	0.8	0.6	<0.4	0.9	0.5	1.1	0.8
Selenium (Se), total	mg/L	0.0003	0.0004	0.0003	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0006	0.0005	0.0005	0.0005	0.0004	0.0004	<0.0002
Silicon (Si), total	mg/L	2.47	2	1.97	2.03	2.04	2.23	2.81	3.24	3.58	2.99	1.76	1.54	3.37	2.53	3.55	2.67

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		27/05/2005	18/06/2005	30/06/2005	22/08/2005	22/09/2005	25/10/2005	24/01/2006	22/02/2006	15/03/2006	27/04/2006	25/05/2006	31/07/2006	28/02/2007	12/07/2007	13/03/2008	14/05/2008
Silver (Ag), total	mg/L	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	0.00007
Sodium (Na), total	mg/L	0.9	1.4	1.1	1.4	1.6	1.8	2.5	2.6	2.8	2.7	0.8	1.4	2.8	1.2	4.3	1.2
Strontium (Sr), total	mg/L	0.118	0.188	0.18	0.178	0.203	0.234	0.235	0.223	0.234	0.233	0.076	0.186	0.259	0.17	0.283	0.108
Sulphur (S), total	mg/L	12.5	19.4	17	22.7	21.5	24.2	28.5	31	32.1	30.8	7.9	21.9	31.9	24.4	35.9	12.5
Thallium (Tl), total	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005					<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti), total	mg/L	0.0111	0.002	0.0041	0.0015	0.0102	0.0036	0.0019	0.0016	0.0022	0.0012	0.0108	0.055	0.0019	0.0608	0.0025	0.018
Uranium (U), total	mg/L	<0.0005	0.0007	0.0006	0.0008	0.0008	0.0008	0.001	0.001	0.001	0.0008	<0.0005	0.0005	0.0008	0.0008	0.0012	<0.0005
Vanadium (V), total	mg/L	0.0012	0.0003	0.0004	0.0002	0.0004	0.0004	<0.0001	<0.0001	0.0002	0.0002	0.001	0.0002	<0.0001	0.001	0.0003	0.0018
Zinc (Zn), total	mg/L	0.057	0.028	0.026	0.04	0.068	0.058	0.038	0.037	0.039	0.035	0.054	0.034	0.061	0.325	0.067	0.106
Zirconium (Zr), total	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminum (Al), dissolved	mg/L	<0.05	0.117	0.076	0.062	0.058	0.028	0.008	<0.005	<0.005	<0.005	0.061	0.14	0.008	0.27	<0.02	0.089
Antimony (Sb), dissolved	mg/L	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	
Arsenic (As), dissolved	mg/L	<0.002	0.0017	0.0011	0.0018	0.0013	0.0013	0.0012	0.0014	0.0011	0.0015	0.0009	0.0013	0.0014	0.0013	0.002	0.0011
Barium (Ba), dissolved	mg/L	0.04	0.055	0.051	0.058	0.055	0.058	0.079	0.084	0.073	0.08	0.03	0.057	0.096	0.051	0.1	0.038
Beryllium (Be), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
Bismuth (Bi), dissolved	mg/L	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005
Boron (B), dissolved	mg/L	<0.02	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.003	0.003	0.002	<0.002	<0.002	0.003	<0.002	<0.01	<0.002
Cadmium (Cd), dissolved	mg/L	0.00035	0.00018	0.0001	0.00018	0.00023	0.0002	0.00015	0.00013	0.00018	0.00014	0.00015	0.0002	0.00012	0.00076	0.0002	0.00029
Calcium (Ca), dissolved	mg/L	30	44.7	40.2	48.9	49.2	53.5	64.4	68.8	56.7	64.9	22.4	48.2	71.7	45	73.7	29.2
Chromium (Cr), dissolved	mg/L	<0.005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	0.0005
Cobalt (Co), dissolved	mg/L	0.001	0.0004	0.0002	0.0003	0.0005	0.0005	0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0006	0.0002	0.0052	<0.0005	0.0012
Copper (Cu), dissolved	mg/L	<0.01	0.002	0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.001	0.005	<0.005	0.003
Iron (Fe), dissolved	mg/L	0.55	0.07	0.03	0.03	0.04	0.06	0.03	0.03	0.02	0.53	0.18	0.05	<0.01	0.06	0.02	0.23
Lead (Pb), dissolved	mg/L	0.004	0.0011	0.0002	<0.0001	<0.0001	0.0001	0.0004	0.0003	0.0004	0.0004	0.0005	0.0002	0.0003	0.0003	<0.0005	0.0016
Lithium (Li), dissolved	mg/L	<0.01	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.004	0.004	0.002	0.004	0.004	0.005	<0.005	0.002
Magnesium (Mg), dissolved	mg/L	9.3	13.6	12.1	16	14.3	15.6	17.9	20.9	17.5	18.3	6.1	15.7	22	12.9	22.6	8.5
Manganese (Mn), dissolved	mg/L	0.095	0.043	0.038	0.041	0.048	0.066	0.074	0.068	0.06	0.09	0.038	0.06	0.09	0.2	0.11	0.121
Mercury (Hg), dissolved	mg/L																
Molybdenum (Mo), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.005	<0.001
Nickel (Ni), dissolved	mg/L	0.006	0.0061	0.0052	0.0048	0.0076	0.0067	0.0047	0.0036	0.0014	0.0034	0.004	0.0076	0.0079	0.0267	0.004	0.0109
Phosphorus (P), dissolved	mg/L																
Potassium (K), dissolved	mg/L	0.4	<0.4	<0.4	<0.4	0.4	0.6	0.7	0.8	0.9	0.8	0.4	0.4	0.8	<0.4	1	0.6
Selenium (Se), dissolved	mg/L	<0.002	0.0004	0.0004	0.0005	0.0005	0.0005	0.0004	0.0006	0.0005	0.0006	<0.0002	<0.0002	0.0004	0.0004	<0.001	<0.0002
Silicon (Si), dissolved	mg/L	2.27	1.96	1.84	2.16	2.03	2.26	2.86	3.47	2.96	2.97	1.35	1.7	3.59	1.88	3.77	1.61
Silver (Ag), dissolved	mg/L	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00001
Sodium (Na), dissolved	mg/L	0.8	1.4	0.9	1.3	1.6	1.9	2.4	2.6	2.4	2.9	1	1.4	2.9	1.2	4.1	0.9
Strontium (Sr), dissolved	mg/L	0.12	0.179	0.178	0.191	0.189	0.215	0.236	0.242	0.176	0.231	0.074	0.163	0.23	0.167	0.25	0.108
Sulphur (S), dissolved	mg/L	13.6	20.2	18.7	25.3	22.6	24.2	31.5	32.1	26.2	31	8.3	24.2	32.8	24.4	34.1	12.6
Thallium (Tl), dissolved	mg/L	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005					<0.00005	<0.00005	<0.0002	<0.00005
Tin (Sn), dissolved	mg/L	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001
Titanium (Ti), dissolved	mg/L	<0.005	0.0016	0.0011	<0.0005	0.0015	0.0016	0.002	0.0018	0.0015	0.0013	0.0008	0.0484	0.0024	0.0555	<0.002	0.0008
Uranium (U), dissolved	mg/L	<0.005	0.0007	0.0006	0.0007	0.0008	0.0008	0.0009	0.0011	0.0008	0.001	<0.0005	0.0008	0.001	0.0006	<0.002	<0.0005
Vanadium (V), dissolved	mg/L	<0.001	0.0003	0.0003	0.0018	0.0003	0.0003	0.0001	0.0004	0.0002	0.0008	0.0002	0.0003	<0.0001	0.0003	0.0007	0.0003
Zinc (Zn), dissolved	mg/L	0.05	0.026	0.015	0.026	0.034	0.041	0.038	0.036	0.03	0.038	0.027	0.016	0.053	0.09	0.062	0.057
Zirconium (Zr), dissolved	mg/L																

Data omitted from calculation of summary statistics.

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		03/07/2008	04/10/2008	01/02/2009	26/05/2009	04/07/2009	08/10/2009	09/02/2010	05/05/2010	06/07/2010	07/10/2010	09/02/2011	27/05/2011	12/07/2011	29/10/2011	23/11/2011	15/12/2011
Discharge (Flow)	L/s																
Total Suspended Solids	mg/L	5	34	5	26	7	7	3	61	8	2	16	2	<1	2	1.9	1.7
pH (field)	pH units	7.31	7.4		6.82	8.06	7.29	8.05	7.95	7.91	8	8.05	8	8.61	8.27	7.95	7.59
pH (lab)	pH units	8.2	7.65	7.72	7.9	8.2	8.1	8.2	8	7.91	8.02	8.02	8.09	8.2	7.87	8.15	7.82
Specific Conductance (field)	µS/cm													300	441.7		467.6
Specific Conductance (lab)	µS/cm	382	314	524	200	320	364	492	238	337	397	775	259	279	419	473	453
Temperature (field)	C	15	2		7	17.4	2.2	0.5	5	15	2	0.5	8.39	16.2	0.1	-0.1	-0.1
Dissolved Oxygen (field)	mg/L														10.69	9.86	9.53
Dissolved Oxygen (field)	%														73.9	67.5	65
ORP (field)	mV														284.4		
Hardness (from total)	mg/L				98.4	169	185	268	117	171	203	377	131	144	220	245	237
Hardness (from dissolved)	mg/L	191	182	318	99.3	166	187	281	117	172	209	382	131	142	221	246	235
Alkalinity, total	mg/L										110	230	98	110	120		133
Chloride	mg/L																
Fluoride	mg/L																
Sulphate, dissolved	mg/L						77	110	52	76	89	170	39	32	89.7	109	101
Ammonia (N)	mg/L																0.045
Nitrite (N)	mg/L														<0.05	<0.005	<0.005
Nitrate (N)	mg/L														<0.2	0.076	0.087
Total Kjeldahl Nitrogen	mg/L														0.3	0.377	0.173
Dissolved Organic Carbon	mg/L		6.4	2.1	8	5.1	5	2.2			4.5	4.3	9	9.4	3.8	4.15	3.32
Aluminum (Al), total	mg/L	0.326	1.52	0.023	0.385	0.673	0.777	0.282	0.792	0.635	0.268	0.113	0.0216	0.0145	0.262	0.126	0.151
Antimony (Sb), total	mg/L	<0.0002	<0.0002	<0.0002	0.00015	0.00013	0.0001	0.0001	0.00046	0.00012	0.00009	0.00018	0.00028	0.00033	0.00014	0.00014	0.0001
Arsenic (As), total	mg/L	0.0016	0.0027	0.0018	0.00189	0.00126	0.00091	0.00197	0.00283	0.00109	0.00127	0.00496	0.00803	0.00752	0.00136	0.00174	0.00145
Barium (Ba), total	mg/L	0.062	0.055	0.102	0.0392	0.0492	0.05	0.077	0.0646	0.0461	0.0564	0.122	0.0544	0.0564	0.0605	0.072	0.0728
Beryllium (Be), total	mg/L	<0.0001	0.00004	<0.00004	0.00002	0.00004	0.00004	0.00001	0.00005	0.00003	0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), total	mg/L	<0.0005	<0.0001	<0.0001	<0.000005	<0.000005	<0.000005	<0.000005	0.000009	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), total	mg/L	0.003	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), total	mg/L	0.0007	0.00144	0.00033	0.000593	0.000706	0.000922	0.000578	0.000601	0.000855	0.000675	0.00112	0.000052	0.000014	0.000609	0.000542	0.000561
Calcium (Ca), total	mg/L	52	44.4	87.6	26.9	44.9	48.7	72.8	31.3	43.6	51.2	100	33.8	34.1	57	63.9	62.8
Chromium (Cr), total	mg/L	0.0007	0.0011	0.0006	0.0003	0.0001	0.0003	0.0004	0.0012	0.0004	0.0005	0.0006	0.0003	0.0002	0.0002	0.0002	<0.0001
Cobalt (Co), total	mg/L	0.0045	0.00578	0.00051	0.00205	0.00288	0.00418	0.00136	0.00237	0.00365	0.00345	0.00238	0.000109	0.000066	0.00249	0.00175	0.0016
Copper (Cu), total	mg/L	0.003	0.01	0.001	0.00418	0.00561	0.00597	0.0026	0.00584	0.00551	0.00355	0.00258	0.0005	0.00032	0.00328	0.00229	0.00227
Iron (Fe), total	mg/L	0.18	1.19	0.18	0.609	0.22	0.343	0.345	1.83	0.257	0.226	0.472	0.166	0.068	0.24	0.215	0.202
Lead (Pb), total	mg/L	0.001	0.0031	0.0006	0.00441	0.000786	0.000452	0.00157	0.00592	0.000897	0.000381	0.00156	0.000671	0.000401	0.00286	0.00208	0.000354
Lithium (Li), total	mg/L	0.007	0.006	0.005	0.0027	0.0053	0.0062	0.0057	0.0035	0.0059	0.0062	0.0089	0.0022	0.0029	0.0061	0.0065	0.0058
Magnesium (Mg), total	mg/L	16.4	14	25.7	7.61	13.7	15.3	20.9	9.38	15	18.3	30.6	11.3	14.3	18.9	20.8	19.6
Manganese (Mn), total	mg/L	0.225	0.223	0.127	0.14	0.139	0.16	0.152	0.186	0.149	0.197	0.308	0.0529	0.0255	0.173	0.175	0.159
Mercury (Hg), total	mg/L				<0.00001	0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo), total	mg/L	<0.001	0.00053	0.0008	0.00035	0.00044	0.00045	0.00076	0.00046	0.0004	0.00056	0.00132	0.00153	0.00127	0.00057	0.00069	0.00061
Nickel (Ni), total	mg/L	0.0315	0.031	0.013	0.0132	0.0233	0.029	0.0199	0.0145	0.0258	0.0248	0.0326	0.00177	0.00103	0.0201	0.0197	0.02
Phosphorus (P), total	mg/L		0.018	<0.01	0.025	0.008	0.01	0.01		0.009		0.007	0.014	0.015	0.006	0.006	0.003
Potassium (K), total	mg/L	0.5	0.5	1	0.48	0.37	0.4	0.77	0.61	0.32	0.52	1.19	0.95	0.72	0.57	0.7	0.61
Selenium (Se), total	mg/L	0.0003	0.0007	<0.0006	0.0003	0.00047	0.0005	0.00055	0.00042	0.00048	0.00046	0.0009	0.00007	0.00006	0.00056	0.00058	0.00061
Silicon (Si), total	mg/L	1.68	2.78	3.81	1.54	1.96	2.19	3.67	2.18	1.67	1.85	4.33	0.963	0.586	2.3	2.9	2.7

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		03/07/2008	04/10/2008	01/02/2009	26/05/2009	04/07/2009	08/10/2009	09/02/2010	05/05/2010	06/07/2010	07/10/2010	09/02/2011	27/05/2011	12/07/2011	29/10/2011	23/11/2011	15/12/2011
Silver (Ag), total	mg/L	<0.00001	<0.00001	<0.00001	0.000012	0.000007	<0.000005	0.000009	0.000024	0.000005	<0.000005	<0.000005	0.000006	<0.000005	0.000017	0.000009	<0.000005
Sodium (Na), total	mg/L	1.7	1.24	3.36	0.72	1.2	1.35	2.65	0.94	1.17	1.8	4.03	2.72	3.83	1.9	2.29	2.22
Strontium (Sr), total	mg/L	0.211	0.161	0.242	0.0956	0.176	0.196	0.228	0.118	0.188	0.214	0.347	0.169	0.196	0.22	0.227	0.233
Sulphur (S), total	mg/L	31.8		37.4	14	25	29	43	15	29	33	57	13	13	37	38	34
Thallium (Tl), total	mg/L	<0.00005	<0.00001	<0.00001	0.000003	0.000002	<0.000002	<0.000002	0.000007	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000003	<0.000002
Tin (Sn), total	mg/L	<0.001	0.0004	<0.0001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	0.00003	0.00002	<0.00001	<0.00001	0.00045	0.00004	0.00004
Titanium (Ti), total	mg/L	0.004	0.0095	0.0005	0.0045	0.0009	0.0007	<0.0005	0.0177	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), total	mg/L	0.0007	0.0008	0.0011	0.000427	0.000719	0.000934	0.001	0.000973	0.000741	0.000879	0.0012	0.000155	0.000095	0.000863	0.000978	0.000898
Vanadium (V), total	mg/L	0.0002	0.00101	0.00008	0.0005	<0.0002	<0.0002	<0.0002	0.0015	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), total	mg/L	0.09	0.218	0.073	0.0852	0.103	0.148	0.101	0.0761	0.114	0.1	0.175	0.0044	0.0014	0.0996	0.0975	0.0998
Zirconium (Zr), total	mg/L	<0.001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al), dissolved	mg/L	0.149	0.18	0.013	0.0965	0.189	0.144	0.0124	0.0669	0.171	0.0629	0.0111	0.0202	0.0036	0.0646	0.0165	0.0185
Antimony (Sb), dissolved	mg/L	0.0009	0.001	0.0007	0.00014	0.00012	0.00009	0.00008	0.00017	0.0001	0.00011	0.00019	0.00033	0.00032	0.0001	0.0001	0.00009
Arsenic (As), dissolved	mg/L	0.0013	0.0007	0.0013	0.00089	0.00095	0.00066	0.00117	0.00122	0.00073	0.00113	0.00181	0.00715	0.00735	0.00105	0.00132	0.00105
Barium (Ba), dissolved	mg/L	0.061	0.04	0.094	0.0333	0.0494	0.0479	0.075	0.0427	0.0456	0.0559	0.146	0.0528	0.0584	0.0605	0.0703	0.073
Beryllium (Be), dissolved	mg/L	<0.0001	<0.00004	<0.00004	<0.00001	<0.00001	0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L	<0.0005		<0.0001	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	<0.002	<0.004	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.00058	0.00114	0.00024	0.000322	0.000495	0.000676	0.000487	0.000153	0.000541	0.000609	0.000862	0.000057	0.000165	0.000517	0.000449	0.000492
Calcium (Ca), dissolved	mg/L	49.1	48.1	85.3	26.8	44.2	49	75.6	31.5	44.5	53.8	91.3	33.5	34	57.2	64.5	61.7
Chromium (Cr), dissolved	mg/L	<0.0005	0.0006	0.0006	0.0003	<0.0001	0.0004	0.0003	0.0003	0.0004	0.0003	0.0008	0.0003	0.0003	0.0001	0.0002	<0.0001
Cobalt (Co), dissolved	mg/L	0.0041	0.00425	0.00053	0.00118	0.00246	0.00389	0.000961	0.000898	0.00285	0.00325	0.00276	0.000094	0.00005	0.00246	0.00164	0.00155
Copper (Cu), dissolved	mg/L	0.002	0.004	0.002	0.00253	0.00378	0.00369	0.00139	0.00271	0.00337	0.00231	0.00182	0.00108	0.00026	0.00222	0.00167	0.00361
Iron (Fe), dissolved	mg/L	0.03	0.066	0.06	0.186	0.041	0.035	0.062	0.245	0.023	0.04	0.027	0.101	0.044	0.063	0.066	0.067
Lead (Pb), dissolved	mg/L	0.0001	0.0009	0.0004	0.000797	0.000184	0.000244	0.0001	0.0018	0.000154	0.000107	0.000172	0.0016	0.000336	0.00144	0.000195	0.00008
Lithium (Li), dissolved	mg/L	0.006	0.005	0.006	0.0027	0.0054	0.0056	0.0059	0.0032	0.0059	0.0062	0.0102	0.0023	0.0028	0.0062	0.0067	0.0058
Magnesium (Mg), dissolved	mg/L	16.6	15.1	25.5	7.84	13.6	15.7	22.4	9.37	14.9	18.1	37.5	11.5	13.8	19.1	20.7	19.7
Manganese (Mn), dissolved	mg/L	0.21	0.149	0.13	0.0815	0.122	0.146	0.129	0.131	0.123	0.194	0.34	0.0243	0.0123	0.159	0.173	0.156
Mercury (Hg), dissolved	mg/L				<0.00001	<0.00001	<0.00001	<0.00001		<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.000020	<0.00001
Molybdenum (Mo), dissolved	mg/L	<0.001	0.00052	0.00082	0.00035	0.00045	0.00042	0.00076	0.00045	0.00038	0.00055	0.00152	0.00156	0.00133	0.00054	0.00067	0.00062
Nickel (Ni), dissolved	mg/L	0.0281	0.025	0.013	0.0103	0.0206	0.0281	0.0195	0.00887	0.0216	0.0236	0.0381	0.00193	0.00099	0.0207	0.0192	0.019
Phosphorus (P), dissolved	mg/L		<0.01	<0.01	0.008	<0.002	0.004	0.005		0.003		0.003	0.01	0.007	<0.002	0.004	<0.002
Potassium (K), dissolved	mg/L	0.4	0.4	1	0.5	0.36	0.4	0.79	0.61	0.32	0.53	1.53	0.95	0.7	0.51	0.71	0.62
Selenium (Se), dissolved	mg/L	0.0002	<0.0006	0.0011	0.00036	0.00044	0.00048	0.00054	0.00035	0.00045	0.00046	0.00076	0.00006	0.00005	0.00057	0.00059	0.00058
Silicon (Si), dissolved	mg/L	1.7	2.38	3.68	1.47	1.88	2.14	3.47	1.74	1.65	2.07	3.41	0.955	0.593	2.3	2.8	2.7
Silver (Ag), dissolved	mg/L	<0.00001	0.00007	<0.00001	0.000018	<0.000005	<0.000005	<0.000005	0.000011	<0.000005	<0.000005	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na), dissolved	mg/L	1.8	1.3	3.5	0.76	1.19	1.43	2.81	0.99	1.17	1.77	4.93	2.94	3.63	1.98	2.36	2.25
Strontium (Sr), dissolved	mg/L	0.203	0.151	0.242	0.0962	0.177	0.19	0.237	0.115	0.185	0.218	0.439	0.167	0.197	0.233	0.232	0.232
Sulphur (S), dissolved	mg/L	30.9		39	15	24	29	44	16	28	34	67	13	13	35	37	38
Thallium (Tl), dissolved	mg/L	<0.00005	0.00002	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn), dissolved	mg/L	<0.001	0.0017	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	0.00008	0.00006	0.00038
Titanium (Ti), dissolved	mg/L	0.0043	0.0007	0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U), dissolved	mg/L	0.0007	0.0006	0.001	0.000325	0.000639	0.000785	0.000939	0.000619	0.000641	0.000847	0.00144	0.000162	0.000115	0.00103	0.000958	0.000817
Vanadium (V), dissolved	mg/L	0.0001	0.00007	0.00011	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn), dissolved	mg/L	0.054	0.158	0.082	0.0489	0.0453	0.0886	0.0837	0.0287	0.0468	0.0789	0.166	0.0055	0.016	0.0777	0.0876	0.0892
Zirconium (Zr), dissolved	mg/L		0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data omitted from calculation of summary statistics.

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		14/01/2012	10/02/2012	19/03/2012	05/04/2012	03/05/2012	04/06/2012	06/07/2012	05/08/2012	23/09/2012	13/10/2012	17/11/2012	08/12/2012	10/01/2013	18/02/2013	12/03/2013	06/04/2013
Discharge (Flow)	L/s								6486	3553.7	3061.013						
Total Suspended Solids	mg/L	12.1	14.4	4.7	1.1	42.1	22.7	7.3	2.5	2.1	3.2	1.3	1.5	1.7	3.5	2.4	1.1
pH (field)	pH units	7.57	7.52	7.52	7.43	8.00	7.82	8.06	8.21	8.02	7.37		7.09	7.39	7.62	7.69	7.91
pH (lab)	pH units	8.11	8.24	8.24	8.12	7.87	8.09	8.06	8.2	8.2	8.07	8.04	7.98	8.11	7.87	8.31	8.13
Specific Conductance (field)	µS/cm	463.8	505	506	595	246.7	336.1	375.7	386.2		468.7	516	597	555	476.8	317	611.2
Specific Conductance (lab)	µS/cm	496	501	506	509	245	308	343	357	405	427	480	520	511	537	562	588
Temperature (field)	C	0	-0.1	-0.1	0	0.6	11.9	15.2	13.2	7.3	-0.1	0	0.03	0.05	0	-0.1	-0.1
Dissolved Oxygen (field)	mg/L	9.1	10.24	9.89		13.38	10.6	9.41	10.5	11.08	13.7		10.65	12.82	12.22	8.76	10.1
Dissolved Oxygen (field)	%	63	70.1	67.2		93.1	99	93.9	100	92	93.6		73.3	87.9	82	57.8	68.1
ORP (field)	mV	315	56.7	-2.7	104.6	231.4	315.1	120.4	265.4		-41.2				136.1	53.7	165.5
Hardness (from total)	mg/L	241	259	252	249	130	153	177	189	207	224	247	270	281	277	285	327
Hardness (from dissolved)	mg/L	254	270	253	262	122	143	152	186	201	223	257	259	272	269	301	322
Alkalinity, total	mg/L		154			71.6		92.4			125				158		191
Chloride	mg/L					0.55		0.98			0.79				2.7		2.74
Fluoride	mg/L																0.104
Sulphate, dissolved	mg/L	112	117	98.3	112	50.2	64.6	85.3	84.9	102	104	115	124	114	122	135	134
Ammonia (N)	mg/L																
Nitrite (N)	mg/L	<0.005	<0.005	<0.05	<0.005	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.059	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010
Nitrate (N)	mg/L	0.099	0.139	<0.20	0.136	0.32	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.105	0.101	0.161	0.147	0.163
Total Kjeldahl Nitrogen	mg/L	0.442	0.22	0.56	0.878	0.27	0.41	0.24	0.39	0.22	0.26	0.43	0.239	0.137	0.684	0.538	0.252
Dissolved Organic Carbon	mg/L	2.91	3	3.05	4.31	12.2	4.61	4.73	4.11	3.58	4.24	3.36	2.7	1.76	4.5	3.54	2.87
Aluminum (Al), total	mg/L	0.133	0.31	0.111	0.0641	0.845	0.718	0.808	0.41	0.366	0.141	0.17	0.0523	0.0579	0.0636	0.0397	0.0209
Antimony (Sb), total	mg/L	0.00013	0.00016	0.00014	0.0002	0.000173	0.000164	0.000123	0.000093	0.0001	0.000098	0.000128	0.000135	0.000109	0.000176	0.000321	0.00018
Arsenic (As), total	mg/L	0.00224	0.00385	0.00183	0.0016	0.00465	0.00195	0.00113	0.00113	0.00143	0.00136	0.00174	0.00214	0.00205	0.00205	0.00246	0.00248
Barium (Ba), total	mg/L	0.0739	0.0847	0.0721	0.0759	0.0502	0.0504	0.0508	0.0512	0.0572	0.0615	0.0761	0.0908	0.0955	0.0914	0.0979	0.103
Beryllium (Be), total	mg/L	0.00001	0.00002	0.00001	<0.00001	0.000038	0.000042	0.000049	0.000021	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
Bismuth (Bi), total	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000006	0.0000057	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050
Boron (B), total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.011
Cadmium (Cd), total	mg/L	0.000696	0.000935	0.000521	0.000578	0.000988	0.000891	0.000893	0.000636	0.00083	0.00044	0.000828	0.000567	0.000505	0.000536	0.000558	0.000368
Calcium (Ca), total	mg/L	65.9	69.6	66.6	66.8	35.3	40.5	46.7	49.4	54.3	60.9	66.7	71.3	76.4	74.3	76.5	87.7
Chromium (Cr), total	mg/L	<0.0001	0.0002	0.0003	0.0001	0.00037	0.00036	0.00019	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00238	0.00038	0.00026
Cobalt (Co), total	mg/L	0.00143	0.00259	0.000918	0.000858	0.00339	0.0034	0.00415	0.00265	0.00368	0.00152	0.0023	0.00112	0.000857	0.000826	0.000642	0.00034
Copper (Cu), total	mg/L	0.00192	0.00303	0.00174	0.00228	0.00573	0.00532	0.00602	0.00364	0.00308	0.00184	0.00247	0.00122	0.001	0.00278	0.00317	0.00209
Iron (Fe), total	mg/L	0.271	0.538	0.245	0.174	1.21	0.707	0.325	0.213	0.213	0.228	0.252	0.254	0.221	0.25	0.266	0.220
Lead (Pb), total	mg/L	0.00191	0.00835	0.00143	0.00142	0.0103	0.00926	0.000606	0.000289	0.000353	0.0007	0.00137	0.000821	0.00107	0.00271	0.00741	0.00144
Lithium (Li), total	mg/L	0.0056	0.006	0.006	0.006	0.00302	0.00484	0.00635	0.00591	0.00676	0.00538	0.00613	0.0056	0.00602	0.00571	0.00599	0.00502
Magnesium (Mg), total	mg/L	18.5	20.8	20.9	19.9	10.1	12.7	14.6	15.9	17.3	17.4	19.6	22.4	21.8	22.2	22.9	26.2
Manganese (Mn), total	mg/L	0.166	0.287	0.133	0.127	0.306	0.212	0.171	0.138	0.201	0.125	0.204	0.202	0.164	0.151	0.172	0.149
Mercury (Hg), total	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.0007	0.00062	0.00075	0.00075	0.000361	0.000383	0.000387	0.000453	0.000477	0.000541	0.000602	0.000793	0.00083	0.00084	0.00104	0.00123
Nickel (Ni), total	mg/L	0.0168	0.0233	0.0169	0.0179	0.0156	0.0212	0.0287	0.0203	0.0242	0.0135	0.0229	0.0173	0.0155	0.0164	0.0135	0.00545
Phosphorus (P), total	mg/L	0.01	0.017	0.006	0.005	0.0528	0.0242	0.0067	0.0022	0.0028	0.0035	0.0055	0.0027	0.0057	0.015	0.0121	<0.10
Potassium (K), total	mg/L	0.69	0.77	0.86	1.19	0.769	0.486	0.372	0.381	0.516	0.609	0.714	0.785	0.904	1.4	1.43	1.34
Selenium (Se), total	mg/L	0.00068	0.0006	0.0006	0.00058	0.000353	0.000467	0.000598	0.000567	0.000513	0.000603	0.000647	0.00066	0.000549	0.000639	0.000476	0.00039
Silicon (Si), total	mg/L	3.3	3.1	2.9	3	2.24	2.08	2.26	1.89	2.04	2.3	2.78	3.26	3.76	3.48	3.55	3.83

Station Name		KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2	KV-2
Sample Date		14/01/2012	10/02/2012	19/03/2012	05/04/2012	03/05/2012	04/06/2012	06/07/2012	05/08/2012	23/09/2012	13/10/2012	17/11/2012	08/12/2012	10/01/2013	18/02/2013	12/03/2013	06/04/2013
Silver (Ag), total	mg/L	<0.000005	0.000007	0.000008	<0.000005	0.000057	0.0000396	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	0.000007	0.000017
Sodium (Na), total	mg/L	2.32	2.63	2.7	2.83	1.09	1.15	1.32	1.38	1.65	1.7	2.27	2.99	2.81	3.54	3.81	4.34
Strontium (Sr), total	mg/L	0.22	0.235	0.237	0.234	0.115	0.161	0.176	0.194	0.207	0.23	0.24	0.248	0.259	0.239	0.258	0.248
Sulphur (S), total	mg/L	43	39	35	40	17	23	28	30	37	35	38.8	40.9	44.1	39.5	44.5	44.4
Thallium (Tl), total	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	0.000006	0.0000074	0.0000036	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000002	<0.0000020	0.000003	0.000006	<0.000010
Tin (Sn), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Titanium (Ti), total	mg/L	<0.0005	0.0014	<0.0005	<0.0005	0.00858	0.00437	0.00262	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00071	<0.00050	<0.010
Uranium (U), total	mg/L	0.000918	0.00103	0.000931	0.000916	0.000732	0.000684	0.000762	0.000738	0.000893	0.000957	0.000903	0.000944	0.000954	0.000959	0.00112	0.00123
Vanadium (V), total	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.00077	0.00047	0.0003	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010
Zinc (Zn), total	mg/L	0.0942	0.151	0.096	0.0929	0.149	0.127	0.152	0.0959	0.119	0.0704	0.13	0.103	0.0822	0.0955	0.0899	0.0476
Zirconium (Zr), total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.00032	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Aluminum (Al), dissolved	mg/L	0.0107	0.0095	0.0104	0.0093	0.0408	0.129	0.181	0.143	0.124	0.0373	0.0149	0.00683	0.00645	0.0073	0.00516	0.0038
Antimony (Sb), dissolved	mg/L	0.0001	0.0001	0.00011	0.00015	0.000102	0.000122	0.000116	0.000089	0.000095	0.000087	0.000109	0.000122	0.000104	0.000137	0.000121	0.00012
Arsenic (As), dissolved	mg/L	0.00139	0.00128	0.0012	0.00118	0.00103	0.000807	0.00083	0.000937	0.00105	0.000954	0.00128	0.00138	0.00142	0.00144	0.00141	0.00161
Barium (Ba), dissolved	mg/L	0.0733	0.0802	0.0754	0.0764	0.0384	0.0463	0.05	0.0511	0.0559	0.0583	0.0742	0.0913	0.0885	0.0885	0.095	0.103
Beryllium (Be), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050
Boron (B), dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010
Cadmium (Cd), dissolved	mg/L	0.000313	0.000304	0.000403	0.000329	0.000275	0.00042	0.000676	0.000502	0.000721	0.00035	0.000644	0.000275	0.000131	0.000273	0.000294	0.000174
Calcium (Ca), dissolved	mg/L	67.9	72.3	66.9	71.7	32.7	36.3	40	48.5	52.6	60.2	68.9	69.1	72.5	72.4	81.3	87.2
Chromium (Cr), dissolved	mg/L	0.0001	<0.0001	0.0002	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00084	0.00019	<0.00010
Cobalt (Co), dissolved	mg/L	0.00129	0.00124	0.000816	0.000845	0.000699	0.0021	0.00324	0.00243	0.00349	0.00141	0.00227	0.00107	0.000853	0.000758	0.000617	0.00028
Copper (Cu), dissolved	mg/L	0.00129	0.00083	0.00114	0.00147	0.00206	0.00265	0.00346	0.00269	0.00215	0.00188	0.00177	0.000659	0.000646	0.00197	0.00167	0.00145
Iron (Fe), dissolved	mg/L	0.057	0.048	0.027	0.047	0.226	0.0423	0.0228	0.0348	0.0364	0.0428	0.056	0.0441	0.04	0.0557	0.0372	0.031
Lead (Pb), dissolved	mg/L	0.000066	0.000104	0.000175	0.000306	0.000455	0.000174	0.000337	0.000042	0.00004	0.000051	0.000157	0.000191	0.000102	0.00045	0.000322	0.000142
Lithium (Li), dissolved	mg/L	0.0057	0.0062	0.0061	0.0058	0.00256	0.00497	0.00609	0.00592	0.0067	0.00524	0.00635	0.00607	0.00587	0.00573	0.00577	0.00479
Magnesium (Mg), dissolved	mg/L	20.5	21.8	20.8	20.1	9.76	12.6	12.8	15.7	16.9	17.8	20.7	20.9	22	21.5	23.7	25.4
Manganese (Mn), dissolved	mg/L	0.165	0.191	0.122	0.124	0.121	0.123	0.148	0.129	0.189	0.112	0.21	0.198	0.162	0.148	0.146	0.127
Mercury (Hg), dissolved	mg/L	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.00071	0.00079	0.00076	0.00073	0.000385	0.000439	0.000429	0.0004	0.00051	0.000528	0.000672	0.000885	0.00088	0.000934	0.000997	0.00123
Nickel (Ni), dissolved	mg/L	0.0182	0.0197	0.0166	0.017	0.00809	0.0164	0.0233	0.0193	0.0233	0.0139	0.0235	0.0184	0.0159	0.0157	0.0139	0.00518
Phosphorus (P), dissolved	mg/L	0.003	<0.002	0.003	0.008	0.0077	<0.0020	0.0025	<0.0020	<0.0020	<0.0020	0.0029	<0.0020	<0.0020	0.0088	0.0061	<0.10
Potassium (K), dissolved	mg/L	0.74	0.8	0.91	1.23	0.728	0.464	0.321	0.39	0.486	0.552	0.723	0.792	0.84	1.4	1.19	1.29
Selenium (Se), dissolved	mg/L	0.0006	0.00055	0.00059	0.0006	0.00029	0.000478	0.000543	0.00055	0.000564	0.000367	0.000548	0.000537	0.000572	0.000709	0.000563	0.00040
Silicon (Si), dissolved	mg/L	3	3.3	2.9	3.2	1.71	1.61	1.59	1.73	1.96	2.22	2.99	2.98	3.52	3.4	3.93	3.90
Silver (Ag), dissolved	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010
Sodium (Na), dissolved	mg/L	2.62	2.8	2.72	2.85	1.07	1.13	1.11	1.39	1.61	1.79	2.38	2.83	2.86	3.4	3.84	4.22
Strontium (Sr), dissolved	mg/L	0.23	0.239	0.231	0.23	0.114	0.163	0.176	0.195	0.204	0.22	0.241	0.249	0.246	0.24	0.255	0.252
Sulphur (S), dissolved	mg/L	40	41	36	41	18	23	24	30	36	34	40.9	37.1	42.2	41.3	42.8	42.1
Thallium (Tl), dissolved	mg/L	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	0.0000023	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.000010
Tin (Sn), dissolved	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010
Titanium (Ti), dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010
Uranium (U), dissolved	mg/L	0.000947	0.000974	0.000885	0.000899	0.000513	0.000698	0.00069	0.000699	0.000864	0.000926	0.000854	0.000858	0.000933	0.000941	0.00118	0.00126
Vanadium (V), dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010
Zinc (Zn), dissolved	mg/L	0.0852	0.0959	0.0804	0.0822	0.0411	0.0421	0.0582	0.0492	0.0816	0.054	0.122	0.0999	0.086	0.0853	0.0774	0.0378
Zirconium (Zr), dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	

Data omitted from calculation of summary statistics.

Station Name		KV-2	KV-2	KV-2	KV-2
Sample Date		09/05/2013	09/06/2013	05/07/2013	06/08/2013
Discharge (Flow)	L/s				
Total Suspended Solids	mg/L	5.2	35.0	5.8	1.8
pH (field)	pH units	7.94	7.8	7.88	8.02
pH (lab)	pH units	8.02	8.07	8.00	8.10
Specific Conductance (field)	µS/cm	377.1	240.9	289.8	379.4
Specific Conductance (lab)	µS/cm	432	262	328	323
Temperature (field)	C	0.2	10.6	14.8	16.6
Dissolved Oxygen (field)	mg/L	10.6	10.48	9.45	9.62
Dissolved Oxygen (field)	%	70.4	91.5	91	96.4
ORP (field)	mV	79.3	88.1	92.6	156.7
Hardness (from total)	mg/L	238	141	171	190
Hardness (from dissolved)	mg/L	240	140	168	186
Alkalinity, total	mg/L	138	82.9	94.1	99.9
Chloride	mg/L	0.62	<0.50	<0.50	<0.50
Fluoride	mg/L	0.115	0.092	0.111	0.132
Sulphate, dissolved	mg/L	101	56.7	72.5	82.0
Ammonia (N)	mg/L				
Nitrite (N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Nitrate (N)	mg/L	0.0526	0.0111	0.0183	0.0144
Total Kjeldahl Nitrogen	mg/L	0.230	0.372	0.208	0.166
Dissolved Organic Carbon	mg/L	3.95	7.49	5.31	4.33
Aluminum (Al), total	mg/L	0.134	0.899	0.442	0.321
Antimony (Sb), total	mg/L	0.00018	0.00038	0.00018	0.00014
Arsenic (As), total	mg/L	0.00203	0.00603	0.00148	0.00165
Barium (Ba), total	mg/L	0.0621	0.0583	0.0511	0.0576
Beryllium (Be), total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), total	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), total	mg/L	0.000452	0.00135	0.000535	0.000483
Calcium (Ca), total	mg/L	63.7	37.0	45.6	49.7
Chromium (Cr), total	mg/L	0.00028	0.00178	0.00040	0.00010
Cobalt (Co), total	mg/L	0.00092	0.00360	0.00229	0.00216
Copper (Cu), total	mg/L	0.00242	0.00708	0.00431	0.00342
Iron (Fe), total	mg/L	0.292	1.49	0.305	0.143
Lead (Pb), total	mg/L	0.00308	0.0169	0.00122	0.00164
Lithium (Li), total	mg/L	0.00614	0.00463	0.00457	0.00533
Magnesium (Mg), total	mg/L	19.3	11.7	13.8	16.0
Manganese (Mn), total	mg/L	0.121	0.249	0.145	0.151
Mercury (Hg), total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), total	mg/L	0.000554	0.000502	0.000471	0.000524
Nickel (Ni), total	mg/L	0.0149	0.0200	0.0192	0.0188
Phosphorus (P), total	mg/L	<0.050	0.053	<0.050	<0.050
Potassium (K), total	mg/L	0.78	0.71	0.51	0.49
Selenium (Se), total	mg/L	0.00051	0.00041	0.00045	0.00041
Silicon (Si), total	mg/L	2.48	2.40	1.97	1.62

Station Name		KV-2	KV-2	KV-2	KV-2
Sample Date		09/05/2013	09/06/2013	05/07/2013	06/08/2013
Silver (Ag), total	mg/L	0.000056	0.000120	0.000021	<0.000010
Sodium (Na), total	mg/L	1.92	0.935	1.17	1.44
Strontium (Sr), total	mg/L	0.251	0.155	0.174	0.190
Sulphur (S), total	mg/L	35.2	17.8	23.5	27.2
Thallium (Tl), total	mg/L	<0.000010	0.000011	<0.000010	<0.000010
Tin (Sn), total	mg/L	<0.00010	<0.00010	0.00015	<0.00010
Titanium (Ti), total	mg/L	<0.010	0.012	<0.010	<0.010
Uranium (U), total	mg/L	0.000880	0.000641	0.000694	0.000683
Vanadium (V), total	mg/L	<0.0010	0.0018	<0.0010	<0.0010
Zinc (Zn), total	mg/L	0.0712	0.155	0.0821	0.0624
Zirconium (Zr), total	mg/L	<0.00080	<0.00080	<0.00080	<0.00080
Aluminum (Al), dissolved	mg/L	0.0130	0.0776	0.152	0.180
Antimony (Sb), dissolved	mg/L	<0.00010	0.00013	0.00013	0.00011
Arsenic (As), dissolved	mg/L	0.00101	0.00094	0.00102	0.00128
Barium (Ba), dissolved	mg/L	0.0595	0.0437	0.0489	0.0554
Beryllium (Be), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000308	0.000511	0.000411	0.000398
Calcium (Ca), dissolved	mg/L	64.2	37.5	45.0	48.8
Chromium (Cr), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L	0.00068	0.00133	0.00186	0.00192
Copper (Cu), dissolved	mg/L	0.00143	0.00225	0.00285	0.00234
Iron (Fe), dissolved	mg/L	0.037	0.107	0.054	0.029
Lead (Pb), dissolved	mg/L	0.000177	0.000264	0.000606	0.000090
Lithium (Li), dissolved	mg/L	0.00579	0.00394	0.00463	0.00542
Magnesium (Mg), dissolved	mg/L	19.3	11.4	13.6	15.6
Manganese (Mn), dissolved	mg/L	0.102	0.119	0.124	0.138
Mercury (Hg), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.000517	0.000396	0.000457	0.000475
Nickel (Ni), dissolved	mg/L	0.0137	0.0120	0.0168	0.0168
Phosphorus (P), dissolved	mg/L	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L	0.76	0.57	0.47	0.46
Selenium (Se), dissolved	mg/L	0.00049	0.00036	0.00044	0.00046
Silicon (Si), dissolved	mg/L	2.35	1.69	1.79	1.56
Silver (Ag), dissolved	mg/L	<0.000010	0.000010	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L	1.91	0.910	1.24	1.38
Strontium (Sr), dissolved	mg/L	0.244	0.151	0.170	0.182
Sulphur (S), dissolved	mg/L	34.8	17.8	23.0	26.9
Thallium (Tl), dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.000786	0.000489	0.000624	0.000638
Vanadium (V), dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.0539	0.0617	0.0486	0.0352
Zirconium (Zr), dissolved	mg/L	<0.00080	<0.00080	<0.00080	<0.00080

Data omitted from calculation of summary statistics.

Station Name			Type	KV-85D	KV-85D	KV-85D	KV-85D	KV-85D	KV-85D	KV-85D	KV-85D	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	22/09/2011	19/11/2011	19/01/2012	23/11/2012	10/12/2012	14/01/2013	10/03/2013	10/06/2013	14/02/2010	16/11/2010	09/12/2010	10/02/2011	27/05/2011	21/06/2011	17/08/2011	22/09/2011	31/10/2011
Water Level	m			25.8	26.92		29.13	27.38			26.07	28.45	27.88	27.52	29.81	28.29	29.04	26.09	26.345	
Geodetic Groundwater Level	masl			871.6	870.46		868.25	870.00			871.31	872.97	873.54	873.90	871.61	873.13	872.38	875.33	875.075	
Well Depth	mbTOC				42.92	6.96	42.91	42.97			42.86									37
Well Purge Volume	L						85	84	84	90	105									
Total Suspended Solids	mg/L		25	**44**	19.7	**33.4**	**177**	**349**	**181**	**162**	**50.0**		12	**42**	25	**53**			**91**	
pH (field)	pH units	6.5-9	6.5-9.5	6.97		8.1	6.93	6.82	7.06	7.32	6.96	6.70	6.82	8.45	8.79	7.64			6.79	
pH (lab)	pH units	6.5-9	6.5-9.5	7.58	7.74	8.13	7.93	7.94	7.84	8.01	7.81	6.85	7.39	7.34	7.23	7.27		7.08	7.92	
Specific Conductance (field)	µS/cm			1780		253.2	1998	1561	1725	1132	1161								515	
Specific Conductance (lab)	µS/cm			1720	893	259	1760	1740	1790	1740	1240	693	523	542	661	668		490	520	
Temperature (field)	C			1.6		0	1.2	0.12	0.22	1.8	1.7	0.7	0.2	1		6.3			1.5	
Dissolved Oxygen (field)	mg/L						5.7	3.83	6.06	6.66	2.05									
Dissolved Oxygen (field)	%						41.1	26.5	42	48.4	15.3									
ORP (field)	mV					334.2	-55.9			-8.7	-30.4									
Hardness (from dissolved)	mg/L			1080	325	93.4	1150	1040	1060	1090	777	359	270	263	287	370	367	250	254	
Alkalinity, total	mg/L			280	182	94.6	285	279	291	272	274	93	80	86	92	98		79	85	
Alkalinity, bicarbonate HCO3	mg/L			340	222	116	348	340	355	331		100	98	110	110	120		96	100	
Chloride	mg/L	120					0.99	0.88	1.4	1.1		0.54								
Fluoride	mg/L	0.12																		
Sulphate, dissolved	mg/L	100		**803**	**255**	37.3	**822**	**867**	**792**	**883**	**519**	**229**	**180**	**190**	**190**	**250**	**240**	**160**	**163**	
Ammonia (N)	mg/L		5	0.22	0.069	0.85	0.19	0.22	0.21	0.18	0.138		0.015	0.011		0.095	0.041		0.065	
Nitrite (N)	mg/L	0.06										<0.01			<0.005	<0.005				
Nitrate (N)	mg/L	3										0.16			0.26	0.25				
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L			0.082	0.054	0.073	0.124	0.117	0.0762	0.062			0.005		0.009	0.035	0.005	<0.002	0.247	
Dissolved Organic Carbon	mg/L			1.1	12.4	2.34	1.51	1.07	1.76	0.59	8.46	<0.5	1.9	4.5	2.7	3.4	1.9	1.8	1.4	
Aluminum (Al), dissolved	mg/L	*		0.0173	0.0109	0.0066	<0.0010	0.0092	0.00151	<0.0010	0.0034	<0.005	0.0038	0.0041	0.0035	0.0029	0.0018	0.0037	0.0096	
Antimony (Sb), dissolved	mg/L	2		0.00089	0.00576	0.00021	0.00088	0.00068	0.000433	0.00064	0.00151	<0.0002	0.00011	0.00023	0.00024	0.00033	0.00011	0.00013	0.00084	
Arsenic (As), dissolved	mg/L	0.005		**0.135**	0.00431	0.00453	**0.162**	**0.135**	**0.166**	**0.139**	**0.0880**	0.0003	0.00042	0.00054	0.0005	0.00087	0.00055	0.00056	0.00065	
Barium (Ba), dissolved	mg/L	2.9		0.015	0.0886	0.0897	0.0102	0.0114	0.0107	0.0104	0.0405	0.048	0.035	0.038	0.0399	0.0487	0.0496	0.0339	0.0463	
Beryllium (Be), dissolved	mg/L	0.0053		0.00002	0.00001	<0.00001	<0.000050	<0.000050	<0.000010	0.000064	<0.00010	<0.00004	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi), dissolved	mg/L			<0.000005	<0.000005	<0.000005	<0.000025	<0.000025	<0.0000050	<0.000025	<0.00050	<0.001	0.000046	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B), dissolved	mg/L	5		<0.05	<0.05	<0.05	<0.25	<0.25	<0.050	<0.25	<0.010	<0.004	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (Cd), dissolved	mg/L	0.000017		**0.000042**	**0.000945**	**0.00011**	**<0.000025**	**<0.000025**	<0.0000050	**<0.000025**	**0.000136**	**0.00033**	**0.000273**	**0.000339**	**0.000462**	**0.000888**	**0.00041**	**0.000311**	**0.000805**	
Calcium (Ca), dissolved	mg/L			295	94.2	25.6	307	276	295	293	210	99.2	74.5	73.9	80.2	104	101	68.6	71	
Chromium (Cr), dissolved	mg/L	0.0089		0.0003	0.0002	0.0023	<0.00050	<0.00050	<0.00010	<0.00050	<0.00010	<0.0004	0.0005	0.0004	0.0006	0.0005	0.0003	0.0003	0.0004	
Cobalt (Co), dissolved	mg/L			0.000795	0.000228	0.00031	0.000487	0.000514	0.000378	0.000565	0.00468	0.00025	0.000045	0.000127	0.000156	0.000129	0.000021	0.000013	0.000138	
Copper (Cu), dissolved	mg/L	*		0.00103	**0.00455**	0.00092	<0.00025	<0.00025	<0.000050	**0.0309**	0.00089	0.001	0.00181	0.00243	0.00286	**0.00426**	0.00154	0.00135	0.00343	
Iron (Fe), dissolved	mg/L	0.3		**6.03**	0.077	0.008	**7.74**	**7.26**	**6.86**	**6.34**	**2.19**	<0.01	0.006	0.009	0.007	0.013	0.011	0.006	0.017	
Lead (Pb), dissolved	mg/L	*		0.0011	0.00159	0.000739	0.000034	0.000085	0.000021	0.000211	0.000469	<0.0001	0.000647	0.000923	**0.00857**	**0.00831**	**0.00713**	0.00361	**0.0109**	
Lithium (Li), dissolved	mg/L			0.0158	0.012	0.0037	0.0146	0.0158	0.0162	0.0146	0.00815	0.009	0.008	0.0088	0.0079	0.0089	0.0088	0.0075	0.0079	
Magnesium (Mg), dissolved	mg/L			84	21.8	7.14	91.7	86.1	78.8	86.6	61.4	27	20.3	19.1	21	26.7	27.5	19.1	18.6	
Manganese (Mn), dissolved	mg/L			0.842	0.207	0.131	0.803	0.858	0.706	0.82	1.89	0.0148	0.0103	0.0158	0.0206	0.0439	0.00603	0.00326	0.057	
Mercury (Hg), dissolved	mg/L	0.000026		<0.00001	<0.00001	<0.00001	**<0.000050**	**<0.000050**	<0.000010	**<0.000050**	<0.000010		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	
Molybdenum (Mo), dissolved	mg/L	0.073		0.00188	0.0022	0.00697	0.00176	0.00155	0.00187	0.00165	0.00233	<0.0001	0.00023	0.00036	0.00033	0.00025	0.00009	0.00012	0.00014	
Nickel (Ni), dissolved	mg/L	*		0.00337	0.00634	0.00091	0.00241	0.00261	0.00177	0.0025	0.0128	0.005	0.00239	0.00263	0.0041	0.00345	0.00282	0.00206	0.00272	
Phosphorus (P), dissolved	mg/L			0.015	0.019	0.024	<0.010	<0.010	0.0037	<0.010	<0.050	0.01	0.004	0.003	0.005	0.007	0.003	0.004	0.012	
Potassium (K), dissolved	mg/L			1.74	2.46	0.61	1.66	1.57	1.5	1.55	1.76	0.3	0.35	0.38	0.43	0.55	0.36	0.32	0.39	
Selenium (Se), dissolved	mg/L	0.001		<0.00004	0.00021	0.00005	<0.00020	<0.00020	<0.000040	0.00026	0.00015	0.0006	0.00072	0.00074	0.00069	0.00066	**0.00123**	**0.00128**	0.00086	
Silicon (Si), dissolved	mg/L			5.4	3.6	3.4	5.33	4.75	5.82	5.62	4.62	2.68	3.15	3.11	2.41	3.7	3.37	3.1	3.1	
Silver (Ag), dissolved	mg/L	0.0001		0.000015	0.000031	0.000006	<0.000025	<0.000025	<0.0000050	<0.000025	0.000039	<0.00001	0.000006	0.000012	0.00001	0.000051	0.000032	0.000015	0.000024	
Sodium (Na), dissolved	mg/L			4.48	114	12.4	5.19	4.81	4.24	5.9	4.17	1.4	3.64	4.52	5.03	5.05	1.54	1.74	1.14	
Strontium (Sr), dissolved	mg/L			0.818	0.484	0.136	0.832	0.823	0.979	0.814	0.543	0.246	0.175	0.175	0.191	0.244	0.24	0.159	0.173	
Sulphur (S), dissolved	mg/L			291	128	13	276	286	269	274	160	76.5	69	69	72	98	94	63	60	
Thallium (Tl), dissolved	mg/L	0.0008		<0.000002	0.000017	0.000002	<0.000010	<0.000010	<0.0000020	<0.000010	<0.000010	<0.00001	<0.000002	0.000004	0.000004	0.000005	0.000013	<0.000002	0.000003	
Tin (Sn), dissolved	mg/L			0.00012	0.00027	0.0005	<0.0010	<0.0010	<0.00020	0.0012	<0.00010	<0.0001	0.00055	0.00258	0.00156	0.00304	0.00046	0.00014	0.00039	
Titanium (Ti), dissolved	mg/L	0.1		0.0007	0.0008	<0.0005	<0.0025	<0.0025	<0.00050	<0.0025	<0.010	<0.0004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Uranium (U), dissolved	mg/L	0.015		**0.0323**	**0.0158**	0.00138	**0.0302**	**0.0262**	**0.0308**	**0.0288**	**0.0244**	0.0031	0.00217	0.0026	0.00304	0.00416	0.00308	0.00164	0.00188	
Vanadium (V), dissolved	mg/L			<0.0002	<0.0002	<0.0002	<0.0010	0.0014	<0.00020	<0.0010	<0.0010	<0.0001	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Zinc (Zn), dissolved	mg/L	0.03		0.0142	**0.107**	0.0055	0.011	0.0131	0.00538	0.0103	**0.0436**	**0.036**	**0.0349**	**0.0433**	**0.0549**	**0.076**	**0.0514**	**0.0634**	**0.0515**	
Zirconium (Zr), dissolved	mg/L			0.0013	0.0005	<0.0001	0.00135	0.00212	0.00131	0.0009	0.00332	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	

Station Name			Type	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86	KV-86
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	21/11/2011	23/12/2011	19/01/2012	09/02/2012	16/03/2012	11/04/2012	06/05/2012	02/06/2012	14/07/2012	04/08/2012	24/09/2012	20/10/2012	23/11/2012	10/12/2012	14/01/2013	17/02/2013	11/03/2013
Water Level	m				27.28	27.66	27.9	28.32	28.66	28.270	28	27.54	27.58	27.92	28.22	27.05	27.67	28.77	29.3	29.63
Geodetic Groundwater Level	masl				874.14	873.76	873.5	873.10	872.76	873.150	873	873.88	873.84	873.50	873.20	874.37	873.75	872.65	872.1	871.79
Well Depth	mbTOC				37.57	37.2	37.5	37.32	37.4	37.200	37.35	37.4	37.36	37.42	37.439	37.4	37.38	37.4	37.55	37.4
Well Purge Volume	L						60	60	60	60.00	56	30	60	60	60	65	60	60	50	60
Total Suspended Solids	mg/L		25	31.4	42.9	46	<1.0	<1.0	63.1	4.3	1.6	3.4	6.1	2.1	10.7	4.9	1.5	<1.0	<1.0	<1.0
pH (field)	pH units	6.5-9	6.5-9.5	7.71	6.73	7.84	6.58	6.81	7.58	7.28	7.01	6.82	7.46	7.61	7.53	6.66	6.47	6.54	7.57	7.07
pH (lab)	pH units	6.5-9	6.5-9.5	7.62	7.53	7.36	7.92	7.33	7.36	7.74	7.4	7.62	7.43	7.85	7.21	7.71	7.71	7.54	7.25	7.77
Specific Conductance (field)	µS/cm				588.4	570.3	666.3	602.1	705	681.4	750.9	543.8	539.6	715	563	657	508	632	680	490.3
Specific Conductance (lab)	µS/cm			546	572	585	601	613	614	632	635	522	529	630	649	588	584	657	709	746
Temperature (field)	C			0	1.1	1.4	1	1.9	2.6	2.8	3.7	6.3	2.9	2.6	1.8	1.64	1.53	1.71	1.7	0.1
Dissolved Oxygen (field)	mg/L			1.6	7.15		7.16	6.76	8.71		11	6.91	9.6	6.54			12	11.15	7.54	11.71
Dissolved Oxygen (field)	%			13	51		53.2	49	64.5		83	55.6	72	63.4			85	80.9	54.6	81.6
ORP (field)	mV					326.3	231.2	74.1	12.6	20.00	318.1	102.2	245	17.6	160.1	117			-46.9	16.8
Hardness (from dissolved)	mg/L			281	280	300	327	304	309	323	295	273	274	318	335	304	279	356	366	405
Alkalinity, total	mg/L			95.3	90.9	87.3	85.4	83.8	82.6	83.5	81.7	78.4	79.1	91.1	96.8	97.4	97.2	95.3	96.7	99.8
Alkalinity, bicarbonate HCO3	mg/L			116	111	107	104	102	101	102	99.7	95.6	96.5	111	118	119	119	116	118	122
Chloride	mg/L	120								<0.50	1.3	1.2	0.75	0.62	0.75	0.66	0.75	1.1	1.1	1.2
Fluoride	mg/L	0.12																		
Sulphate, dissolved	mg/L	100		180	219	208	199	254	226	230	230	188	177	214	248	206	198	235	235	322
Ammonia (N)	mg/L		5	0.053	0.022	0.015	0.024	0.072	0.0085	0.06	0.026	<0.0050	0.013	0.0057	0.016	0.0062	0.021	<0.0050	0.0065	0.0094
Nitrite (N)	mg/L	0.06																		
Nitrate (N)	mg/L	3																		
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L			0.044	0.065	0.052	<0.002	0.003	0.061	0.0051	0.0028	0.0071	0.0049	0.0065	0.0191	0.0071	0.0045	0.0025	0.0021	0.004
Dissolved Organic Carbon	mg/L			1.79	1.69	1.45	1.16	2.17	0.77	0.9	<0.50	1.03	1.3	1.76	1.07	1.12	1.11	1.55	1.38	0.68
Aluminum (Al), dissolved	mg/L	*		0.0029	0.0033	0.0027	0.0013	0.0027	0.0016	0.00106	0.00129	0.00153	0.00279	0.00122	0.00135	0.00161	0.00135	0.00121	0.00155	0.00073
Antimony (Sb), dissolved	mg/L	2		0.0004	0.00034	0.00082	0.00006	0.00007	0.00009	0.000071	0.000076	0.000077	0.000081	0.000093	0.000081	0.00008	0.000194	0.000069	0.000111	0.000073
Arsenic (As), dissolved	mg/L	0.005		0.0012	0.00105	0.00112	0.00044	0.00045	0.00045	0.000502	0.000552	0.000644	0.000755	0.000665	0.000559	0.000686	0.000821	0.000471	0.000624	0.000486
Barium (Ba), dissolved	mg/L	2.9		0.0373	0.0413	0.0416	0.0429	0.0411	0.0442	0.0444	0.0435	0.035	0.0366	0.0465	0.0454	0.0486	0.0408	0.048	0.0495	0.0527
Beryllium (Be), dissolved	mg/L	0.0053		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), dissolved	mg/L			0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), dissolved	mg/L	5		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium (Cd), dissolved	mg/L	0.000017		0.000808	0.000793	0.00123	0.000307	0.000287	0.000253	0.000272	0.000206	0.000238	0.000164	0.000229	0.000343	0.000292	0.000401	0.000324	0.000627	0.000341
Calcium (Ca), dissolved	mg/L			79.3	77.3	83.5	90.9	85.1	87.4	89.7	80	77.4	78.2	87.4	95.9	84.2	77.9	103	103	115
Chromium (Cr), dissolved	mg/L	0.0089		0.0001	0.0011	0.0008	<0.0001	0.0002	0.0002	0.00031	0.00012	0.00019	0.0002	0.00014	0.00013	0.00019	0.00034	<0.00010	0.0003	<0.00010
Cobalt (Co), dissolved	mg/L			0.000135	0.000089	0.000137	0.000077	0.000024	0.000026	0.000018	0.0000192	0.000032	0.000028	0.000017	0.000014	0.000027	0.000077	0.000012	0.000017	0.000009
Copper (Cu), dissolved	mg/L	*		0.00119	0.00166	0.00149	0.00127	0.00099	0.00092	0.00118	0.000662	0.00118	0.000428	0.00154	0.00131	0.00135	0.0012	0.00126	0.00102	0.00145
Iron (Fe), dissolved	mg/L	0.3		0.003	0.004	0.005	0.003	0.003	0.006	0.0067	0.0078	0.0058	0.0169	0.0077	0.0062	0.0345	0.0057	0.0018	0.0101	0.0012
Lead (Pb), dissolved	mg/L	*		0.0224	0.0289	0.089	0.000775	0.00125	0.000481	0.00193	0.00179	0.000433	0.000651	0.00102	0.000313	0.000245	0.00325	0.000266	0.00369	0.00033
Lithium (Li), dissolved	mg/L			0.0085	0.0079	0.0081	0.0087	0.0086	0.0085	0.00831	0.00838	0.0078	0.00772	0.00835	0.00812	0.00816	0.00821	0.00836	0.00859	0.00898
Magnesium (Mg), dissolved	mg/L			20.2	21.2	22.2	24.3	22.1	22.1	24.1	23.1	19.5	19.2	24.3	23.3	22.7	20.6	24.3	26.3	28.7
Manganese (Mn), dissolved	mg/L			0.0334	0.0156	0.0246	0.0005	0.00025	0.00092	0.000647	0.00163	0.00203	0.000891	0.00157	0.000565	0.00146	0.0106	0.000225	0.00246	0.00019
Mercury (Hg), dissolved	mg/L	0.000026		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.073		0.00014	0.00008	0.00013	0.00007	0.0001	0.00015	0.000103	0.000078	0.00013	0.000158	0.000125	0.000134	0.000225	0.000174	0.000083	0.000095	0.000064
Nickel (Ni), dissolved	mg/L	*		0.00221	0.00224	0.00244	0.00235	0.00233	0.00262	0.00281	0.00247	0.00219	0.00237	0.00269	0.00238	0.00257	0.00276	0.0022	0.00271	0.00272
Phosphorus (P), dissolved	mg/L			0.004	0.004	0.005	0.005	0.006	0.004	0.0069	0.0046	0.0066	<0.0020	<0.0020	<0.0020	0.0064	<0.0020	0.002	<0.0020	0.0022
Potassium (K), dissolved	mg/L			0.47	0.4	0.41	0.33	0.3	0.31	0.339	0.31	0.281	0.283	0.317	0.321	0.301	0.307	0.329	0.342	0.324
Selenium (Se), dissolved	mg/L	0.001		0.00072	0.00099	0.00081	0.00081	0.00087	0.0009	0.000877	0.000951	0.000834	0.000609	0.000685	0.000635	0.00158	0.000932	0.000748	0.000766	0.00104
Silicon (Si), dissolved	mg/L			3.4	3.1	3.3	3.3	3	3.2	3.21	2.83	3.47	3.32	3.16	3.32	3.11	2.73	3.64	3.22	3.53
Silver (Ag), dissolved	mg/L	0.0001		0.000005	<0.000005	0.000006	0.000006	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), dissolved	mg/L			6.14	2.23	1.81	1.34	1.27	1.32	1.41	1.37	1.26	1.24	1.41	1.31	1.38	1.35	1.36	1.48	1.53
Strontium (Sr), dissolved	mg/L			0.495	0.239	0.22	0.206	0.193	0.2	0.211	0.204	0.171	0.171	0.217	0.218	0.191	0.202	0.232	0.247	0.26
Sulphur (S), dissolved	mg/L			71	72	89	82	77	84	88	88	68	68	88	88	71.6	67.2	95.4	91.8	102
Thallium (Tl), dissolved	mg/L	0.0008		0.000004	0.000004	0.000015	<0.000002	<0.000002	0.000004	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000002	<0.0000020	0.000002	<0.0000020
Tin (Sn), dissolved	mg/L			0.00024	0.00019	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00072	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), dissolved	mg/L	0.1		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), dissolved	mg/L	0.015		0.00269	0.00243	0.00252	0.00256	0.00225	0.00225	0.00242	0.00226	0.00166	0.00166	0.00273	0.00326	0.00303	0.00266	0.0032	0.00351	0.0041
Vanadium (V), dissolved	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn), dissolved	mg/L	0.03		0.0544	0.0576	0.0735	0.0341	0.0341	0.0359	0.0373	0.0359	0.0349	0.0402	0.0402	0.0366	0.0393	0.0405	0.0331	0.0443	0.0387
Zirconium (Zr), dissolved	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Station Name			Type	KV-86	KV-86	KV-86	KV-86	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87	KV-87
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	10/04/2013	13/05/2013	15/07/2013	12/10/2013	14/02/2010	22/09/2011	24/12/2011	06/05/2012	03/06/2012	14/07/2012	04/08/2012	24/09/2012	21/10/2012	23/11/2012	11/03/2013	06/04/2013	13/05/2013
Water Level	m			29.91	30.2	23	26.34	43.58	42.422	42.81	45.76	45.8	45.94	45.46	43.56		43.91		46.91	47.43
Geodetic Groundwater Level	masl			871.51	871.2	878	875.08	893.74	894.898	894.51	891.56	891.5	891.38	891.86	893.76		893.41		890.41	889.89
Well Depth	mbTOC			37.36	36.86	37.16	37.13			52.93	52.98	53.13	52.89	53.09	53.03		53.23		53.12	52.89
Well Purge Volume	L			20	45	84	65			20		24	7	48	28.4		60	60	10	0
Total Suspended Solids	mg/L		25	**78.5**	8.1	<1.0	1.6		16	**107**	**486**	**4440**	**3380**	**2320**	**17200**	**3990**	**273**	**1680**	**3820**	**5790**
pH (field)	pH units	6.5-9	6.5-9.5	6.91	7.18	6.56	7.28	6.89	6.75	6.68	6.84	6.58	6.75	6.84	7.05		6.65	6.75	6.82	6.89
pH (lab)	pH units	6.5-9	6.5-9.5	7.06	7.25	7.37	7.61	7.1	7.36	7.58	7.9	7.49	7.48	7.68	7.59	7.22	7.6	7.68	7.28	7.20
Specific Conductance (field)	µS/cm			659.9	570	459.5	498.1		2073	2299	2395.0	2732	2555	2454	2707		2670	1585	2343	1762
Specific Conductance (lab)	µS/cm			768	788	566	418	2280	2060	2100	2390	2430	2400	2370	2360	2390	2320	2370	2380	2390
Temperature (field)	C			0.4	3.2	4.4	2.3	0.9	1.9	0.9	2.6	2.8	7	2.7	3		1.13	1	2.7	2
Dissolved Oxygen (field)	mg/L			9.28	8.84	9.17	8.53			6.55		16	3.57	4.1	5.91		9.25	4.91	6.8	6.41
Dissolved Oxygen (field)	%			66.2	68.2	70.7	67.2			46.6		118	29.6	31	45.7		66.8	35	52.3	48.1
ORP (field)	mV			143.4	60.3	166.5	60.8				-105.20	204.7	-69.2	271.9	-65		-47.3	-24	-10	-7
Hardness (from dissolved)	mg/L			441	469	311	238	1650	1310	1270	1550	1470	1640	1620	1620	1560	1550	1670	1630	1720
Alkalinity, total	mg/L			106	108	90.3	80.1	482	490	497	492	481	487	477	466	497	476	451	553	713
Alkalinity, bicarbonate HCO3	mg/L							590	600	606	600	587	594	582	569	606	581	550		
Chloride	mg/L	120			0.52		0.59	9.18			2.4	2.7	3.3	3.2	4.1	5.8	6.8	3.4		<10
Fluoride	mg/L	0.12			0.033		0.046													**<0.40**
Sulphate, dissolved	mg/L	100		**329**	**322**	**210**	**160**	**953**	**841**	**846**	**1120**	**1190**	**1110**	**1090**	**1100**	**1140**	**1080**	**1250**	**1230**	**1190**
Ammonia (N)	mg/L		5	<0.0050	<0.0050	<0.0050	<0.0050		0.71	0.75	0.29	0.077	0.23	0.21	0.11	0.21	0.17	0.2	0.185	0.195
Nitrite (N)	mg/L	0.06			<0.0010		<0.0010	<0.01												<0.020
Nitrate (N)	mg/L	3			0.274		0.197	<0.01												<0.10
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L								0.083	0.234	0.0816	0.0213	0.497	0.195	2.41	0.421	0.0681	0.435		
Dissolved Organic Carbon	mg/L			1.02	1.14	1.10	0.81	1	2.5	2.34	1.2	<0.50	1.54	1.16	10.3	1.57	0.97	1.12	1.47	1.91
Aluminum (Al), dissolved	mg/L	*		0.0019	0.0016	0.0013	0.0020	<0.005	0.0071	0.005	0.0048	0.0046	0.0049	0.0743	0.0042	0.0044	0.0015	<0.0010	<0.0050	0.0027
Antimony (Sb), dissolved	mg/L	2		<0.00010	0.00015	<0.00010	<0.00010	0.0407	0.0004	0.0007	<0.00010	0.00032	0.00067	<0.00010	0.00058	0.00056	<0.00010	0.00014	<0.00050	0.00128
Arsenic (As), dissolved	mg/L	0.005		0.00054	0.00063	0.00054	0.00049	**0.0192**	**0.0151**	**0.0276**	0.00448	**0.0132**	**0.0102**	**0.0196**	**0.0183**	**0.0111**	**0.031**	**0.0264**	**0.0295**	**0.0188**
Barium (Ba), dissolved	mg/L	2.9		0.0558	0.0548	0.0393	0.0317	0.02	0.0929	0.0872	0.0228	0.0244	0.0208	0.0175	0.0233	0.0238	0.0144	0.0171	0.0145	0.0164
Beryllium (Be), dissolved	mg/L	0.0053		<0.00010	<0.00010	<0.00010	<0.00010	<0.00004	0.00002	<0.00005	0.000082	0.000113	<0.000050	<0.000050	<0.000050	<0.000050	0.000064	0.000055	<0.00050	<0.00020
Bismuth (Bi), dissolved	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.001	<0.000005	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.0025	<0.0010
Boron (B), dissolved	mg/L	5		<0.010	<0.010	<0.010	<0.010	<0.004	<0.05	<0.3	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.050	<0.020
Cadmium (Cd), dissolved	mg/L	0.000017		**0.000350**	**0.00154**	**0.000833**	**0.000249**	<0.00001	**0.000107**	**<0.00003**	**0.000116**	**0.000085**	**0.000091**	**<0.000025**	**0.00006**	**<0.000025**	**<0.000025**	**<0.000025**	**<0.000050**	**<0.000020**
Calcium (Ca), dissolved	mg/L			125	134	88.0	66.3	425	373	353	431	388	468	459	458	458	440	479	456	486
Chromium (Cr), dissolved	mg/L	0.0089		0.00018	0.00040	0.00028	0.00022	<0.0004	0.0004	0.0007	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00132	<0.00050	<0.00050	0.00174	0.00040
Cobalt (Co), dissolved	mg/L			<0.00010	0.00020	<0.00010	<0.00010	0.0189	0.00133	0.00682	0.000521	0.0011	0.00293	0.000587	0.00305	0.0015	0.00128	0.00101	0.00083	0.00198
Copper (Cu), dissolved	mg/L	*		0.00130	0.00110	0.00247	0.00120	<0.001	0.00007	<0.0003	0.00034	0.00088	<0.00025	<0.00025	0.00056	<0.00025	<0.00025	<0.00025	<0.0010	<0.00040
Iron (Fe), dissolved	mg/L	0.3		<0.020	0.014	<0.010	<0.010	<0.01	**5.16**	**18.5**	**7.75**	**6.97**	**4.56**	**8.61**	**7.07**	**6.76**	**8.32**	**8.76**	**8.63**	**4.24**
Lead (Pb), dissolved	mg/L	*		0.000593	**0.0132**	0.00166	0.000480	<0.0001	0.000126	0.00006	0.000161	0.000356	0.00407	<0.000025	0.00223	0.000142	<0.000025	0.000058	<0.00025	<0.00010
Lithium (Li), dissolved	mg/L			0.00801	0.00750	0.00726	0.00673	0.035	0.0279	0.024	0.0332	0.0319	0.0331	0.0322	0.0347	0.0343	0.0324	0.0341	0.0283	0.0350
Magnesium (Mg), dissolved	mg/L			31.4	32.5	22.3	17.6	144	92.4	95.5	116	121	115	115	115	101	110	115	120	123
Manganese (Mn), dissolved	mg/L			0.00294	0.00471	0.00240	0.000761	1.09	1.61	2.15	1.14	1.19	1.21	1.12	1.17	0.987	1.06	1.11	1.09	1.12
Mercury (Hg), dissolved	mg/L	0.000026		<0.000010	<0.000010	<0.000010	<0.000010		<0.00001	**<0.00005**	<0.000010	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.073		0.000058	0.000238	0.000104	0.000092	0.0048	0.00042	0.0011	<0.00025	0.00057	0.00156	0.00027	0.00211	0.00111	0.00053	0.00064	0.00050	0.00128
Nickel (Ni), dissolved	mg/L	*		0.00283	0.00364	0.00238	0.00188	0.078	0.00188	0.0055	0.00257	0.00303	0.00807	0.00243	0.0106	0.00595	0.00629	0.00395	0.0035	0.0110
Phosphorus (P), dissolved	mg/L			<0.10	<0.050	<0.050	<0.050	<0.01	0.079	0.02	0.056	0.027	0.02	0.02	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050
Potassium (K), dissolved	mg/L			0.33	0.36	0.30	0.28	2.1	2.58	2.5	1.93	1.92	1.91	1.75	2.17	2.25	1.74	1.73	1.84	2.06
Selenium (Se), dissolved	mg/L	0.001		0.00073	0.00086	**0.00131**	0.00087	<0.0006	0.00013	<0.0002	0.00043	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00020
Silicon (Si), dissolved	mg/L			3.33	3.32	3.15	3.01	3.78	6.9	6.6	5.96	5.04	6.28	5.99	5.88	5.93	5.55	6.32	5.40	5.47
Silver (Ag), dissolved	mg/L	0.0001		<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	0.000017	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	0.000027	<0.000025	<0.000025	<0.000050	0.000022
Sodium (Na), dissolved	mg/L			1.53	1.57	1.32	1.15	15.5	9.17	9.3	7.94	8.82	9.32	8.94	11.5	10.8	11.6	8.79	7.24	7.79
Strontium (Sr), dissolved	mg/L			0.264	0.236	0.200	0.147	1.38	1.33	1	1.14	1.18	1.17	1.19	1.73	1.23	1.14	1.28	1.13	1.21
Sulphur (S), dissolved	mg/L			104	108	71.0	52.2	318	306	285	374	408	420	385	395	356	355	393	373	375
Thallium (Tl), dissolved	mg/L	0.0008		<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000002	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000020
Tin (Sn), dissolved	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	0.00034	0.00082	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	0.00043
Titanium (Ti), dissolved	mg/L	0.1		<0.010	<0.010	<0.010	<0.010	0.0006	0.0006	<0.003	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.050	<0.020
Uranium (U), dissolved	mg/L	0.015		0.00430	0.00363	0.00268	0.00148	**0.142**	0.00712	0.00768	**0.0187**	**0.0221**	**0.0227**	**0.0225**	**0.0289**	**0.0233**	**0.0271**	**0.0262**	**0.0238**	**0.0256**
Vanadium (V), dissolved	mg/L			<0.0010	<0.0010	<0.0010	<0.0010	0.0002	0.0004	<0.001	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0021	0.0024	<0.0010	<0.0050	<0.0020
Zinc (Zn), dissolved	mg/L	0.03		**0.0412**	**0.0582**	**0.0411**	**0.0304**	**0.064**	0.0017	0.0047	0.00083	0.00204	0.00671	0.0058	0.00763	0.0146	0.00868	0.00201	0.0056	0.0168
Zirconium (Zr), dissolved	mg/L				<0.00080	<0.00080	<0.00080	0.003	0.0073	0.004	0.00448	0.00505	0.0019	0.00517	0.00303	0.00233	0.00223	0.00538		0.0107

Station Name			Type	KV-87	KV-87	KV-87	KV-87	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D	KV-88D
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	15/07/2013	09/08/2013	06/09/2013	30/10/2013	21/11/2011	19/12/2011	19/01/2012	09/02/2012	11/04/2012	07/05/2012	02/06/2012	13/07/2012	04/08/2012	24/09/2012	24/10/2012	15/12/2012	14/05/2013
Water Level	m			46.7	47.84	48.49	46.38		37.92	38.24	38.42	38.8	38.624	36.25	37.39	37.06	37.55	37.65	38.19	39.23
Geodetic Groundwater Level	masl			890.6	889.48	888.83	890.94		869.70	869.38	869.20	868.8	868.996	871.37	870.23	870.56	870.07	869.97	869.43	868.39
Well Depth	mbTOC			52.88	52.9	52.9	53.12		51.54	51.42	50.67	51.42	50.665	51.02	51.12	51.5	51.4	51.12	51.37	51.02
Well Purge Volume	L			329	15	7	16				80	80	75.00	88.62	40	85	83.1		120	10
Total Suspended Solids	mg/L		25	**4910**	**133**	**3010**	**407**	**179**	**33.5**	**86.5**	**27.6**	**35.9**	**33.2**	24.2	**31.3**	**39.6**	**52.6**		**55**	**126**
pH (field)	pH units	6.5-9	6.5-9.5	6.82	6.54	6.91	**6.34**	7.23	6.55	7.19	6.51	6.85	**6.46**	6.75	6.57	6.94	6.8		**6.34**	6.7
pH (lab)	pH units	6.5-9	6.5-9.5	6.96	7.37	7.72	7.09	7.94	7.57	7.43	7.62	7.18	8.07	7.52	7.5	7.32	7.35	7.64	7.37	6.99
Specific Conductance (field)	µS/cm			1751	2452	2270	2762		3158	2819	3309		2937.0	2103	2793	3012	3456		3167	2229
Specific Conductance (lab)	µS/cm			2340	2350	2390	1880	2860	2830	2930	3050	3070	3060	1810	2630	2870	2990	2950	3010	3030
Temperature (field)	C			3.6	6.9	5.2	1.30	0.3	1.5	0.1	1	1.5	2.0	3.5	5.5	1.9	2.9		0.65	1.1
Dissolved Oxygen (field)	mg/L			7.46	8.13	11.96	9.34	10.08	7.55		4.41		5.33	2	1.26	4.6	3.19		6.96	2.06
Dissolved Oxygen (field)	%			58.5	68.7	98.6	68.7	70.5	58.3		35.4		39.10	16	10.2	33	26.1		49.3	15.4
ORP (field)	mV			-26.4	113.1	147.6	-53.3			299.9	49.5	-32.2	89.90	259.3	-62.1	281.6	-34.1			-40
Hardness (from dissolved)	mg/L			1710	1630	1680	1640	2210	1960	1940	2360	2160	2100	1040	1960	2050	2110	1980	2090	2240
Alkalinity, total	mg/L			484	490	493	491	392	385	388	386	386	387	333	388	387	386	368	392	408
Alkalinity, bicarbonate HCO3	mg/L							478	469	474	470	471	472	406	473	472	471	449	478	
Chloride	mg/L	120			<10	<10	<10						1.1	1.2	1.3					<10
Fluoride	mg/L	0.12					**0.45**													**<0.40**
Sulphate, dissolved	mg/L	100		**1200**	**1200**	**1190**	**1190**	**1590**	**1570**	**1710**	**1690**	**1720**	**1680**	**801**	**1400**	**1530**	**1600**	**1690**	**1640**	**1800**
Ammonia (N)	mg/L		5	0.205	0.158	0.233	0.169	0.28	0.26	0.26	0.21	0.18	0.21	0.13	0.15	0.17	0.18	0.15	0.17	0.115
Nitrite (N)	mg/L	0.06					<0.020													<0.020
Nitrate (N)	mg/L	3					<0.10													<0.10
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L							0.198	0.145	0.11	0.212	0.33	0.317	0.196	0.262	0.306	0.382	0.495	0.36	
Dissolved Organic Carbon	mg/L			1.29	2.57	0.79	1.12	2.48	2.83	2.68	1.35	<0.50	2.25	0.86	1.18	0.9	0.77	1.7	1.13	1.32
Aluminum (Al), dissolved	mg/L	*		0.0321	<0.0020	<0.0020	0.0033	0.022	0.002	0.002	0.005	0.003	**0.0118**	0.0055	0.0061	0.0159	0.0036	<0.010	0.004	0.0048
Antimony (Sb), dissolved	mg/L	2		<0.00050	0.00023	0.00023	<0.00020	0.0038	0.0032	0.0029	0.001	0.0007	0.00055	0.00056	0.00052	0.00051	0.00034	<0.00050	0.00043	<0.00020
Arsenic (As), dissolved	mg/L	0.005		**0.0321**	0.00024	0.00066	**0.0220**	**0.108**	**0.0226**	**0.0065**	**0.84**	**0.878**	**0.831**	**0.446**	**0.781**	**0.884**	**0.878**	**0.739**	**0.851**	**0.728**
Barium (Ba), dissolved	mg/L	2.9		0.0154	0.0145	0.0125	0.0146	0.0482	0.0394	0.0336	0.0162	0.0133	0.0123	0.00931	0.013	0.0132	0.0123	0.0182	0.0135	0.0267
Beryllium (Be), dissolved	mg/L	0.0053		<0.00050	<0.00020	<0.00020	<0.00020	<0.00005	<0.00005	<0.00005	0.00005	0.0001	0.000062	0.000058	<0.000050	0.000091	0.000075	<0.00020	<0.000050	<0.00020
Bismuth (Bi), dissolved	mg/L			<0.0025	<0.0010	<0.0010	<0.0010	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.0010	<0.000025	<0.0010
Boron (B), dissolved	mg/L	5		<0.050	<0.020	<0.020	<0.020	<0.3	<0.3	<0.3	<0.3	<0.3	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.25	<0.020
Cadmium (Cd), dissolved	mg/L	0.000017		**<0.000050**	**0.00187**	**0.00211**	**<0.000020**	**0.0317**	**0.0334**	**0.023**	**0.00278**	**0.00037**	**0.000493**	**0.000177**	**0.000095**	**0.000193**	**0.000071**	**<0.00010**	**<0.000025**	**<0.000020**
Calcium (Ca), dissolved	mg/L			475	448	464	450	520	468	454	539	498	485	242	467	476	485	453	477	512
Chromium (Cr), dissolved	mg/L	0.0089		<0.00050	<0.00020	<0.00020	<0.00020	<0.0005	0.0008	0.0006	<0.0005	<0.0005	0.00084	<0.00050	<0.00050	<0.00050	0.00058	<0.0020	<0.00050	<0.00020
Cobalt (Co), dissolved	mg/L			0.00113	0.00090	0.00100	0.00046	0.0256	0.025	0.029	0.03	0.0281	0.026	0.0118	0.0212	0.0225	0.0242	0.0231	0.0237	0.0254
Copper (Cu), dissolved	mg/L	*		<0.0010	0.00262	<0.00040	<0.00040	0.0029	0.0023	0.0012	0.0007	<0.0003	0.00033	0.00033	<0.00025	0.00031	<0.00025	<0.0010	0.00094	<0.00040
Iron (Fe), dissolved	mg/L	0.3		**7.21**	**0.780**	0.018	**7.84**	0.024	0.023	**1.76**	**26.7**	**25.6**	**25.5**	**8.06**	**19.9**	**22.8**	**25.3**	**25.4**	**26.5**	**43.7**
Lead (Pb), dissolved	mg/L	*		0.00034	<0.00010	<0.00010	0.00028	0.00023	0.00028	0.001	0.00198	0.00007	0.00339	0.00245	0.000918	0.000387	**0.0149**	<0.00020	0.000071	<0.00010
Lithium (Li), dissolved	mg/L			0.0272	0.0287	0.0321	0.0277	0.034	0.032	0.027	0.032	0.031	0.0302	0.022	0.0275	0.0291	0.0308	0.028	0.029	0.0290
Magnesium (Mg), dissolved	mg/L			128	124	126	125	222	192	197	247	223	215	105	193	209	218	205	218	233
Manganese (Mn), dissolved	mg/L			1.09	1.11	1.21	1.15	5.24	5.15	5.24	6.15	6.17	5.82	2.79	4.66	4.78	5.32	5.53	5.82	7.29
Mercury (Hg), dissolved	mg/L	0.000026		<0.000010	<0.000010	<0.000010	<0.000010	**<0.00005**	**<0.00005**	**<0.00005**	**<0.00005**	**<0.00005**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.000050**	**<0.00020**	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.073		0.00078	0.00038	0.00036	0.00017	0.0009	0.0009	0.0009	0.0005	0.0006	0.00053	0.00039	0.00067	0.00057	0.0006	<0.0010	0.00052	0.00090
Nickel (Ni), dissolved	mg/L	*		0.0055	0.0039	0.0047	0.0016	0.109	0.105	0.106	0.128	0.12	0.112	0.0502	0.0905	0.103	0.11	0.0963	0.106	0.0786
Phosphorus (P), dissolved	mg/L			<0.050	<0.050	<0.050	<0.050	0.02	<0.01	0.02	0.02	0.02	0.033	0.01	0.036	<0.010	<0.010	<0.040	<0.010	<0.050
Potassium (K), dissolved	mg/L			1.82	2.12	1.91	1.83	2.9	2.4	2.5	2.6	2.2	2.13	1.52	1.84	2.01	2.01	1.8	1.9	2.26
Selenium (Se), dissolved	mg/L	0.001		<0.00050	<0.00020	<0.00020	<0.00020	**0.0012**	0.0009	0.0006	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00080	<0.00020	<0.00020
Silicon (Si), dissolved	mg/L			5.23	5.40	5.39	5.76	6.8	5.7	6	7.3	7	7.41	4.45	7.49	7.09	6.84	7.3	7.14	7.87
Silver (Ag), dissolved	mg/L	0.0001		<0.000050	<0.000020	<0.000020	<0.000020	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.00010	<0.000025	<0.000020
Sodium (Na), dissolved	mg/L			7.01	7.53	7.60	8.15	10.4	7.6	9.3	7.7	10	7.94	3.49	3.88	3.73	3.62	3.4	4.95	12.5
Strontium (Sr), dissolved	mg/L			1.20	1.25	1.18	1.08	1.43	1.36	1.26	1.46	1.39	1.39	0.714	1.15	1.32	1.42	1.28	1.36	1.39
Sulphur (S), dissolved	mg/L			383	370	373	374	678	536	575	606	581	589	286	527	576	603	613	588	581
Thallium (Tl), dissolved	mg/L	0.0008		<0.000050	<0.000020	<0.000020	<0.000020	0.00007	0.00006	0.00006	0.00006	0.00002	0.000026	0.000013	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000020
Tin (Sn), dissolved	mg/L			<0.00050	<0.00020	<0.00020	<0.00020	0.00065	0.00034	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	0.00039
Titanium (Ti), dissolved	mg/L	0.1		<0.050	<0.020	<0.020	<0.020	<0.003	<0.003	<0.003	<0.003	<0.003	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.010	<0.0025	<0.020
Uranium (U), dissolved	mg/L	0.015		**0.0248**	**0.0240**	**0.0246**	**0.0202**	**0.0197**	**0.0168**	**0.0181**	**0.0183**	**0.0179**	**0.0179**	0.00859	**0.0157**	**0.0161**	**0.0172**	**0.0153**	**0.0163**	**0.0157**
Vanadium (V), dissolved	mg/L			<0.0050	<0.0020	<0.0020	<0.0020	<0.001	<0.001	<0.001	<0.001	<0.001	0.0013	0.0013	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0020
Zinc (Zn), dissolved	mg/L	0.03		<0.0050	**0.137**	**0.207**	0.0028	**0.361**	**0.367**	**0.352**	**0.42**	**0.382**	**0.369**	**0.15**	**0.247**	**0.295**	**0.294**	**0.159**	**0.287**	**0.0868**
Zirconium (Zr), dissolved	mg/L			0.0096	0.0029	0.0026	0.0118	<0.0005	<0.0005	<0.0005	0.0006	0.0009	0.00062	0.00134	0.00069	0.00115	0.00156	<0.0020	0.00065	<0.0016

Station Name			Type	KV-88D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	14/07/2013	19/11/2011	23/12/2011	19/01/2012	07/02/2012	16/03/2012	11/04/2012	06/05/2012	02/06/2012	13/07/2012	04/08/2012	24/09/2012	18/10/2012	20/10/2012	21/11/2012	10/12/2012	14/01/2013
Water Level	m			34.34	21.65	21.77	22.48	22.7	23.3	23.63	21.430	21.38	21.64	20.15	18.84	19.11	19.29	21.07	22.04	23.33
Geodetic Groundwater Level	masl			873.28	877.27	877.15	876.44	876.2	875.6	875.29	877.490	877.54	877.28	878.77	880.08	879.81	879.63	877.85	876.88	875.59
Well Depth	mbTOC			50.78	39.3	39.3	39.7	39.3	39.12	39.12	39.200	39.15	39.12	39.29	39.27	39.4	39.11	39	39.12	
Well Purge Volume	L			102	15				105	100	120.00	107	50	115	122.58		180	108	110	110
Total Suspended Solids	mg/L		25	**57.2**	10	**221**	**54**	18.2	18	**33.1**	**28.5**	**26.3**	**86.2**	**31.6**	**37.5**		11.4	12.9	**29.8**	15.1
pH (field)	pH units	6.5-9	6.5-9.5	6.97		6.85	7.2	6.9	6.91	7.23	7.25	6.82	6.92	7.02	7.05		6.99	**6.38**	6.58	6.56
pH (lab)	pH units	6.5-9	6.5-9.5	7.24	7.64	7.75	7.73	8	7.56	7.54	7.94	7.8	7.84	7.65	7.79		7.32	8.03	7.98	7.77
Specific Conductance (field)	µS/cm			917		1724	1567	2045	1883	2210	1836.0	2135	1950	1850	2030		1548	1656	1587	1763
Specific Conductance (lab)	µS/cm			1090	1650	1710	1700	1800	1850	1850	1840	1860	1830	1820	1800		1790	1750	1790	1860
Temperature (field)	C			4		1	0.1	2.4	1	3	4.1	7.3	9.6	6.2	5.2		1.8		2.13	3.55
Dissolved Oxygen (field)	mg/L			1.27		2.25		3.11	4.3			3	0.86	2	2.4				7.35	5.09
Dissolved Oxygen (field)	%			9.8		15.4		25.1	30.6			25	7.6	16	20				54.1	38.9
ORP (field)	mV			20.2			299	47.2	-63.3	-43.1	-21.70	293.6	-71.4	238.1	-42.7		-10.1			
Hardness (from dissolved)	mg/L			667	1000	1020	1030	1190	1130	1080	1100	1170	1130	1140	1160		1050	1180	1140	1110
Alkalinity, total	mg/L			275	500	507	507	502	511	501	517	520	528	525	542		539	512	525	540
Alkalinity, bicarbonate HCO3	mg/L				610	618	619	613	624	612	630	635	644	640	661		658	625	641	658
Chloride	mg/L	120									2	2.7	3	2.8	2.7		2.8	3	2.8	2.6
Fluoride	mg/L	0.12																		
Sulphate, dissolved	mg/L	100		**385**	**536**	**539**	**540**	**609**	**620**	**644**	**630**	**632**	**617**	**583**	**554**		**583**	**582**	**660**	**612**
Ammonia (N)	mg/L		5	0.0742	0.28	0.29	0.24	0.31	0.37	0.31	0.38	0.29	0.32	0.29	0.33		0.31	0.3	0.31	0.31
Nitrite (N)	mg/L	0.06																		
Nitrate (N)	mg/L	3																		
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L				0.012	0.382	0.064	0.026	0.02	0.047	0.0455	0.0579	0.0901	0.0605	0.0697		0.036	0.0387	0.0696	0.0392
Dissolved Organic Carbon	mg/L			2.56	0.96	2.21	1.07	1.87	1.82	<0.50	1.54	0.62	2.13	0.8	1.09		0.9	1.21	1.25	1.58
Aluminum (Al), dissolved	mg/L	*		0.0030	0.0024	0.004	0.001	0.006	0.0023	0.002	0.00215	0.00257	0.0052	0.0126	0.00164		0.00218	<0.0010	<0.0010	0.0019
Antimony (Sb), dissolved	mg/L	2		0.00037	0.001	0.0009	0.00064	0.0004	0.00033	0.0002	0.000177	0.000147	0.0003	0.0002	0.000133		0.000114	0.00021	0.00021	0.00046
Arsenic (As), dissolved	mg/L	0.005		**0.261**	0.00483	0.0042	0.00134	**0.0389**	**0.0466**	**0.0447**	**0.0392**	**0.0383**	**0.0225**	**0.0381**	**0.0319**		**0.0342**	**0.0308**	**0.0323**	**0.0352**
Barium (Ba), dissolved	mg/L	2.9		0.0170	0.112	0.101	0.0604	0.0247	0.0214	0.0195	0.0164	0.0157	0.0198	0.0165	0.0154		0.0127	0.0129	0.0142	0.0122
Beryllium (Be), dissolved	mg/L	0.0053		<0.00010	<0.00001	<0.00005	0.00001	<0.00005	<0.00001	<0.00005	<0.000010	0.000022	<0.000050	<0.000050	0.000019		0.000015	<0.000050	<0.000050	<0.000050
Bismuth (Bi), dissolved	mg/L			<0.00050	<0.000005	<0.00003	<0.000005	<0.00003	<0.000005	<0.00003	<0.0000050	<0.0000050	<0.000025	<0.000025	<0.0000050		<0.0000050	<0.000025	<0.000025	<0.000025
Boron (B), dissolved	mg/L	5		<0.010	<0.05	<0.3	<0.05	<0.3	<0.05	<0.3	<0.050	<0.050	<0.25	<0.25	<0.050		<0.050	<0.25	<0.25	<0.25
Cadmium (Cd), dissolved	mg/L	0.000017		<0.000010	**0.000107**	**0.00091**	**0.000456**	**0.00015**	**0.000082**	**0.00004**	**0.0001**	**0.000095**	**0.00005**	**0.000064**	**0.000109**		<0.0000050	**<0.000025**	**<0.000025**	**<0.000025**
Calcium (Ca), dissolved	mg/L			181	242	248	261	296	280	272	275	293	290	286	287		269	292	277	280
Chromium (Cr), dissolved	mg/L	0.0089		<0.00010	<0.0001	0.0007	0.0003	0.001	0.0004	<0.0005	0.00033	0.00057	0.00051	<0.00050	0.00084		0.00033	<0.00050	<0.00050	<0.00050
Cobalt (Co), dissolved	mg/L			0.00530	0.0116	0.0106	0.00838	0.00432	0.00495	0.00386	0.00267	0.00287	0.00273	0.00253	0.00257		0.00193	0.0025	0.00265	0.00258
Copper (Cu), dissolved	mg/L	*		<0.00020	0.00023	0.0011	0.00038	<0.0003	<0.00005	<0.0003	0.000077	0.00005	<0.00025	<0.00025	0.000092		<0.000050	<0.00025	<0.00025	<0.00025
Iron (Fe), dissolved	mg/L	0.3		**4.11**	**1.54**	**0.584**	**0.67**	**6.1**	**7.12**	**7.39**	**6.96**	**6.64**	**5.27**	**7.01**	**6.25**		**6.12**	**6.66**	**5.56**	**5.99**
Lead (Pb), dissolved	mg/L	*		0.000086	0.000056	0.00022	0.000207	0.00045	0.000079	0.0001	0.000099	0.0000723	0.000344	0.000137	0.000202		0.000029	0.000031	0.000051	0.000053
Lithium (Li), dissolved	mg/L			0.0159	0.0073	0.009	0.0102	0.015	0.0149	0.014	0.0139	0.0144	0.0134	0.0139	0.0136		0.0131	0.0134	0.0129	0.0091
Magnesium (Mg), dissolved	mg/L			52.0	96.8	97.3	91.8	111	105	98.1	101	107	99.1	104	109		92.8	109	109	100
Manganese (Mn), dissolved	mg/L			1.45	1.35	1.3	1.09	0.827	0.833	0.796	0.726	0.788	0.737	0.691	0.707		0.617	0.669	0.741	0.691
Mercury (Hg), dissolved	mg/L	0.000026		<0.000010	<0.000020	**<0.00005**	<0.00001	**<0.00005**	<0.00001	**<0.00005**	<0.000010	<0.000010	**<0.000050**	**<0.000050**	<0.000010		<0.000010	**<0.000050**	**<0.000050**	**<0.000050**
Molybdenum (Mo), dissolved	mg/L	0.073		0.000401	0.00102	0.0011	0.00114	0.0011	0.00132	0.0012	0.00114	0.000893	0.00148	0.00195	0.000955		0.000757	0.00075	0.0008	0.0009
Nickel (Ni), dissolved	mg/L	*		0.0191	0.0133	0.013	0.0109	0.0092	0.00873	0.0086	0.00696	0.00706	0.00779	0.00645	0.00687		0.00503	0.00669	0.00878	0.00688
Phosphorus (P), dissolved	mg/L			<0.050	0.003	<0.01	0.009	0.02	0.02	<0.01	0.0264	0.0416	0.03	0.024	0.0316		0.0264	<0.010	<0.010	0.027
Potassium (K), dissolved	mg/L			1.18	2.41	2.5	2.28	2.8	2.54	2.4	2.44	2.51	2.26	2.41	2.57		2.35	2.42	2.49	2.25
Selenium (Se), dissolved	mg/L	0.001		<0.00010	0.00009	<0.0002	0.00004	<0.0002	<0.00004	<0.0002	0.000063	<0.000040	<0.00020	<0.00020	<0.000040		<0.000040	<0.00020	<0.00020	<0.00020
Silicon (Si), dissolved	mg/L			4.02	3.5	3.9	4.2	4.7	4.3	4.3	4.72	4.09	4.95	4.53	4.8		4.61	4.49	4.23	4.99
Silver (Ag), dissolved	mg/L	0.0001		<0.000010	<0.000005	<0.00003	<0.000005	<0.00003	0.00001	<0.00003	0.000009	0.0000146	<0.000025	<0.000025	0.000016		0.000014	0.000025	<0.000025	**0.000102**
Sodium (Na), dissolved	mg/L			2.77	9.57	12.4	13.2	28.4	22.9	23.4	20.6	17.6	15.9	13.9	15.6		10.4	11.4	11.8	10.6
Strontium (Sr), dissolved	mg/L			0.425	0.6	0.577	0.54	0.682	0.692	0.635	0.664	0.641	0.631	0.657	0.681		0.647	0.653	0.643	0.625
Sulphur (S), dissolved	mg/L			122	186	194	209	224	228	208	227	253	229	215	232		203	208	215	256
Thallium (Tl), dissolved	mg/L	0.0008		<0.000010	0.000055	0.00005	0.000035	0.00003	0.000016	<0.00001	0.000007	0.0000026	<0.000010	<0.000010	<0.0000020		<0.0000020	<0.000010	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L			<0.00010	0.00037	0.00209	0.0003	<0.001	<0.0002	<0.001	0.0003	<0.00020	<0.0010	<0.0010	<0.00020		<0.00020	<0.0010	<0.0010	<0.0010
Titanium (Ti), dissolved	mg/L	0.1		<0.010	<0.0005	<0.003	<0.0005	<0.003	0.0006	<0.003	<0.00050	<0.00050	<0.0025	<0.0025	<0.00050		0.00063	<0.0025	<0.0025	<0.0025
Uranium (U), dissolved	mg/L	0.015		0.00398	**0.0813**	**0.0792**	**0.0723**	**0.0892**	**0.0885**	**0.0824**	**0.0902**	**0.0893**	**0.0812**	**0.081**	**0.0777**		**0.0782**	**0.0874**	**0.0755**	**0.0803**
Vanadium (V), dissolved	mg/L			<0.0010	<0.0002	<0.001	<0.0002	<0.001	<0.0002	<0.001	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020		<0.00020	0.0032	<0.0010	0.0015
Zinc (Zn), dissolved	mg/L	0.03		**0.0506**	0.0101	**0.126**	**0.0471**	**0.0402**	**0.0313**	0.0231	**0.041**	0.0112	**0.037**	0.0175	0.0183		0.00945	0.0157	**0.0422**	0.0193
Zirconium (Zr), dissolved	mg/L			<0.00080	0.0008	0.0008	0.0011	0.0021	0.0048	0.0021	0.00449	0.00551	0.00317	0.00477	0.00905		0.00971	0.00553	0.00334	0.00613

Station Name			Type	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	KV-89D	FM-MW-1	FM-MW-2	FM-MW-3	KV-103	KV-103	KV-103	KV-103	KV-103	KV-103	ON-MW-4	ON-MW-4
Sample Date		FIGWQG-Industrial-Tier1	A WUL QZ09-092 F&M EQS	17/02/2013	10/03/2013	13/05/2013	14/07/2013	08/08/2013	12/10/2013	25/08/2013	29/08/2013	12/09/2013	06/05/2013	11/06/2013	06/07/2013	31/08/2013	07/09/2013	15/10/2013	17/09/2013	13/10/2013
Water Level	m			23.84	24.44	22.78	20.14	20.05	20.38										19.89	19.86
Geodetic Groundwater Level	masl			875.08	874.48	876.14	878.78	878.87	878.54										862.22	862.25
Well Depth	mbTOC			39.4	39.3	38.86	38.7	38.86	39.12										26.18	26.38
Well Purge Volume	L			95	110	97	111	113	112									1125	150.96	39.12
Total Suspended Solids	mg/L		25	18.8	108	22.1	10.8		19.4	742	429	10900	17.0	17.2	17.6	25.3	32.1	62.0		
pH (field)	pH units	6.5-9	6.5-9.5	6.74	6.92	6.81	6.62	6.85	6.74	7.65	8.39	6.88		6.59	6.55	6.63	6.05	6.69	6.72	6.57
pH (lab)	pH units	6.5-9	6.5-9.5	7.46	7.8	7.44	7.39		7.57	7.81	7.69	8.09	7.19	7.74	7.26	6.97	7.68	7.27	7.77	7.36
Specific Conductance (field)	µS/cm			1791	1218	1325	1541	1913	1930	1900	1280	1383		1974	2071	2060	2096	2188	1119	929
Specific Conductance (lab)	µS/cm			1870	1830	1810	1800		1470	1880	1320	1550	2240	2220	2100	1980	2240	1740	875	727
Temperature (field)	C			1.9	0.8	3.4	7.1	4.6	2	3	5.6	4.2		4	5.4	4.8	4.3	1.8	1.6	1.7
Dissolved Oxygen (field)	mg/L			5.28	2.93	4.53	0.41	1.7	1.71			15.27		5.3	1.98	4.53	5.73	1.29	0.97	1.46
Dissolved Oxygen (field)	%			38.9	20.8	35	3.4	13.7	12.5			120.4		42.4	16	35.9	45.4	9.4	7.1	10.6
ORP (field)	mV			102.5	-3.3	3.2	60.5	30.1	-11.7	-120	-85.5	118.8		-26.7	15.4	20	136.4	-11.6	-6.8	-28.5
Hardness (from dissolved)	mg/L			1170	1190	1200	1220		1150	1280	860	994	1490	1520	1520	1490	1560	1510	524	502
Alkalinity, total	mg/L			532	520	595	553		583	364	162	184	445	405	412	412	382	416	189	192
Alkalinity, bicarbonate HCO3	mg/L			649	635															
Chloride	mg/L	120		3	3.1	<5.0			5.4	<10	<5.0	<5.0	<10		<10	<10	<10	<10	<2.5	<2.5
Fluoride	mg/L	0.12				<0.20			<0.20	<0.40	<0.20	<0.20	<0.40		<0.40			<0.40	0.43	0.47
Sulphate, dissolved	mg/L	100		647	710	639	648		657	940	673	775	1110	1130	1160	1080	1160	1180	323	310
Ammonia (N)	mg/L		5	0.32	0.32	0.293	0.298		0.292	0.118	0.122	0.131	0.103	0.094	0.126	0.120	0.173	0.151		
Nitrite (N)	mg/L	0.06				<0.010			<0.010	<0.020	<0.010	<0.010	0.032		<0.020			<0.020	<0.0050	<0.0050
Nitrate (N)	mg/L	3				<0.050			<0.050	<0.10	<0.050	0.232	<0.10		<0.10			<0.10	<0.025	<0.025
Total Kjeldahl Nitrogen	mg/L																			
Phosphate, total	mg/L			0.0503	0.104															
Dissolved Organic Carbon	mg/L			0.58	<0.50	0.66	1.27		0.60	0.63	1.18	<0.50	1.07	1.06	0.87	1.69	<0.50	1.10		
Aluminum (Al), dissolved	mg/L	*		0.0013	<0.0010	0.0014	0.0018		0.0031	0.0030	0.0044	0.0018	<0.010	0.0028	<0.0020	0.0031	<0.0020	0.0029	0.0033	0.0039
Antimony (Sb), dissolved	mg/L	2		0.00015	0.00032	0.00027	0.00034		0.00027	0.0127	0.0994	0.0134	0.0095	0.0112	0.00641	0.00700	0.00421	0.0254	0.00011	<0.00010
Arsenic (As), dissolved	mg/L	0.005		0.0336	0.0352	0.0349	0.0295		0.0340	0.0695	0.00980	0.00359	0.388	0.707	0.733	0.534	0.0916	0.604	0.325	0.427
Barium (Ba), dissolved	mg/L	2.9		0.0124	0.0122	0.0101	0.00911		0.00976	0.00574	0.0119	0.0102	0.00425	0.00431	0.00433	0.00454	0.00537	0.00487	0.0103	0.00936
Beryllium (Be), dissolved	mg/L	0.0053		<0.000050	<0.000050	<0.00010	<0.00010		<0.00010	<0.00020	<0.00010	<0.00010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010
Bismuth (Bi), dissolved	mg/L			<0.000025	0.0001	<0.00050	<0.00050		<0.00050	<0.0010	<0.00050	<0.00050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Boron (B), dissolved	mg/L	5		<0.25	<0.25	<0.010	<0.010		<0.010	<0.020	<0.010	<0.010	<0.10	<0.020	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Cadmium (Cd), dissolved	mg/L	0.000017		<0.000025	<0.000025	0.000056	0.000517		0.000014	<0.000020	<0.000010	<0.000010	<0.00010	0.000024	<0.000020	0.000040	0.000471	<0.000020	0.000665	0.000257
Calcium (Ca), dissolved	mg/L			301	300	300	308		278	341	174	207	409	426	426	409	428	416	177	169
Chromium (Cr), dissolved	mg/L	0.0089		<0.00050	<0.00050	0.00013	<0.00010		0.00046	<0.00020	<0.00010	<0.00010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010
Cobalt (Co), dissolved	mg/L			0.00269	0.00273	0.00248	0.00238		0.00253	0.00281	0.00067	0.00134	<0.0010	0.00058	0.00040	0.00040	<0.00020	0.00033	0.00254	0.00171
Copper (Cu), dissolved	mg/L	*		<0.00025	<0.00025	<0.00020	<0.00020		<0.00020	<0.00040	<0.00020	<0.00020	<0.0020	0.00055	<0.00040	0.00139	0.00099	<0.00040	<0.00020	<0.00020
Iron (Fe), dissolved	mg/L	0.3		6.51	6.29	5.29	5.21		5.69	5.38	0.773	0.093	11.2	13.1	13.5	12.9	11.2	15.7	3.64	6.52
Lead (Pb), dissolved	mg/L	*		0.000066	0.000048	<0.000050	0.000114		0.000480	<0.00010	0.000205	<0.000050	<0.00050	0.00076	0.00084	0.00127	<0.00010	0.00094	<0.000050	0.000237
Lithium (Li), dissolved	mg/L			0.0128	0.0146	0.0109	0.0115		0.0133	0.0225	0.0148	0.0181	0.0276	0.0258	0.0271	0.0229	0.0266	0.0308	0.0184	0.0166
Magnesium (Mg), dissolved	mg/L			102	107	110	109		111	104	103	116	114	112	110	113	119	115	19.8	19.4
Manganese (Mn), dissolved	mg/L			0.645	0.693	0.642	0.666		0.655	0.961	0.310	0.403	1.13	1.11	1.06	1.05	0.772	1.09	1.44	1.31
Mercury (Hg), dissolved	mg/L	0.000026		<0.000050	<0.000050	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo), dissolved	mg/L	0.073		0.00068	0.00071	0.000908	0.000716		0.000608	0.00218	0.00194	0.00267	0.00054	0.00053	0.00057	0.00057	0.00059	0.00057	0.000773	0.000827
Nickel (Ni), dissolved	mg/L	*		0.00814	0.00701	0.00703	0.00643		0.00680	0.0204	0.00556	0.00601	0.0060	0.0064	0.0041	0.0041	0.0028	0.0041	0.00702	0.00468
Phosphorus (P), dissolved	mg/L			<0.010	0.015	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K), dissolved	mg/L			2.45	2.35	2.40	2.34		2.29	1.57	1.43	1.35	1.71	1.79	1.73	1.89	1.72	1.63	0.59	0.58
Selenium (Se), dissolved	mg/L	0.001		<0.00020	<0.00020	<0.00010	<0.00010		<0.00010	<0.00020	<0.00010	<0.00010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00013	<0.00010
Silicon (Si), dissolved	mg/L			4.88	4.98	4.44	4.37		4.56	4.37	2.73	2.45	5.06	5.19	5.24	5.24	4.87	5.23	4.77	4.82
Silver (Ag), dissolved	mg/L	0.0001		<0.000025	<0.000025	0.000036	0.000028		0.000042	<0.000020	<0.000010	<0.000010	<0.00010	0.000028	<0.000020	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010
Sodium (Na), dissolved	mg/L			12.3	11.7	9.43	9.77		9.69	3.68	6.88	6.18	4.93	4.70	4.78	4.71	4.75	5.12	1.35	1.50
Strontium (Sr), dissolved	mg/L			0.669	0.738	0.625	0.704		0.622	0.877	1.01	1.02	1.10	0.991	1.10	1.05	1.08	1.12	0.263	0.245
Sulphur (S), dissolved	mg/L			216	236	207	203		200	282	218	259	363	349	329	338	363	345	101	97.8
Thallium (Tl), dissolved	mg/L	0.0008		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000020	<0.000010	0.000018	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010
Tin (Sn), dissolved	mg/L			<0.0010	<0.0010	<0.00010	<0.00010		<0.00010	<0.00020	<0.00010	<0.00010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010
Titanium (Ti), dissolved	mg/L	0.1		<0.0025	<0.0025	<0.010	<0.010		<0.010	<0.020	<0.010	<0.010	<0.10	<0.020	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Uranium (U), dissolved	mg/L	0.015		0.0782	0.0985	0.0790	0.0834		0.0761	0.0260	0.0139	0.0209	0.0195	0.0191	0.0186	0.0188	0.0168	0.0199	0.00220	0.00221
Vanadium (V), dissolved	mg/L			<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0020	<0.0010	<0.0010	<0.010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Zinc (Zn), dissolved	mg/L	0.03		0.0813	0.00885	0.0392	0.0674		0.0394	0.0107	0.0060	0.0026	0.037	0.0394	0.0256	0.0336	0.0354	0.0288	0.663	0.524
Zirconium (Zr), dissolved	mg/L			0.0044	0.00865	0.0189	0.0199		0.0181	0.0100	<0.00080	<0.00080	<0.0080	0.0083	0.0085	0.0078	0.0033	0.0071	<0.00080	

KENO HILL SILVER DISTRICT MINING OPERATIONS

WATER MANAGEMENT PLAN

November 2013

Prepared for:

ALEXCO KENO HILL MINING CORP.

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Appendices

Appendix A 24 Hour Precipitation Return Periods Memorandum

1 INTRODUCTION

1.1 PURPOSE OF PLAN

The Water Management Plan was originally submitted to fulfill the conditions set out in Part H, Clause 74 of Water Licence QZ09-092 issued to Alexco Keno Hill Mining Corp (AKHM) on August 19th, 2010. A revised Water Management Plan was prepared for the Yukon Water Board to include the Onek and Lucky Queen Mines. This updated plan outlines the methodology that will be followed to comply with the requirements of the water licence for the Bellekeno, Onek and Lucky Queen Mines and District Mill for AHKM's Keno Hill Silver District Mining Operations and to include the proposed features for the Flame and Moth Mine.

2 LOCATION AND DESCRIPTION

The Keno Hill Silver District (KHSD) is located in central Yukon (63° 54' 32" N, 135° 19' 18" W; NTS 105M/14 & 105M/13) approximately 354 km due north of Whitehorse. Access to the property is via the Alaska, Klondike and Silver Trail Highways from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45km); a total distance of 452 km.

The KHSD is located on and around Galena Hill, Keno Hill and Sourdough Hill which. The property lies along the broad South McQuesten River valley with the three prominent hills to the south of the valley. The existing Bellekeno Mine is located approximately 3 km east of Keno City. Lucky Queen is located approximately 4 km northeast of Keno City and Onek is situated about 500 m northeast of Keno City. The Keno District Mill and associated Dry Stack Tailings Facility (hereinafter referred to as the "DSTF") are located approximately 1 km west of Keno City on the Flame and Moth property.

3 WATER MANAGEMENT PROTOCOLS

Protocols for decision making on water management have been developed and are summarized in the following section.

3.1 BELLEKENO MINE WATER REQUIREMENTS

Water use requirements for the Bellekeno Mine are currently supplied from the recharge to the underground mine pool. Makeup water is also available and permitted for withdrawal from Lightning Creek and Thunder Gulch as well as Bellekeno 625 treatment facility decant water at a rate of up to 245.5 m^3/day. Groundwater seepage through bedrock and vein fractures is collected in the Bellekeno Mine and is pumped to surface for treatment and release. A certain portion of the underground mine pool water is used for various mine development and operations requirements including equipment operation and paste backfill. The overall Bellekeno mine water balance presented is shown in Figure 1.

There may be instances and operational requirements to use water from other permitted sources (i.e. Lightning Creek, Thunder Gulch, Bellekeno 625 treated decant) instead of or in addition to the primary source of the underground mine pool.

Variations in water quality from the underground mine pool may necessitate withdrawing water from Lightning Creek rather than the underground mine pool. As an example, poor settling of suspended solids underground may limit the use of the underground mine pool water for equipment use due to potential damage of mechanical systems. Enhanced total suspended solids (TSS) settling in the surface ponds at Bellekeno 625 would be utilized to continue to treat and discharge to compliant levels but a lack of makeup water from high TSS underground could result in the use of Lightning Creek instead of the underground mine pool water.

Similar to the example of TSS, high ammonia in the underground mine pool from excessive recirculation may result in direct pumping to surface where enhanced ammonia reduction can occur. Additional make up water from Lightning Creek or Thunder Gulch could be required under this scenario.

Operational changes underground may result in an extended period where mine pool water is not available for reuse and the need for withdrawal from Lightning Creek or Bellekeno 625 treated decant would be required. As an example, construction of larger underground sumps would result in the loss of makeup water for a period of time when the new sump is filling before a new decant pump can be installed. During this period, water from either Bellekeno 625 decant or Lightning Creek would be used to supplement mine operations requirements.

The combined water sourcing rate from Lightning Creek for Bellekeno Mine, Onek Mine and District Mill will not exceed the currently licenced maximum rate of 245 m^3/day licenced under QZ09-092.

In terms of protocols and decision making, the Mine Manager is the primary person responsible for determining if these types of operational changes would require alternative water sources. In conjunction with support from Alexco's environmental department professionals, the decision would then be made to either withdraw water from Lightning Creek or Bellekeno 625 decant.

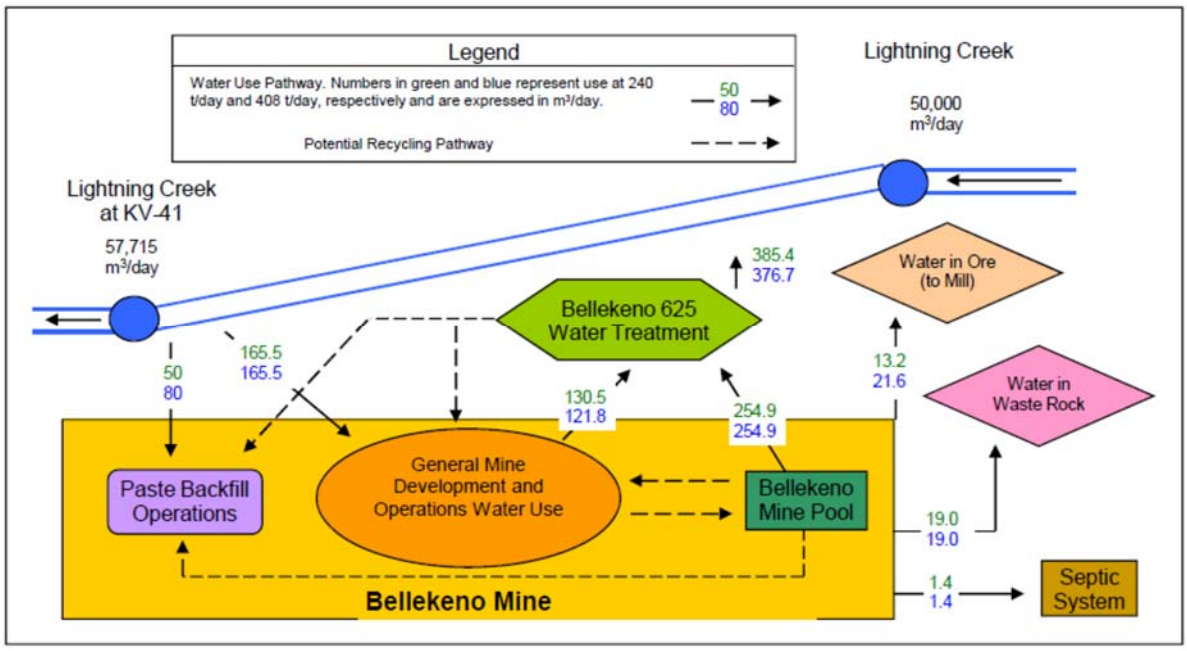


Figure 1 Bellekeno Water Balance Schematic

3.2 DISTRICT MILL SITE WATER REQUIREMENTS

There may be operational or water quality changes that necessitate mill makeup water coming from sources other than Galkeno 900 treatment facility discharge or the mill pond. The mill water balance schematic is shown in Figure 2.

The two primary sources of water usage for mill makeup water are the Mill well and surface runoff collected in the mill pond. Surface water collected in the mill pond is generally only an option in the early spring – late fall period when active runoff is available. Alternative sources of mill makeup water other than these two sources may be necessary based on various operating conditions and changes. These potential conditions and changes include but are not limited to:

- Change in process water chemistry requiring alternative makeup water chemistry. There may be times when the water in the mill pond requires treatment and release due to buildup of metals or pH fouling from excessive recycling. Treatment and release in accordance with current effluent quality standards under QZ09-092 would be conducted and fresh water from other sources would then be used to make up the volume released.
- Sludge generated in the Galkeno 900 lined treatment pond may inadvertently be collected in the vacuum truck and transported to the mill pond. If this occurs, an alternative location may be required.
- Icing conditions on the surface of the Galkeno 900 treatment pond may create liner damage if water removed from the pond for mill makeup requirements drops the ice layer on top of the liner.
- Reduced flow from the Galkeno 900 adit which could result in insufficient volumes to supply mill makeup water requirements.
- Insufficient surface runoff into the mill pond to provide makeup water.

In the event of these potential operations changes, alternative assessed water sources may be used to supply mill makeup water. Alternative water sources include Christal Lake, shallow groundwater wells (currently installed) down gradient of the mill and Bellekeno 625 treated water. In these examples, the Mill Manager would be in consultation with support from Alexco's environmental department professionals and a determination made if alternative water sources need to be used or developed.

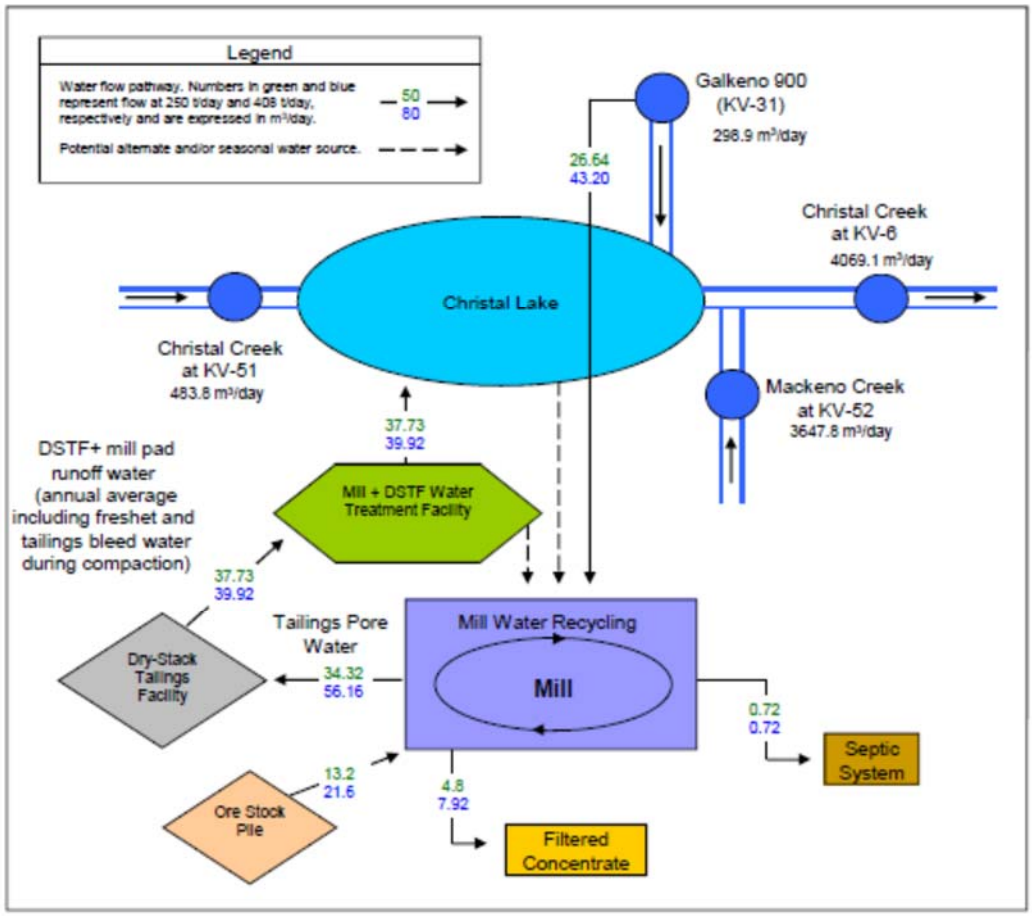


Figure 2 District Mill Water Balance Schematic

3.3 FLAME AND MOTH MINE WATER REQUIREMENTS

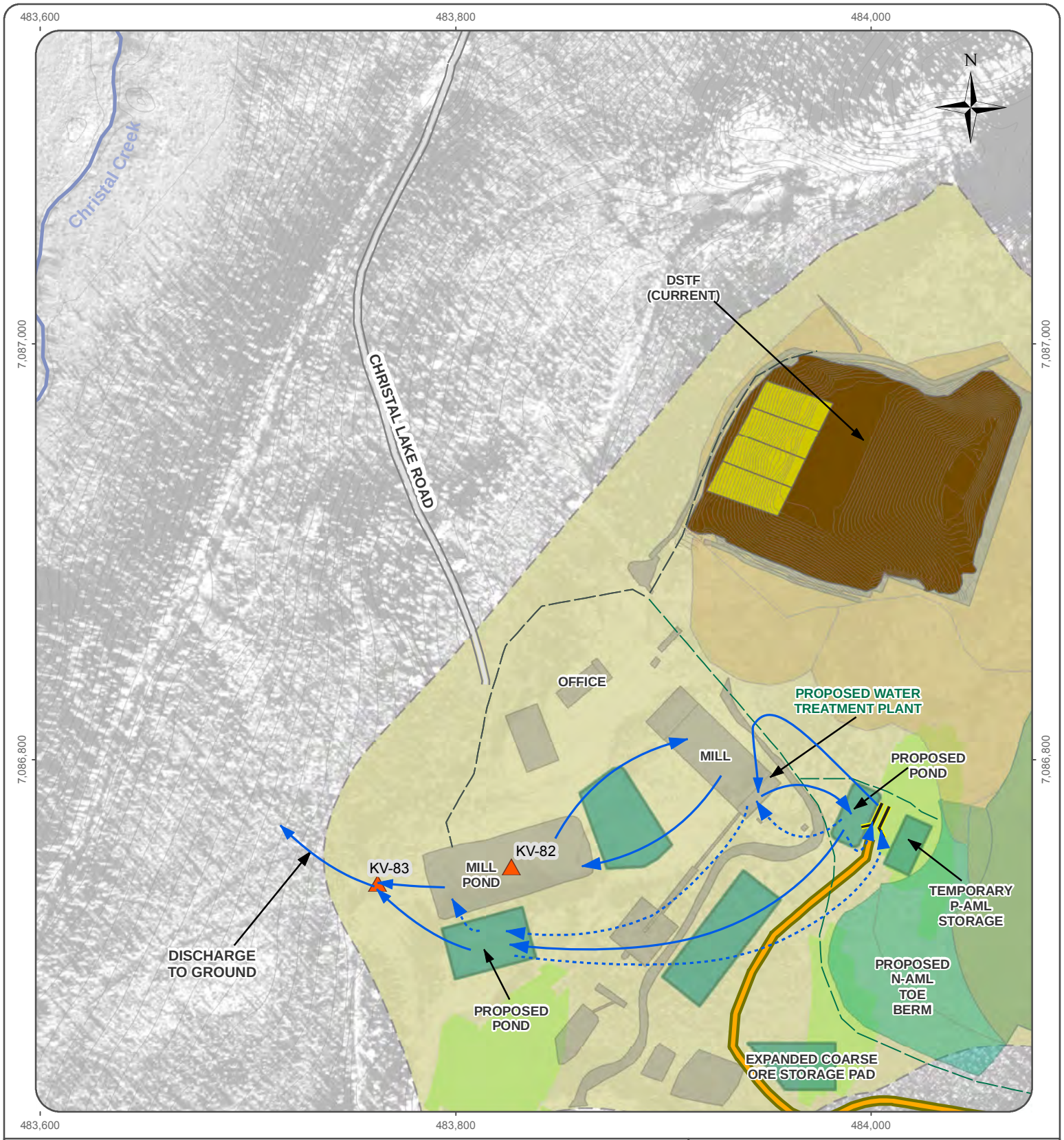
The proposed Flame and Moth underground development and production will require up to 140.1 m^3/day which includes a contingency of 25%. Daily water usage during ongoing underground mine development and operation is estimated at 112.1 m^3/day when mining at an estimated maximum rate of 400 tpd. This water will be used to support activities including percussion drilling, dust suppression, equipment cooling and minor use for sanitation. The site infrastructure and water management structures for Flame and Moth are shown on Figure 3.

Reused process water from the underground workings will be the primary source of water for Flame and Moth mine to the greatest degree possible. This water will be supplemented by water sourced from groundwater encountered in the underground workings and any additional water initially will be sourced from the well supplying the Mill which currently is licenced at a rate of 81 m^3/day. Water will be pumped out of the workings into the proposed water treatment plant which includes an aeration pond (1500 m^3) located adjacent to the Flame and Moth portal. There it will be treated to meet the proposed standards. If further ammonia treatment is required it will be sent for an additional water treatment step. Water with then be discharged to a receiving pond (1500 m^3) prior to be discharged to ground. The overall Flame and Moth Mine water management schematic is presented in Figure 3.

Variations in water quality in the reused water from the underground workings may necessitate using the mill supply well or treated water for the proposed water treatment plant in addition to the reuse of water from underground. For example, poor settling of suspended solids in the underground sumps may limit the use of this water with equipment due to potential damage of mechanical systems. Makeup water could then be sourced from mill supply well or the proposed water treatment plant in this situation.

Operational changes underground may also result in an extended period where water used in the underground workings is not available for reuse. Water from the mill supply well or treated water for the proposed water treatment plant would be used to supplement mine operations requirements in these cases.

In terms of protocols and decision-making, the Mine Manager is the primary person responsible for determining if certain scenarios would require alternative water sources. In conjunction with Alexco's environmental department professionals the decision would then be made to withdraw water from the mill supply well or use water from the proposed water treatment plant.



Surface Water Quality Station
Proposed Road
Existing Diversion Ditch
Proposed Diversion Ditch
Christal Lake Road
Watercourse
Flow Direction
Alternate Flow Direction
Mill Site Footprint
Proposed Features
DSTF Cover and Revegetation Phase I
As Built, DSTF, Sept 2013
DSTF 322,000 Tonnes Design
Buildings/Structures

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 3

FLAME AND MOTH - WATER MANAGEMENT

NOVEMBER 2013

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

This drawing has been prepared for the use of Access Mining Consultants Ltd.'s client and may not be used, reproduced or relied upon by third parties, except as agreed by Access Mining Consultants Ltd. and its client, as required by law or for use of governmental reviewing

AKHM
ACCESS

I:\Keno_Area_Mines\FM\Map\02_Permit\WaterManagement\WaterManagement_20131127.mxd
(*Last edited by: jpan; 2013-11-29/10:32 AM*)

3.4 ONEK 990 WATER REQUIREMENTS

Onek underground development and production will require up to 112.5 m^3/day which includes a contingency of 25%. Daily water usage during ongoing underground mine development and operation is estimated at 90 m^3/day when mining at an estimated maximum rate of 300 tpd. This water will be used to support activities including percussion drilling, dust suppression, equipment cooling and minor use for sanitation. The site infrastructure and water management structures for Onek are shown on Figure 4.

Reused process water from the underground workings will be the primary source of water for Onek 990 to the greatest degree possible. This water will be supplemented by water sourced from meteoric infiltration into the underground workings and any additional water initially will be sourced from Lightning Creek at rate up to 90 m^3/day which is less than the currently licenced rate in WUL QZ09-092 of 245.5 m^3/day. Water may be pumped out of the workings and stored in a water storage pond (225 m^3) located at the 990 portal pad. If there is excess water in the pond at the Onek 990 portal and the water meets effluent quality standards it may be discharged to ground. If the water does not meet effluent quality standards then it will be trucked to the Keno District Mill or Bellekeno water treatment plant. There it will be treated to meet standards and discharged. The overall Onek Mine water balance schematic is presented in Figure 5.

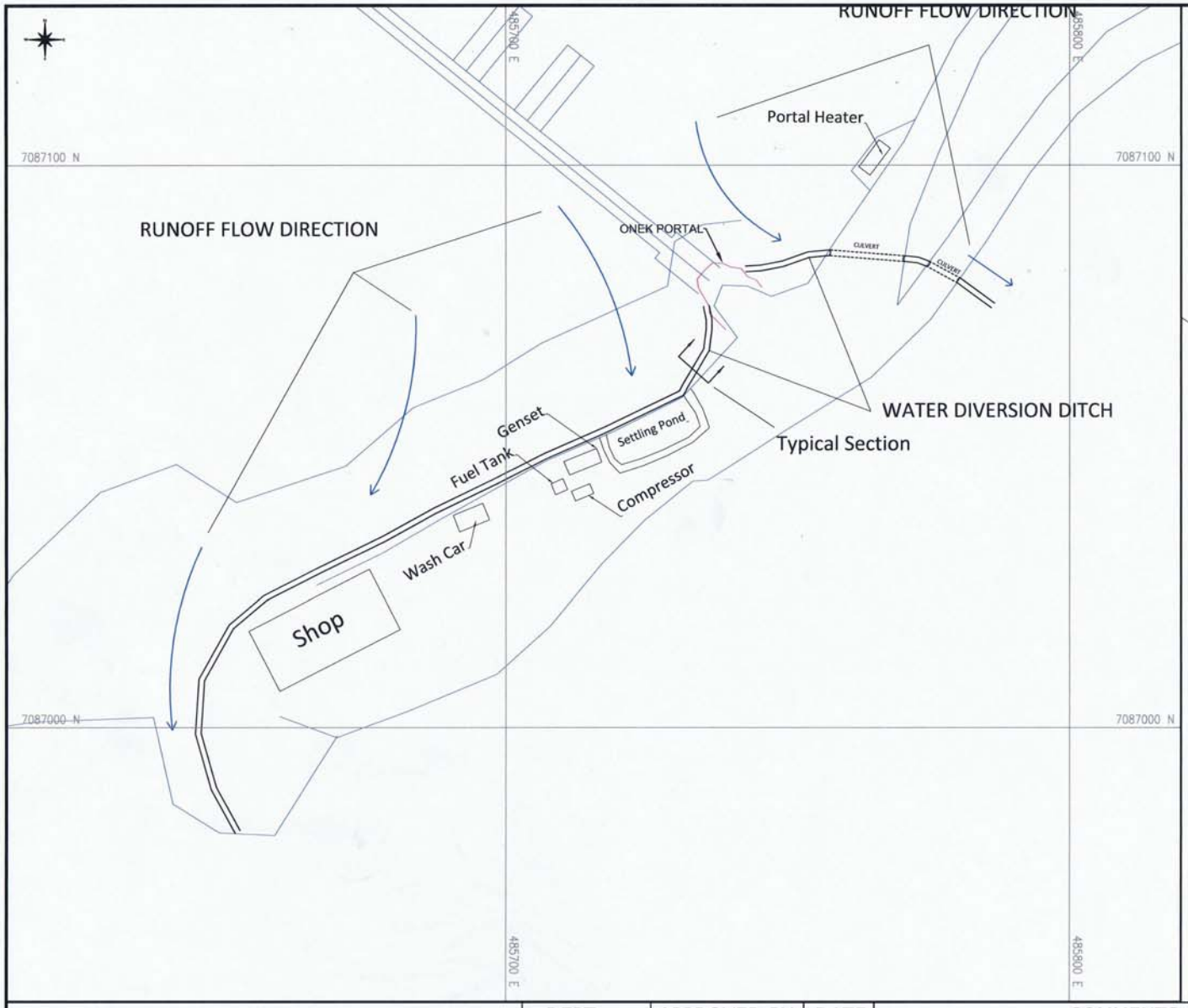
Variations in water quality in the reused water from the underground workings may necessitate withdrawing water from Lightning Creek rather in addition to the reuse of water from underground. For example, poor settling of suspended solids in the small temporary water collection pond and water storage ponds may limit the use of this water with equipment due to potential damage of mechanical systems. Reused water may necessitate longer residences in the storage ponds to allow for settlement of sediments. Makeup water could then be sourced from Lightning Creek in this situation.

Similar to the example of suspended solids, high ammonia in the recycled water from underground workings from excessive recirculation may also necessitate longer residences of water in the storage ponds to allow for ammonia reduction to occur. Additional makeup water from Lightning Creek could be required under this scenario.

Operational changes underground may also result in an extended period where water used in the underground workings is not available for reuse. Water from Lightning Creek would be used to supplement mine operations requirements in these cases.

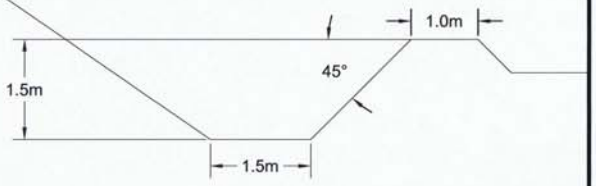
The combined water sourcing from Lightning Creek for Bellekeno Mine, Onek Mine and Keno District Mill will not exceed the currently licenced maximum rate of 245 m^3/day under QZ09-092.

In terms of protocols and decision-making, the Mine Manager is the primary person responsible for determining if certain scenarios would require alternative water sources. In conjunction with Alexco's environmental department professionals, the decision would then be made to withdraw water from Lightning Creek.



GENERAL ARRANGEMENT
NOT FOR CONSTRUCTION

Water Diversion Ditch



Typical Section
Looks NW

Scale 1:75

PROFESSIONAL ENGINEER
YUKON TERRITORY
SCOTT A. SMITH

ALEXCO

ALEXCO KENO HILL MINING CORP.

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: ONEK DIVERSION DITCH

Figure 4

Drawn by: N.Chambers	Scale: 1:750
Date: 11/23/2012	Approval: Date:
File: H:\Onek\Surface contruction\Water management\Onek Diversion Ditch Rev 2.dwg	

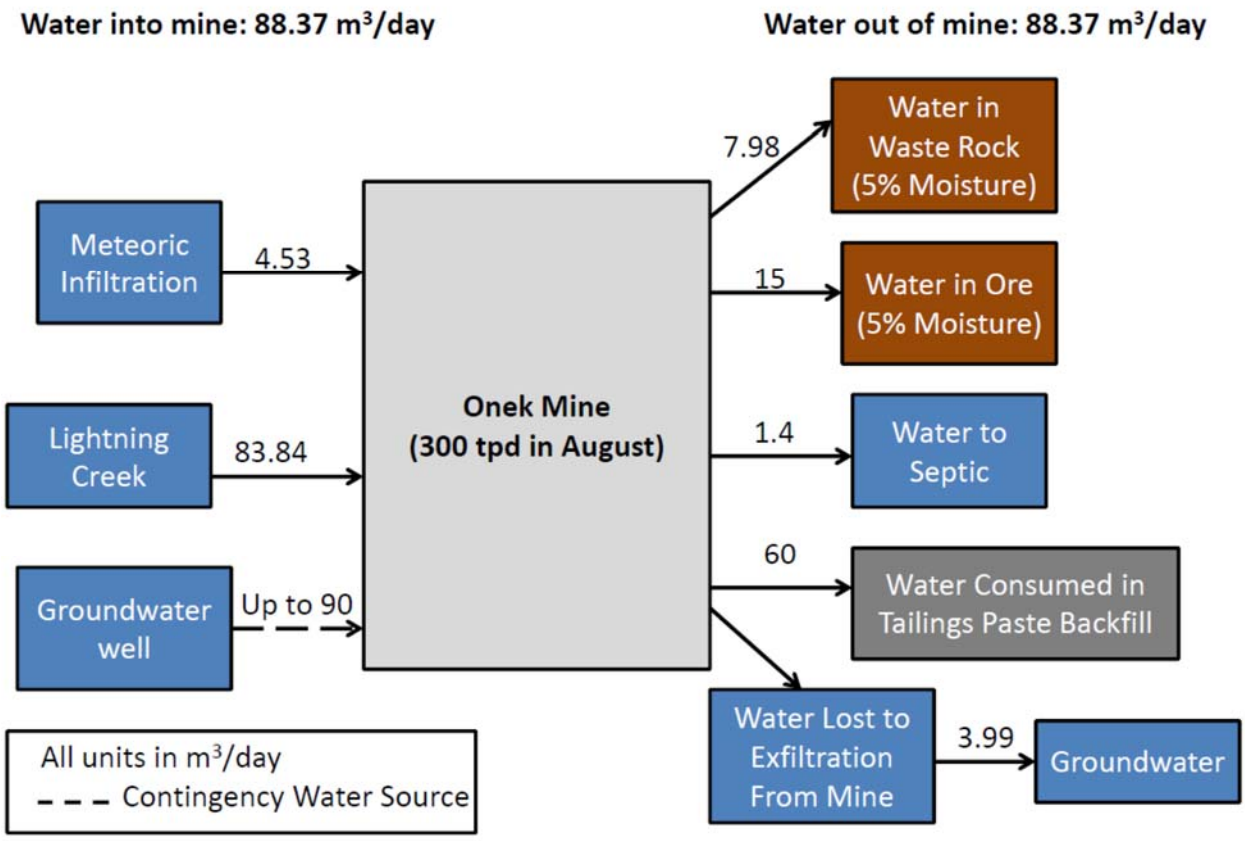


Figure 5 Onek Mine Water Balance Schematic

3.5 LUCKY QUEEN WATER REQUIREMENTS

Lucky Queen underground development and production will require up to 56.25 m^3/day which includes a 25% contingency. Daily water usage during ongoing underground mine development and operation is estimated at 45 m^3/day when mining at an estimated maximum rate of 150 tpd. This water will be used to support activities including percussion drilling, dust suppression and equipment cooling, and minor use for sanitation. The site infrastructure and water management structures for Lucky Queen are shown on Figure 6.

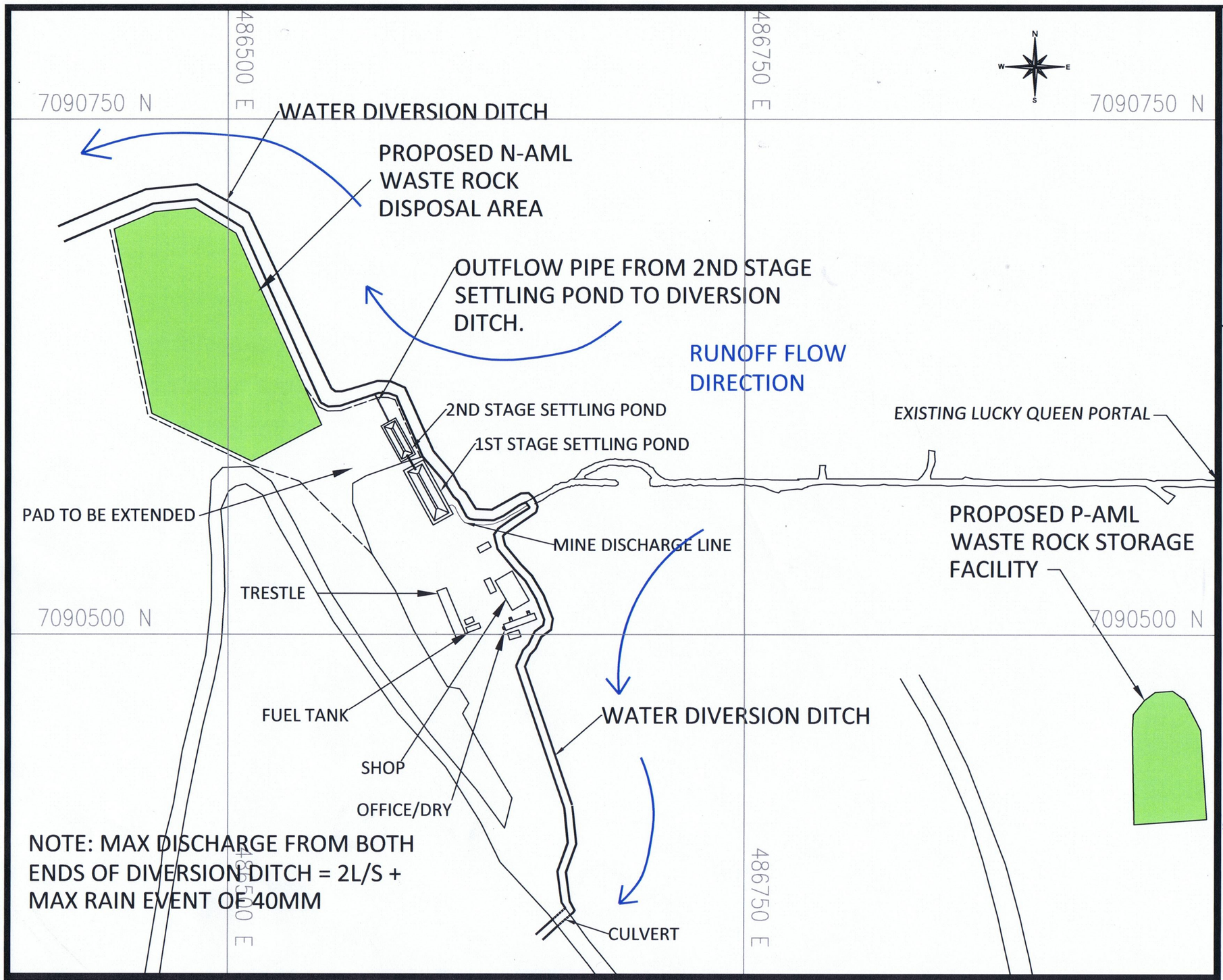
The primary source of water for Lucky Queen will be meteoric infiltration into the underground workings. Infiltration will be collected and temporarily stored in underground sumps to settle and be used as required for drilling purposes and dust suppression. Water will be used, and reused, if necessary, from the underground workings to the extent possible as the primary source. Water in excess of the operational requirements will drain out of the workings to a settling pond first then passing to a water storage pond on the portal pad. From there it may be re-used or if it meets the effluent quality standards it will be directed to a conveyance network that may include ditches and pipes and ultimately discharged to ground. No water treatment facility has been proposed as the existing Lucky Queen adit discharge meets the proposed effluent quality standards and the predicted adit discharge concentration will not increase significantly from baseline. The overall Lucky Queen Mine water balance schematic is shown in Figure 7.

In the event that the Lucky Queen adit discharge water quality is worse than predicted and shows an increasing trend in degradation of water quality above the AMP action threshold, a water treatment facility would be installed at Lucky Queen.

There may be instances and operational requirements where a secondary water source is required instead of or in addition to the infiltration and reused water stored in underground sumps and storage pond. If necessary, a 4 inch groundwater supply well will be constructed near the adit portal as a contingency water source. For example, poor settling of suspended solids in the underground sumps may limit the use of this water with equipment due to potential damage of mechanical systems. Underground water may necessitate longer residences in the sumps to allow for settlement of sediments. Makeup water could then be sourced from the groundwater well in this situation.

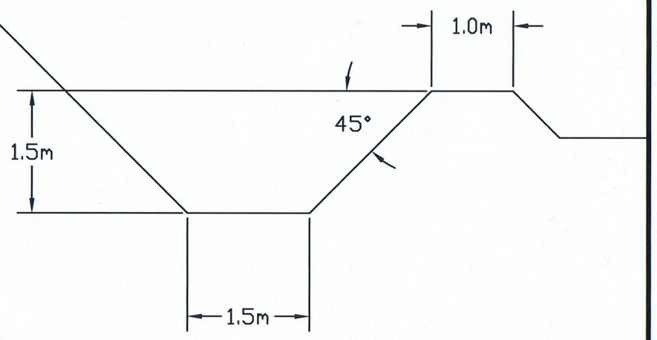
Similar to the example of suspended solids, high ammonia in the recycled water from underground workings from excessive recirculation may also necessitate longer residences of water in the storage ponds to allow for ammonia reduction to occur. Additional makeup water from the groundwater supply well could be required under this scenario.

GENERAL ARRANGEMENT
NOT FOR CONTRUCTION



NOTE: MAX DISCHARGE FROM BOTH ENDS OF DIVERSION DITCH = 2L/S + MAX RAIN EVENT OF 40MM

Water Diversion Ditch



Typical Section
Looks North
Scale 1:75

PROFESSIONAL ENGINEER
YUKON TERRITORY
SCOTT A. SMITH

ALEXCO

ALEXCO KENO HILL MINING CORP.

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *LUCKY QUEEN DIVERSION DITCH*

Drawn by: *N.Chambers*	Scale: *1:2000*
Date: *11/27/2012*	Approval: Date:
File: *H:\Lucky Queen\Surface\Water management\Lucky Queen DIversion Ditch*	

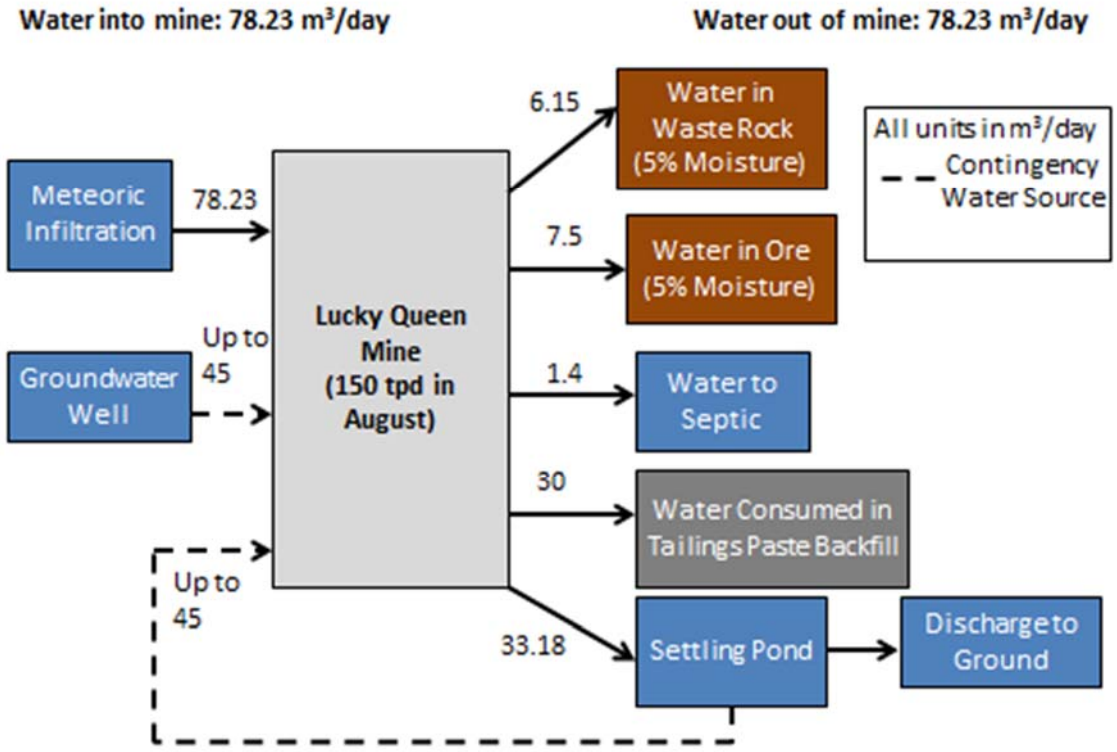


Figure 7 Lucky Queen Mine Water Balance Schematic

3.6 WATER MANAGEMENT STRUCTURES

Storage and settling ponds will be constructed at Onek and Lucky Queen. A settling and storage pond will be constructed outside of the Onek 990 portal. The pond will have a capacity of 93 m^3 (18m by 6m by 2m) with additional capacity of 48 m^3 from a freeboard of 0.50m to accommodate for 24 hour maximum rain event of 37.7 mm at all times during operations and will be lined with HDPE (Figure 7). The calculations of the 24 hour maximum rain events for Onek and Lucky Queen are presented in Appendix A.

Lucky Queen will have a two stage settling pond consisting of a 285 m^3 capacity primary settling pond and a 93 m^3 capacity secondary settling pond down gradient with additional capacity to ensure that there is adequate freeboard at all time during operations (Figure 8). Both ponds will have freeboard of 0.5 m and a combined freeboard capacity of 147 m^3 for the 24 hour maximum rain event of 40.3 mm. The secondary pond will have a pipe that will direct the discharge to the diversion ditch. In the event that treatment is required at Lucky Queen, the ponds would be lined with HDPE or another suitable type of synthetic liner.

Berms will be built up around all water settling and storage ponds to ensure no surface runoff enters the ponds.

A diversion ditch will be excavated up gradient of the Onek 990 portal (Figure 4). The purpose of this ditch is to divert surface water runoff from above the portal from reaching the portal pad and associated infrastructure, including the temporary storage pond. The ditch will run northeast from the portal along the access road diverting the water to ground prior to entering Lightning Creek without interaction with mining activities. The surface water to be managed is intended to be minimal at the portal site and is designed to accommodate the 24 hour maximum rain event of 37.7 mm. A typical section design drawing for the Onek ditch is shown on Figure 3.

A diversion ditch currently excavated up gradient of the Lucky Queen 500 adit to divert surface water runoff from reaching the portal pad, infrastructure and collection pond will be extended around the N-AML waste rock disposal area to divert clean water around the portal pad and waste rock disposal area. The water within the diversion ditch will discharge to ground approximately 3Km uphill from Christal Creek. A typical section design drawing for the Lucky Queen ditch is shown on Figure 6. The diversion ditch has been designed to convey the maximum discharge of 2 L/s and the 24 hour maximum rain event of 40.3 mm.

A diversion ditch will be excavated up gradient of the Flame and Moth portal (Figure 3). The purpose of this ditch is to divert surface water runoff from above the portal from reaching the portal pad and associated infrastructure, including the proposed pond. The ditch will run west from above the portal diverting the water to the diversion ditch being proposed for the dry stack tailings facility expansion. The surface water to be managed is intended to be minimal at the portal site and is designed to accommodate the 24 hour maximum rain event of 37.7 mm which was calculated for the Onek 990 mine which is at 990masl. This estimate is conservative as the Flame and Moth portal will be at a lower elevation (910masl) and thus a smaller 24 hour rain event would be expected. The ditches constructed for the Flame and Moth site will be consistent with the typical section design drawing shown for the Onek ditch on Figure 4.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED

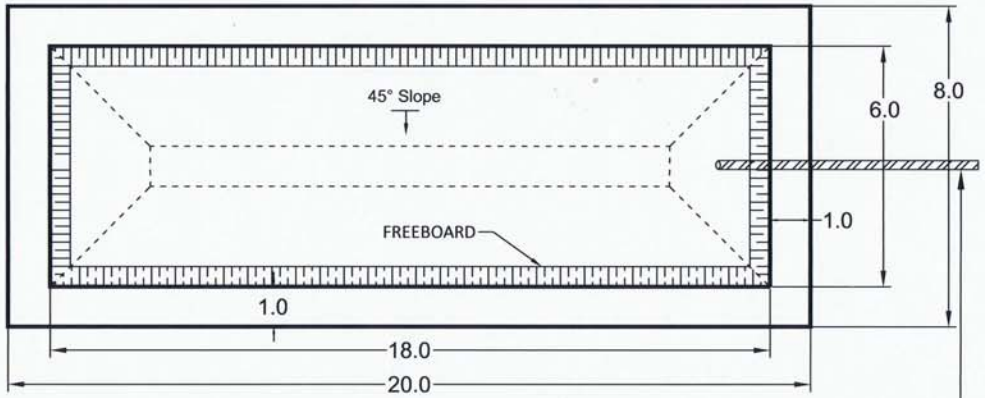
POND VOLUME = 93 CUBIC METERS

FREEBOARD VOLUME CAPACITY = 48 CUBIC METERS

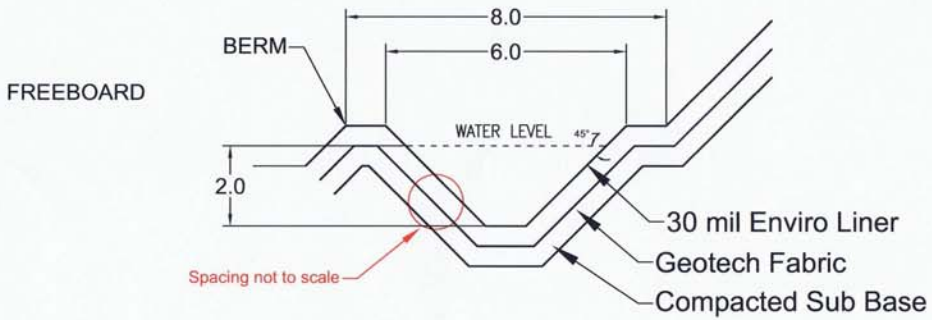
GENERAL ARRANGEMENT NOT FOR CONSTRUCTION

A | I

Settling Pond



PLAN VIEW



SECTION A

PROFESSIONAL ENGINEER
YUKON TERRITORY
SCOTT A. SMITH

ALEXCO

ALEXCO KENO HILL MINING CORP.

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *ONEK SETTLING POND*

Single Pond

Figure 8

Drawn by: *N. Chambers* | Scale: *1:125*

Date: *11/23/2012* | Approval: | Date:

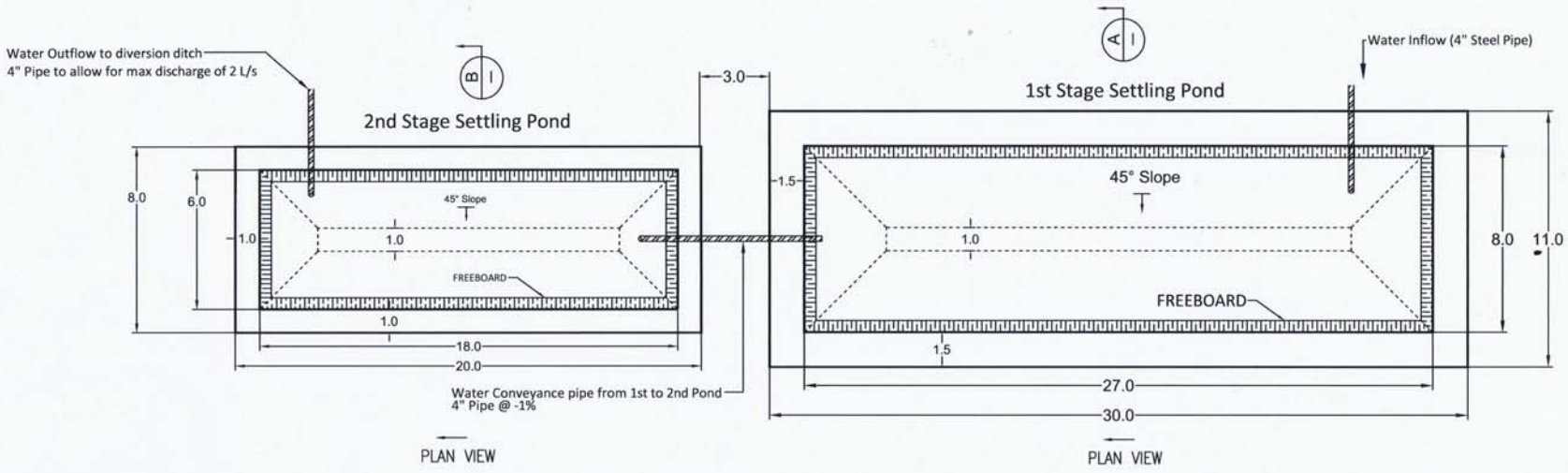
File: *H:\Onek\Surface Construction\Water Management\Onek Settling Pond Rev 1.dwg*

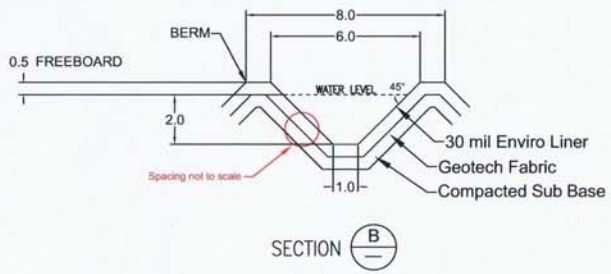
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED

GENERAL ARRANGEMENT NOT FOR CONSTRUCTION

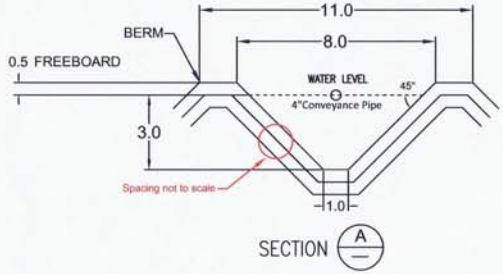
2nd STAGE POND VOLUME = 93 CUBIC METERS
FREEBOARD VOLUME CAPACITY = 48 CUBIC METERS

1st STAGE POND VOLUME = 285 CUBIC METERS
FREEBOARD VOLUME CAPACITY = 99 CUBIC METERS





2nd Stage Settling Pond



1st Stage Settling Pond

NOTE: - 1st Stage Settling Pond dimensions based on actual as-built construction.

- Presently constructed and used as temporary single stage settling pond.

- Section A-A

PROFESSIONAL ENGINEER YUKON TERRITORY SCOTT A. SMITH

ALEXCO

ALEXCO KENO HILL MINING CORP.

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: LUCKY QUEEN SETTLING PONDS
2 Stage Settling Ponds
Figure 9

Drawn by: N.Chambers	Scale: 1:200
Date: 11/23/2012	Approval: Date:
File: H:\Lucky Queen\Surface\Water management\Lucky Queen Settling Ponds Rev 1.dw	

4 CONTINGENCY PLANS

Contingency plans for flood or drought conditions have been considered to ensure unexpected climatic conditions do not adversely affect mine/mill operations or result in significant environmental impact.

4.1 DROUGHT CONDITIONS

The Bellekeno Mine produces excess water that must be collected and treated. Although the Bellekeno Mine produces approximately 4 L/s of constant discharge, only about 50% of the mine recharge volume is required for mine development and operations (equipment, paste backfill). The amount of water required to sustain mine operations is a small portion (1-2%) of the flow at Lightning Creek where mine makeup water is currently permitted for withdrawal. Similar to the mill makeup water requirements, a drought scenario does not represent a current operational concern for the Bellekeno Mine and a contingency plan is currently not in effect.

The Onek Mine requires 112.5 m^3/day of water for development and operations with a 25% contingency. It is estimated that 25% of the underground water can be reused. AKHM is currently licenced to source 245 m^3/day of water from Lightning Creek. Considering the limited water required for the Bellekeno Mine and Mill, elevated water requirements for the Onek Mine will be well within the currently licenced rate from Lightning Creek.

The Lucky Queen Mine requires 56.25 m^3/day. Approximately 25% of water used in underground developments. A contingency groundwater supply well will be constructed. Typical water discharge from the Lucky Queen adit from meteoric infiltration is 56.16 m^3/day. In drought conditions, this infiltration rate may decrease. The reusable fraction of underground water and the groundwater sourced from the proposed contingency well will be able to supplement the meteoric infiltration in the event of drought conditions.

The current make-up water requirements at the mill are approximately 30 m^3/day. This make-up water requirement is less than 5% of the combined flow emanating from Galkeno 900 and Bellekeno 625. The make-up water requirements at the mill also represent a very small portion of the Christal Creek drainage which has its headwaters near the mill site location. Given the relatively small volume of make-up water compared to current source levels, a reduction in make-up water available for mill operations due to a drought condition does not represent a concern from an operational standpoint and therefore no unique contingency plans are deemed necessary for a drought scenario.

4.2 FLOOD CONDITIONS

High flow or flood conditions at the mill do not necessarily pose an extreme case from an operational perspective as the mill site water management design already incorporates ditching and pond volumes based on extreme precipitation events (design capacity in excess of 1:100 year event). In addition, the mill site location is situated with a very small, headwater drainage basin (<3 km^2), effectively minimizing the potential for flooding conditions. In the case of a flood event, active milling operations may be temporarily suspended to ensure operations personnel and equipment are appropriately allocated to managing and maintaining ditches and conveyance structures until the peak flows have decreased to normal levels.

Diversion ditches have been constructed at the Bellekeno and Lucky Queen Mine portals to divert surface water runoff from the portal and portal pads to prevent infiltration into water storage and settlement ponds and into

the mine workings. Diversion ditches will be constructed at the Onek 990 portal and Onek storage ponds to divert surface water runoff from the portal and portal pad to prevent infiltration into water storage and settlement ponds.

4.3 HIGH MINE INFLOW CONDITIONS

Contingency and response plans for high or unexpected underground mine flows fall under the protocols of the company's emergency response plan.

The first priority in a high mine inflow condition is the safety and protection of the employees and contractors working underground at Bellekeno, Onek and Lucky Queen. If the water in-rush was of a nature that required immediate evacuation, the specific protocols for mine evacuation would be initiated by the Mine Manager or his designate (Section 8, Keno Hill Emergency Response Plan).

Once the safety of underground employees and contractors have been established, the nature of the water in-rush would be immediately investigated by the General Manager or his designate. Securing underground facilities and infrastructure would become the next priority after employee safety. Depending on the nature and level of the mine flow in-rush or high flow condition, a determination would be made if mobile equipment needed to be removed from certain levels and locations in the mine and brought to surface or to the central decline. Electrical utilities and infrastructure would be assessed to determine if areas of the mine needed to be isolated or removed from electrical power distribution.

The cause and extent of the high mine water flow condition would then be assessed by the General Manager, Mine Manager and other specialist positions on the site (i.e. Chief Engineer) to determine if the extent of the high mine flow was expected to continue or if flow conditions are expected to recede. Based on the level of high mine flow, the rate of dewatering would be increased to the maximum levels permitted in order to reduce the volume of mine pool. Standby pumps would be established if necessary to increase the volume of water being pumped from the underground mine. The Bellekeno 625 water treatment plant is permitted and capable of treating 10 L/s which is approximately double the current steady state flow conditions of the Bellekeno Mine. If the volume required for dewatering were to exceed permitted levels or if the Bellekeno 625 water treatment plant was not meeting effluent quality standards due to high sustained flows, the appropriate regulatory agencies would be contacted and consulted. If necessary, consideration would be given to applying for an Emergency Amendment under QZ09-092 to manage the high inflow conditions if all other measures were not effective.

5 REPORTING

The results of the Water Management Plan will be included with the annual report for Water Licence QZ09-092. Further to the identified reporting requirements previously identified in clause 83 additional reporting requirements are outlined in clause 54 of Water Licence QZ09-092:

> Unless otherwise specified in this licence, all monitoring data, reports, plans, studies, study results, designs or manual shall be submitted to the Board in the following format:
>
> a) All reports required to be submitted to the Board will be unbound and reproducible by standard photocopier, accompanied by one electronic copy on a CD/DVD.
>
> b) The Licensee shall provide to the Board 5 additional copies of all reports. The additional copies may be either 5 bound paper copies or 5 electronic copies on individual CDs/DVDs.
>
> c) Electronic copies shall be IBM compatible in one of the following formats: Word 97-2003, Excel 97-2003 workbooks, or Adobe .pdf format. Water quality results must be presented in Excel 97-2003 .xls format.

APPENDIX A

24 HOUR PRECIPITATION RETURN PERIODS MEMORANDUM

3 Calcite Business Centre, 151 Industrial Road
Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 Fax (867) 667-6680
www.accessconsulting.ca

Memorandum

To: Alexco Keno Hill Mining Corp.

From: Anthony Bier

CC: Kai Woloshyn

Date: November 7, 2012

Re: 24 hour Precipitation Return Periods

MAXIMUM ANNUAL 24- HOUR PRECIPITATION RETURN PERIOD

Meteorological Services Canada (MSC) provides rainfall intensity-duration-frequency (IDF) curves for currently operated meteorological stations including those at Mayo Airport, Dawson City and Pelly Ranch. Since the Mayo Airport station (Mayo A) is the closest to Keno City, approximately 40kms Southwest of Keno Hill, and there are data from 1974-1981 from the Keno Hill MSC station we can draw on this data to establish a relationship between large rainfall events at Mayo A and Keno City.

The Keno Hill weather station was located within a few kilometers of both the Onek and Lucky Queen mines and between the elevations of the two mines. As such, the average maximum annual 24 hour precipitation event from 1974-1981 was plotted against elevation for Mayo A and Keno Hill. A straight line was then fitted and the slope of that line was used to extrapolate the maximum annual 24 hour precipitation events from Mayo to Onek and Lucky Queen (Figure 1)

Appendix I shows the IDF for Mayo Airport and Appendix II shows the data in tabular form. The 1 in 100 year 24-hour precipitation event is 35mm at Mayo A which translates to 37.7mm and 40.3 mm at Onek and Lucky Queen, respectively (Table 1), based in the relationship in Figure 1. Table 1 shows the Environment Canada 24 hour event return periods for Mayo (Appendix I) and the calculated events for Onek and Lucky Queen using the relationship in Figure 1.

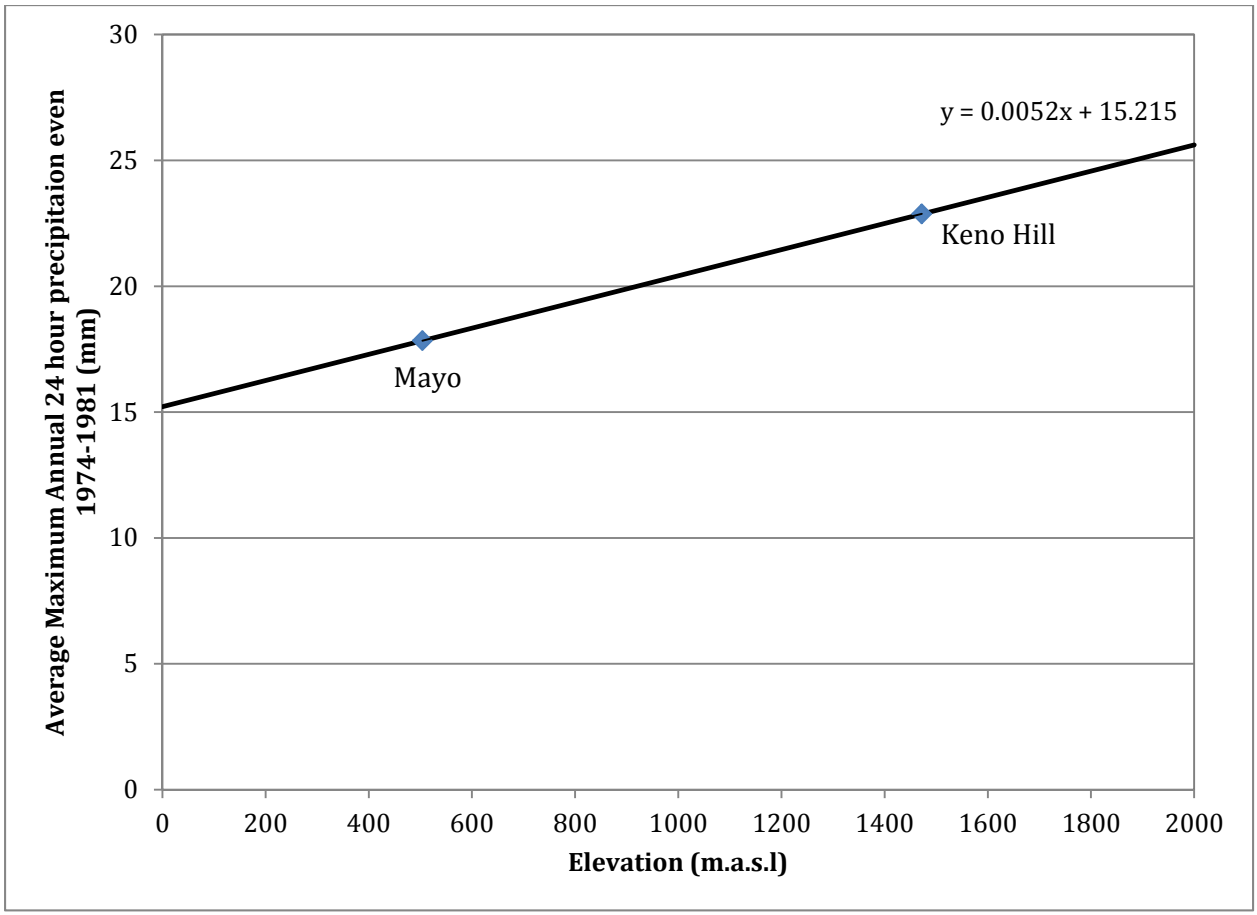


Figure 1: Relationship between size of Average Maximum Annual 24 hour precipitation event at Mayo and Keno Hill, 1974-1981

Table 1: Maximum annual 24 hour precipitation event for various return periods for Mayo A, Onek 990 and Lucky Queen underground workings catchments

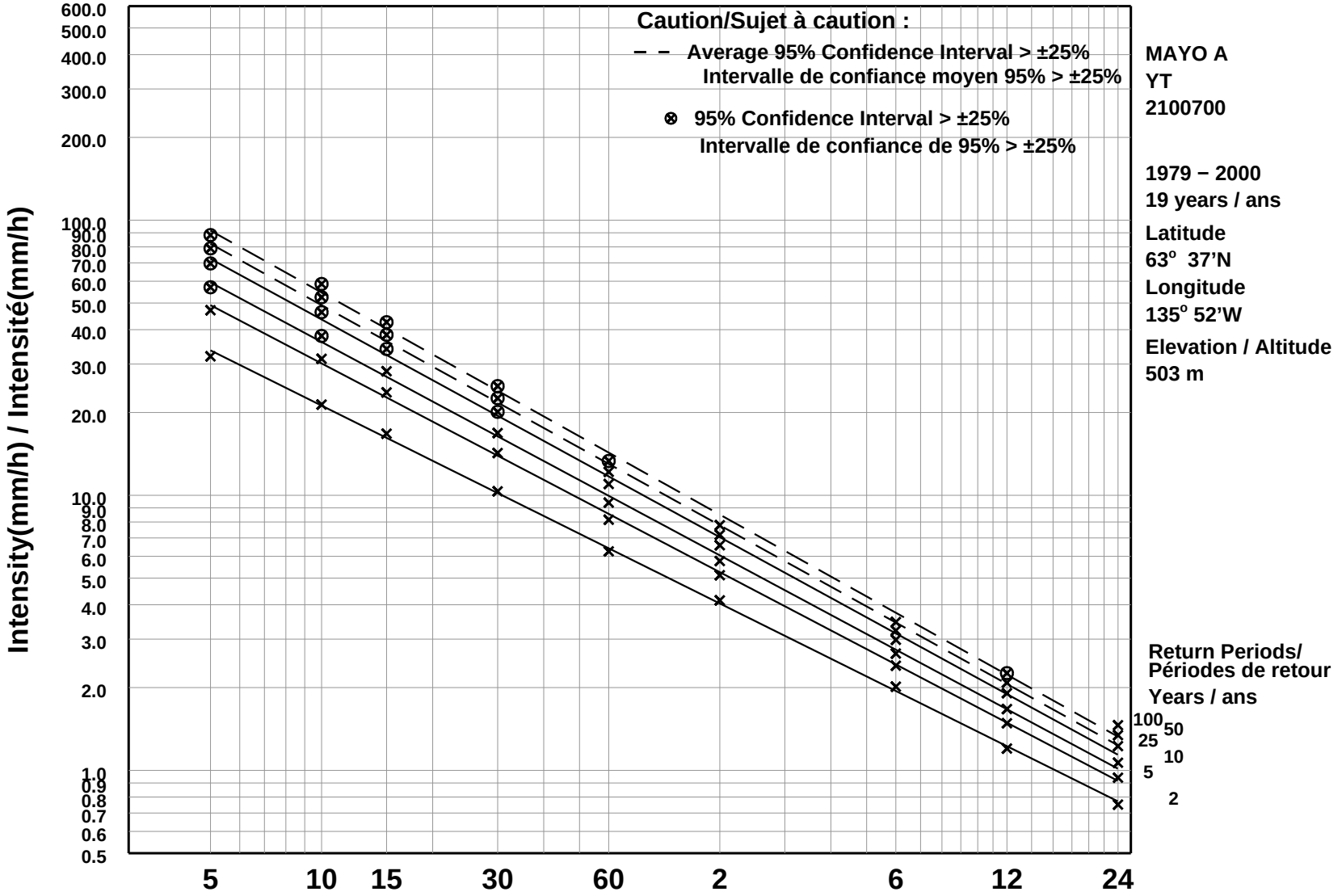
	Maximum Annual 24 hour precipitation event (mm)		
Return Period (years)	**Mayo A**	**Onek**	**Lucky Queen**
2	18.0	20.7	23.3
5	22.6	25.3	27.9
10	25.6	28.3	30.9
25	29.4	32.1	34.7
50	32.2	34.9	37.5
100	35.0	37.7	40.3

APPENDIX I

Short Duration Rainfall Intensity−Duration−Frequency Data

2012/02/09

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Environment Canada Environnement Canada

Canada

APPENDIX II

Environment Canada/Environnement Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2012/02/09

==========

MAYO A YT 2100700

Latitude: 63 37'N Longitude: 135 52'W Elevation/Altitude: 503 m

Years/Années : 1979 - 2000 # Years/Années : 19

==========

****

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1979	3.8	3.8	3.8	3.8	5.6	6.7	11.3	14.1	18.9
1980	2.5	3.1	3.5	5.7	6.1	10.1	11.8	13.3	14.8
1981	-99.9	-99.9	-99.9	-99.9	7.4	13.2	14.4	15.0	15.4
1982	2.3	3.1	3.3	4.6	4.6	6.4	9.1	14.3	18.0
1983	2.0	2.0	2.4	2.8	4.6	5.9	10.4	13.4	20.2
1984	2.4	2.8	3.5	4.0	4.8	7.5	11.1	13.4	14.2
1985	5.0	7.6	7.6	7.6	7.6	7.6	12.8	15.6	20.7
1986	1.7	2.6	3.2	4.3	6.1	9.3	9.3	10.7	20.4
1987	1.8	2.2	2.9	3.7	6.1	9.8	16.2	20.0	22.2
1988	2.3	3.5	4.8	7.8	8.9	9.6	11.2	11.8	16.4
1989	3.0	5.0	6.2	9.3	10.5	10.6	13.2	13.8	16.2
1990	2.2	3.6	5.3	7.8	9.8	10.0	11.3	13.7	20.7
1991	3.2	3.8	4.1	5.8	5.8	8.2	14.0	14.4	20.2
1992	3.3	4.8	6.0	6.0	6.3	9.0	18.0	18.2	18.2
1993	2.1	2.7	2.8	2.8	2.9	4.6	-99.9	-99.9	20.2
1994	3.6	4.1	4.1	4.1	5.2	6.2	-99.9	-99.9	13.9
1995	2.0	2.6	3.5	4.6	5.2	7.5	8.6	10.2	12.5
1996	1.6	1.8	2.3	3.7	6.3	10.6	15.0	25.4	35.0
1997	2.7	4.6	5.4	5.8	6.2	9.7	15.1	16.2	26.7
1998	3.5	5.8	6.6	6.6	6.6	7.0	10.1	11.0	11.2
1999	7.9	9.4	10.2	11.3	12.3	13.1	15.1	21.3	22.8
2000	2.0	2.4	3.2	4.1	6.5	8.0	-99.9	-99.9	16.4
# Yrs. Années	21	21	21	21	22	22	19	19	22

Mean Moyenne	2.9	3.9	4.5	5.5	6.6	8.7	12.5	15.0	18.9
Std. Dev. Écart-type	1.4	1.9	2.0	2.2	2.1	2.2	2.6	3.8	5.2
Skew. Dissymétrie	2.44	1.65	1.43	1.06	1.11	0.36	0.36	1.31	1.42
Kurtosis	10.35	6.15	5.48	4.14	4.75	3.28	2.74	5.11	6.76

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1999	5 min	7.9	7.4

****

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	2.7	3.9	4.8	5.8	6.6	7.4	21
10 min	3.6	5.2	6.3	7.7	8.7	9.8	21
15 min	4.2	5.9	7.1	8.5	9.6	10.6	21
30 min	5.2	7.1	8.4	10.1	11.3	12.5	21
1 h	6.3	8.2	9.4	11.0	12.2	13.3	22
2 h	8.3	10.2	11.5	13.2	14.4	15.6	22
6 h	12.1	14.4	16.0	17.9	19.3	20.8	19
12 h	14.4	17.8	20.1	22.9	25.0	27.1	19
24 h	18.0	22.6	25.6	29.4	32.2	35.0	22

****

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	32.0	47.1	57.0	69.7	79.0	88.3	21
	+/- 6.7	+/- 11.3	+/- 15.2	+/- 20.5	+/- 24.6	+/- 28.6	21
10 min	21.4	31.4	38.0	46.3	52.5	58.6	21
	+/- 4.4	+/- 7.5	+/- 10.1	+/- 13.6	+/- 16.3	+/- 18.9	21
15 min	16.8	23.7	28.2	34.0	38.3	42.6	21
	+/- 3.1	+/- 5.2	+/- 7.0	+/- 9.4	+/- 11.3	+/- 13.1	21
30 min	10.3	14.3	16.8	20.1	22.5	24.9	21
	+/- 1.7	+/- 2.9	+/- 4.0	+/- 5.3	+/- 6.4	+/- 7.4	21

1 h	6.3	8.2	9.4	11.0	12.2	13.3	22
	+/- 0.8	+/- 1.4	+/- 1.9	+/- 2.5	+/- 3.0	+/- 3.5	22
2 h	4.2	5.1	5.8	6.6	7.2	7.8	22
	+/- 0.4	+/- 0.7	+/- 1.0	+/- 1.3	+/- 1.5	+/- 1.8	22
6 h	2.0	2.4	2.7	3.0	3.2	3.5	19
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.7	+/- 0.8	19
12 h	1.2	1.5	1.7	1.9	2.1	2.3	19
	+/- 0.1	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.6	19
24 h	0.8	0.9	1.1	1.2	1.3	1.5	22
	+/- 0.1	+/- 0.1	+/- 0.2	+/- 0.3	+/- 0.3	+/- 0.4	22

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	10.5	14.9	17.9	21.5	24.3	27.0
Std. Dev. /Écart-type (RR)	10.8	16.0	19.5	23.9	27.1	30.4
Std. Error/Erreur-type	0.7	1.0	1.3	1.7	1.9	2.3
Coefficient (A)	6.4	8.6	10.0	11.7	13.0	14.3
Exponent/Exposant (B)	-0.667	-0.703	-0.719	-0.733	-0.741	-0.748
Mean % Error/% erreur moyenne	2.7	2.9	3.9	5.0	5.6	6.1

MASS LOAD MODEL FOR CHRISTAL CREEK

A mass load model for Christal Creek was developed by Interralogic, Inc. using Goldsim simulation framework. The model was initially prepared for simulating metal loads in Christal Creek and to evaluate the reclamation options (currently being developed) for the Keno Hill Silver District Type 2 Abandoned Mines. Interralogic's revised draft report, Chemical Mass Load Model for Christal Creek: Description and results: 2013 update (Attachment A), dated November 12, 2013, provides a detailed description of the development of the model, including the loading sources, key assumptions, stochastic parameters and model calibration. The model has been recalibrated up to July 2013.The GoldSim model has also been updated to include potential loadings from the proposed Flame and Moth mine including N-AML waste rock and mine discharge for cadmium and zinc, the contaminants of concern (Minnow, 2013). Additional parameters for the model were not included as the N-AML waste rock humidity cell leaching rates (Access, 2013) and the deep ground water sampled from the three deep wells (FM-MW-1, FM-MW-2, FM-MW-3) did not identify any additional parameters of potential concern. Figure 1 is a schematic of the loading sources and monitoring locations within Christal Creek watershed.

The load model calculates metal loadings for three phases of the project: pre-mining, operations, and reclamation and post-closure. The load model calculates metal loading results for Christal Creek from 2008 to September 30, 2014 (during the initial decline development period when no discharge is anticipated) without any potential loading from the proposed mining activities from the Flame and Moth Mine. The model then accounts for operating the Flame and Moth mines from October 1, 2014 to December 31, 2020 at the maximum mining rate of 400 tonnes per day (tpd). The loading model incorporates potential loadings for the reclamation and post closure phase (2021 to 2030).

The loading model results include scenarios including a set of potential future reclamation options for the historic United Keno Hill Mines (UKHM) sites. Elsa Reclamation and Development Company Ltd. (ERDC), a subsidiary of Alexco, has been retained by the Government of Canada, to develop a district closure plan for the historic mines that were abandoned by United Keno Hill Mining Corp. On November 19m 2013, ERDC distributed a revised Keno District Closure Options Report (ERDC, 2013) and the Closure options evaluation workshops are scheduled to occur in December 2013. As the preferred Closure options for the Keno District have not been chosen at this time, a set of closure options for the Christal Creek watershed were selected for comparison purposes only to assess the potential impact from the Flame and Moth mine on the potential reclamation activities associated with District closure. The reclamation options chosen for this memo were done based on postulation and do not necessarily reflect the preferred option in Alexco's opinion nor the preferred option to be potentially assessed in YESAB. The reclamation options modeled for the Onek 400 discharge, Galkeno 300, Galkeno 900, Mackeno tailings and historic waste rock are:

- Option 3A for the Onek 400 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 3b for the Galkeno 300 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 3b for the Galkeno 900 discharge, new combined water treatment plant at Silver Trail Highway;
- Option 1a for the Mackeno tailings, cover and close in place with lime addition; and
- Option 1a for waste rock, regrade and cover.

It is currently estimated that the reclamation of the historic mines in the Keno District will have been assessed, permitted and funded in late 2018 or early 2019. The model assumes the Keno District Closure construction begins in 2019, but the Silver Trail highway water treatment plant isn't commissioned and in operation until October 1, 2019.

This memo presents the results from four modelling scenarios for the Christal Creek watershed, which are:

- Base case: Operations of Bellekeno, Onek and Lucky Queen mines with no reclamation of the historic UKHM mines sites as licenced under QML-0009 and QZ12-053;
- Base Case and District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with reclamation of the historic UKHM mines sites (400 tpd scenario from these 3 mines sources);
- Base Case with the Flame and Moth Mine and District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with Flame and Moth and reclamation of the historic UKHM mines sites (400 tpd scenario from these 4 mine sources);
- Base Case and Flame and Moth mine without District Closure: Operations of Bellekeno, Onek and Lucky Queen mines with Flame and Moth and reclamation of the historic UKHM mines sites (400 tpd scenario from these 4 mine sources).

LOADING SOURCES

The loading sources for the Alexco mining operations have been broken out into currently licenced (Bellekeno, Onek 990, and Lucky Queen Mines), which present the base case. While the load sources for the proposed Flame and Moth Mine are presented below. In all of these scenarios, the Bellekeno mine is assumed to always discharge a load since even when the mine is not operating, the mine is either flooded or pumped down and discharged, which occurs into the Lightning Creek watershed. Similarly, Lucky Queen has a long-term discharge even under no mining conditions.

Proposed Load Source: Flame and Moth Mine Discharge via District Mill

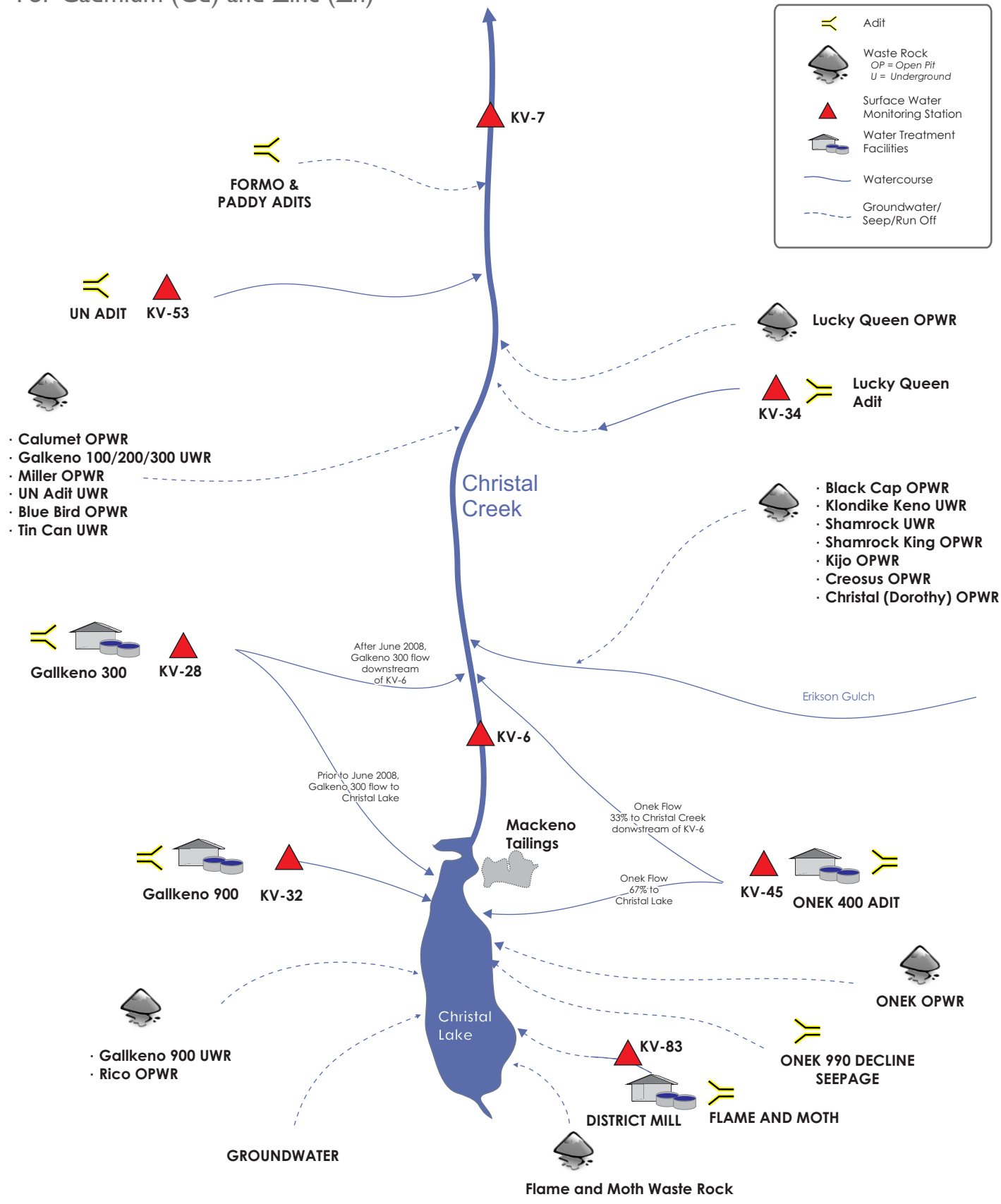
The Flame and Moth Mine will be developed below the water table, but will not have discharge following the closure of the mine as the proposed portal location is located more than 20m above the groundwater table. Interralogic Inc. has predicted a conservative maximum mine inflow rate of 35 L/s (Interralogic, 2013) for the Mine at 270m below ground surface. The Flame and Moth mine discharge rate used for the load model was developed on a monthly time step taken from the water balance prepared for the YESAB Flame and Moth Project proposal, which incorporated Interralogic's mine inflow predictions. The Flame and Moth mine discharge for 400tpd is shown in Table 1. The model assumes that water infiltration into the Flame and Moth underground workings increases at depth as the mine is developed until it reaches a maximum 35 L/s.

Table 1 Flame and Moth Discharge (L/s) at 400 tpd

	2014	2015	2016	2017	2018	2019	2020	2021-30
January	0	21.7	22.7	22.7	26.7	26.7	29.7	0
February	0	21.7	22.7	22.7	26.7	26.7	29.7	0
March	0	21.7	22.7	22.7	26.7	26.7	29.7	0
April	0	21.7	22.7	22.7	26.7	26.7	29.7	0
May	0	21.7	22.7	22.7	26.7	26.7	29.7	0
June	0	21.7	22.7	22.7	26.7	26.7	29.7	0
July	0	20.7	22.7	22.7	26.7	26.7	29.7	0
August	0	20.7	22.7	22.7	26.7	26.7	29.7	0
September	0	20.7	22.7	22.7	26.7	26.7	29.7	0
October	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0
November	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0
December	7.7	20.7	22.7	22.7	26.7	26.7	29.7	0

CHRYSTAL CREEK MASS LOADING MODEL SCHEMATIC

For Cadmium (Cd) and Zinc (Zn)



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CONCEPTUAL DRAWING; FEATURES ARE NOT TO SCALE

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FIGURE 1 - CHRISTAL CREEK MASS LOADING MODEL SCHEMATIC

OCTOBER 2013

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Alexco proposes to discharge treated mine water from the Flame and Moth mine via a proposed water treatment plant located in the District Mill at the existing Effluent Quality Standards (EQS) established for the District Mill (KV-83) in Water Licence QZ12-053 (Table 2). As the model is completed in monthly time steps, the model has incorporated conservative discharge concentrations presented in Table 1. The project expects to discharge on a regular basis given its experience treating water in the district at four water treatment plants (Galkeno 300, Galkeno 900, Silver King and Bellekeno 625). The model has included a concentration of 0.25 mg/L zinc, which is the upper 98th percentile for concentrations discharge to date at the Bellekeno 625 mine water treatment plant, while the cadmium concentration of 0.001 mg/L is the 90th percentile for the Bellekeno 625 mine water treatment plant discharge. The Flame and Moth discharge concentrations used in the model represent conservative loading rates given the experience at the Bellekeno Mine, yet discharge up to the Effluent Quality Standards are anticipated to be infrequent during the mine life, therefore the concentrations used in the model are appropriate to determine potential environmental effects.

Additionally, the concentrations for cadmium and zinc in the three deep groundwater wells are well below the discharge quality used in the model. The cadmium concentration in wells FM-MW-1, FM-MW-2 and FMW-2 ranged from <0.00001 to <0.00002 mg/L, while zinc concentrations ranged from 0.0026 mg/L to 0.0107 mg/L (all below the CCME guidelines). Through the closure planning process for the historic United Keno Hill Mines, zinc and cadmium have been demonstrated to be the Contaminants of Concern (COC) for aquatic effects and therefore are the appropriate metals to assess.

Table 2 Flame and Moth Discharge Water Quality (mg/L)

	Discharge	District Mill Effluent Quality Standards (KV-83) under QZ12-053	Percentile concentration of Bellekeno Discharge (KV-43)
Zinc	0.25	0.5	98th percentile
Cadmium	0.001	0.01	90th percentile

Proposed Load Source: Flame and Moth N-AML Waste Rock

The load rates for Flame and Moth N-AML waste rock (137,105 tonnes) used as construction are calculated with placement starting October 1st of 2014 and ending December 31st, 2015 (38,711 tonnes in 2014 and 98,394 tonnes in 2015). The waste rock from Flame and Moth will only be deposited in the Christal Creek catchment for the purpose of road building, toe berm for the dry stack tailings facility, expanded coarse ore stock pad and mill yard expansion. A portion of this N-AML rock may get backfilled underground if not required for construction purposes. No P-AML rock will be left on surface at closure.

The metal loading rates for the Flame and Moth N-AML waste rock were based on the upper quartile from the first 19 weeks of humidity cell data which are presented in Table 3. The humidity cell raw data is presented in Access Consulting Group's Flame and Moth Geochemical Characterization report (Access 2013).

Table 3 Flame and Moth N-AML Waste Rock Loading Rates

	Loading Rate (Kg/Kg*year)
Zinc	$7.41*10^{-8}$
Cadmium	$3.69*10^{-10}$

Cadmium & zinc attenuation was not activated for the scenarios presented for the Flame and Moth mine. It should be noted that the loading model presented to YESAB for the Onek and Lucy Queen model assumed attenuation occurred at a natural attenuation factor of 12% for zinc and 3%.

Base Case Sources

The base case for the Keno Hill Silver District (KHSD) Mining Operations include the Bellekeno, Onek 990 and Lucky Queen Mines. The licenced load sources included in the base case include: Lucky Queen adit discharge, Onek 990 mine seepage and Lucky Queen and Onek N-AML waste rock. Neither mine has been brought into production as of yet, but for conservatism, the model incorporated the mining of Onek and Lucky Queen to commence on October 1, 2014. This is the same start date Alexco is proposing to initiate development at Flame and Moth, therefore overestimating potential loading from the KHSD mining operations.

Licenced Load Sources: Lucky Queen Adit Discharge

As part of the base case, the Lucky Queen adit discharge rate used for the load model was developed on a monthly time step taken from the water balance prepared in the water balance of Onek and Lucky Queen mines (Access Consulting, 2012a). The Lucky Queen adit discharge for an average precipitation year is shown in Table 4 for 75 tpd. The active mining phase used was October 1, 2014 to 2018 and the reclamation and post-closure phase from 2019 to 2030.

Table 4 Monthly Lucky Queen adit discharge at 75 tpd in L/s (average precipitation year)

	2014	2015	2016	2017	2018	2019-2030
January	0.452	0.412	0.163	0.163	0.163	0.452
February	0.491	0.448	0.200	0.200	0.200	0.491
March	0.595	0.543	0.299	0.299	0.299	0.595
April	0.539	0.246	0.246	0.246	0.515	0.539
May	0.649	0.351	0.351	0.351	0.649	0.649
June	0.825	0.519	0.519	0.519	0.825	0.825
July	0.948	0.637	0.637	0.637	0.948	0.948
August	0.891	0.582	0.582	0.582	0.891	0.891
September	0.789	0.485	0.485	0.485	0.789	0.789
October	0.582	0.341	0.341	0.341	0.638	0.638
November	0.543	0.300	0.300	0.300	0.595	0.595
December	0.469	0.222	0.222	0.222	0.514	0.514

The Lucky Queen adit discharge water quality concentrations for cadmium and zinc used for the model are presented below in Table 5. These concentrations were calculated from the average 2013 concentrations for the Lucky Queen adit discharge at KV-34.

Table 5 Lucky Queen Adit discharge Quality

	Discharge Concentration (mg/L)
Zinc	0.17
Cadmium	0.009

Licenced Load Source: Onek Mine Seepage

There is no discharge anticipated from the Onek 990 portal as the workings will be developed above the groundwater table, but minor volume of water may potential exfiltrate from the underground workings. The Onek mine seepage source term uses average monthly exfiltration rates, which are shown in Table 6 for 150 tpd. The exfiltration rates were calculated and described in the water balance memo (Access 2012a). The seepage concentrations from the Onek mine were developed using the 90th percentile concentration from the shake flask extraction (SFE) of 19 rock samples from the Onek area. The SFE data is presented in detail in the *2012 KHSD Geochemical Characterization for Onek and Lucky Queen* Memo (Access 2012b). The 19 samples include historic mineralized waste rock samples and new development drill core, with the development drill core showing minimal metal leaching capacity.

Table 6 Monthly Onek Mine seepage at 150 tpd in L/s (average precipitation year)

	2014	2015	2016	2017	2018	2019-2030
January	0	0.0231	0.0231	0.0231	0.0231	0.0351
February	0	0.0229	0.0229	0.0229	0.0229	0.0381
March	0	0.0225	0.0225	0.0225	0.0225	0.0462
April	0	0.0231	0.0231	0.0231	0.0351	0.0351
May	0	0.0227	0.0227	0.0227	0.0427	0.0427
June	0	0.0222	0.0222	0.0222	0.0525	0.0525
July	0	0.0218	0.0218	0.0218	0.0612	0.0612
August	0	0.0217	0.0217	0.0217	0.0615	0.0615
September	0	0.0220	0.0220	0.0220	0.0558	0.0558
October	0.0223	0.0223	0.0223	0.0223	0.0495	0.0495
November	0.0225	0.0225	0.0225	0.0225	0.0462	0.0462
December	0.0228	0.0228	0.0228	0.0228	0.0399	0.0399

Licenced Load Source: Lucky Queen and Onek 990 N-AML Waste Rock

The load rates for Lucky Queen N-AML waste rock are calculated with placement starting October 1st of 2014 and ending December 31st, 2016 at Lucky Queen (80,000 metric tonnes total). The waste rock from Onek will only be deposited in the Lightning Creek catchment as the Onek 990 bypass road and bridge have been constructed.

The metal loading rates used for Lucky Queen N-AML waste rock were developed from the Shake Flask extraction rates used in the previous Goldsim model and which were derived from the data presented in the *2012 KHSD Geochemical Characterization for Onek and Lucky Queen* Memo (Access 2012b). The metal loading rates from the Lucky Queen N-AML waste rock is presented in Table 7. A natural attenuation factor of 12% for

zinc and 3% for cadmium was used for the seepage of waste rock. This attenuation factor was determined by the calibration of the GoldSim model from the loading of the Onek 400 adit discharge. The same attenuation factors were therefore used for the new Lucky Queen waste rock considering it would have greater travel distances to Christal Creek.

Table 7 Lucky Queen N-AML Waste Rock Loading Rates

	Loading Rate (Kg/Kg*year)
Zinc	$2.90*10^{-8}$
Cadmium	$6.34*10^{-10}$

RESULTS

The mass load model for Christal Creek was run for the addition of the Flame and Moth Mine and the resulting monthly cadmium and zinc concentrations at KV-6 and KV-7 are presented in Figures 2 to 9 including the CCME guideline for protection of aquatic life. Station KV-6 is located on Christal Creek upstream of the Silver Trail highway and is located just downstream from the outlet of Christal Lake. Station KV-7 is located on Christal Creek at the Hansen Lake road, ~7km downstream of KV-6 and ~4km upstream of the confluence with the South McQuesten River. The concentrations observed at KV-7 include the loadings from the historic and active mines within the Christal Creek watershed. The CCME guidelines for hardness for cadmium was calculated at a hardness of 300 mg/L $CaCO_3$ for KV-6 and KV-7, which are conservative as the hardness for both those sites are typically range from 300 to 600 mg/L $CaCO_3$.

The model results for the Flame and Moth deposit show no significant increase in metal concentrations in the receiving environment are anticipated neither in magnitude or duration in the aquatic environment. The largest loading source, Flame and Moth Mine discharge, is only of short duration and will cease at the end of the mine life. The cadmium concentrations presented in Figures 2 through Figure 5 for KV-6 and KV-7 shows no significant change in baseline with the addition of the Flame and Moth Mine (discharge and waste rock) nor does it show a change to the cadmium concentrations when the District Closure measures are applied to Galkeno 300, Galkeno 900, Onek 400, Mackeno tailings and waste rock.

The zinc concentrations presented in Figure 6 to Figure 9 also show no significant change with the addition of the Flame and Moth Mine to the base case or the implementation of the assumed district closure options. Therefore, the Flame and Moth Mine does not result in any significant short term (operations) or long term (post-closure) metal concentrations when run in conjunction with the implementation of District Closure in the Christal Creek watershed. Therefore, no significant adverse effects to water quality are expected from the Flame and Moth Mine.

MONITORING

An extensive water quality surveillance network is in place at the site through Water Licence QZ12-053 and monitoring will continue during development of the Flame and Moth deposit to update site data and provide further information for closure planning. Additional monitoring locations and frequency have been identified

in the revised Project Proposal submitted to YESAB to reflect the proposed mining activities. As part of ongoing closure planning, the water balance and mass loading calculations will be continually re-visited and updated.

ADAPTIVE MANAGEMENT

The Adaptive Management Plan for the Keno Hill Silver District Mining Operations has been developed and will be updated to include the Flame and Moth deposit as part of the Water Licence application. The Adaptive Management Plan will be updated and submitted to the Water Board, which will specifically include events for changes in water quality or quantity in Christal Creek, mine adit water quality changes and District Mill groundwater quality changes, in addition to issues such as sludge and waste rock management providing assurance that no significant impacts to the receiving environment will occur. The AMP will be updated to include the results of the Christal Creek Load Model to evaluate potentially triggered thresholds.

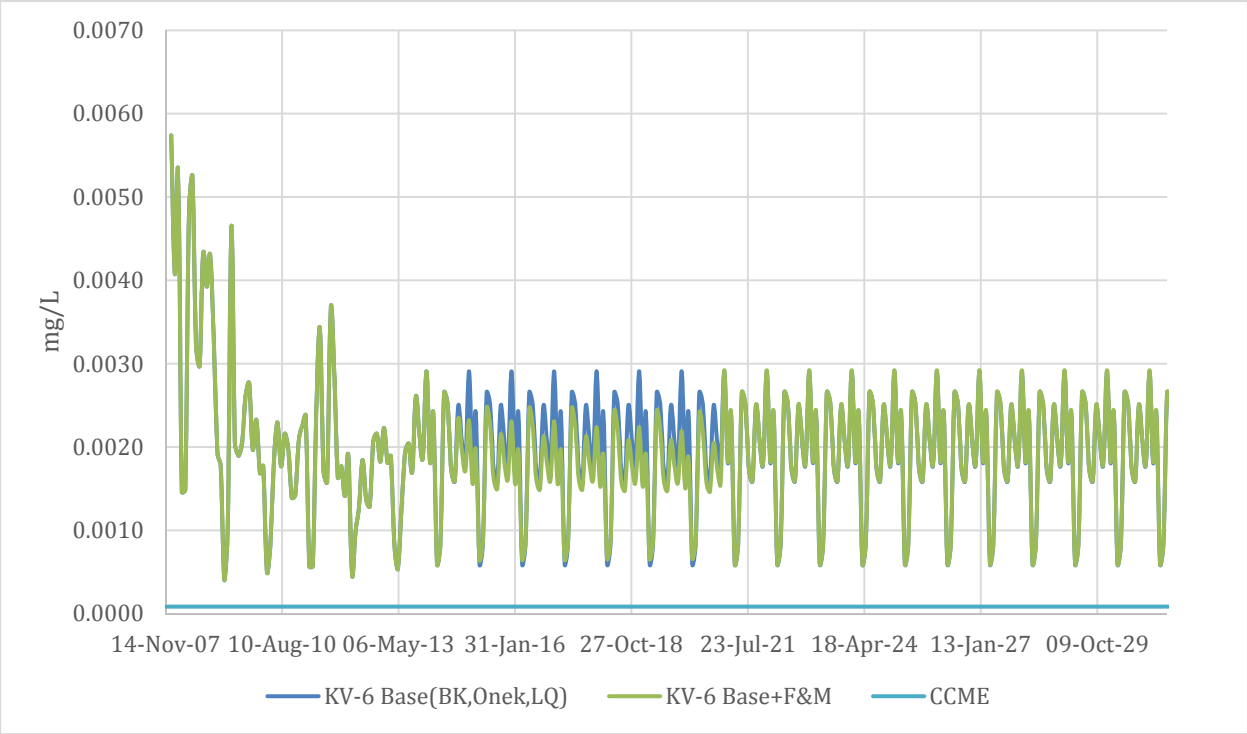

Figure 2 Calculated Total Cadmium at KV-6, Base Case vs. Base Case plus Flame and Moth

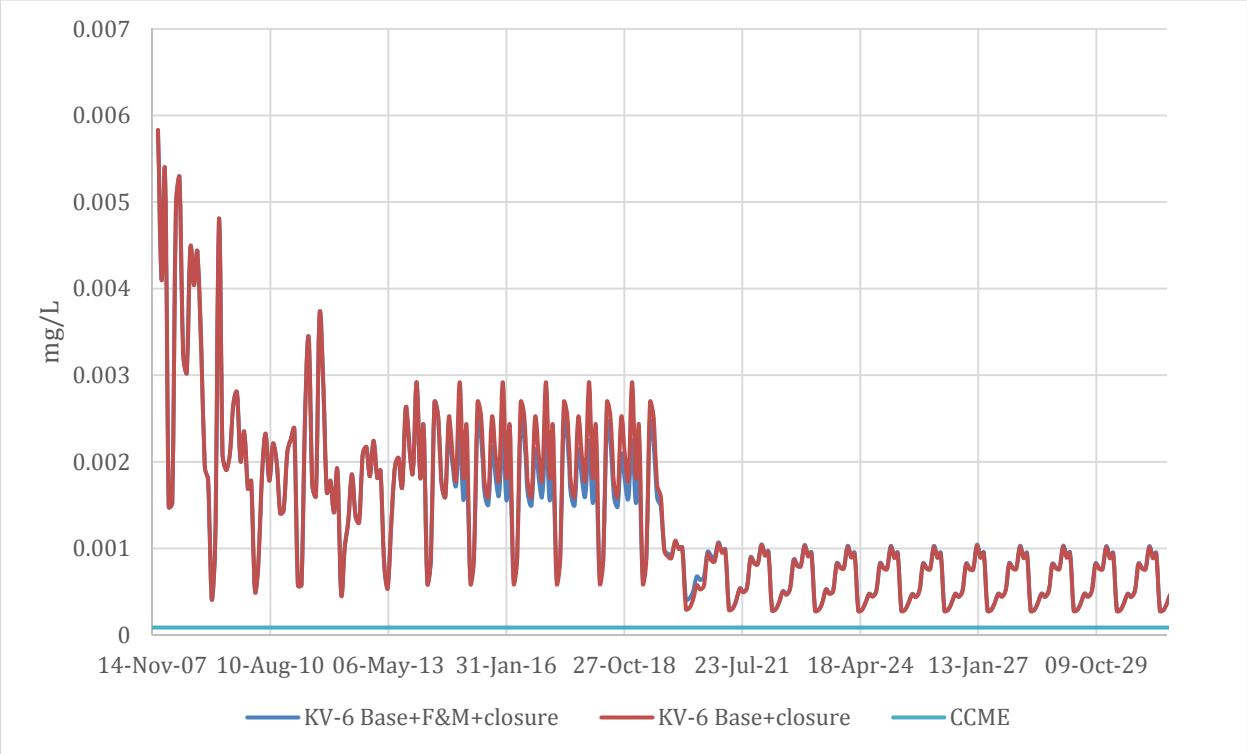

Figure 3 Calculated Total Cadmium at KV-6, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

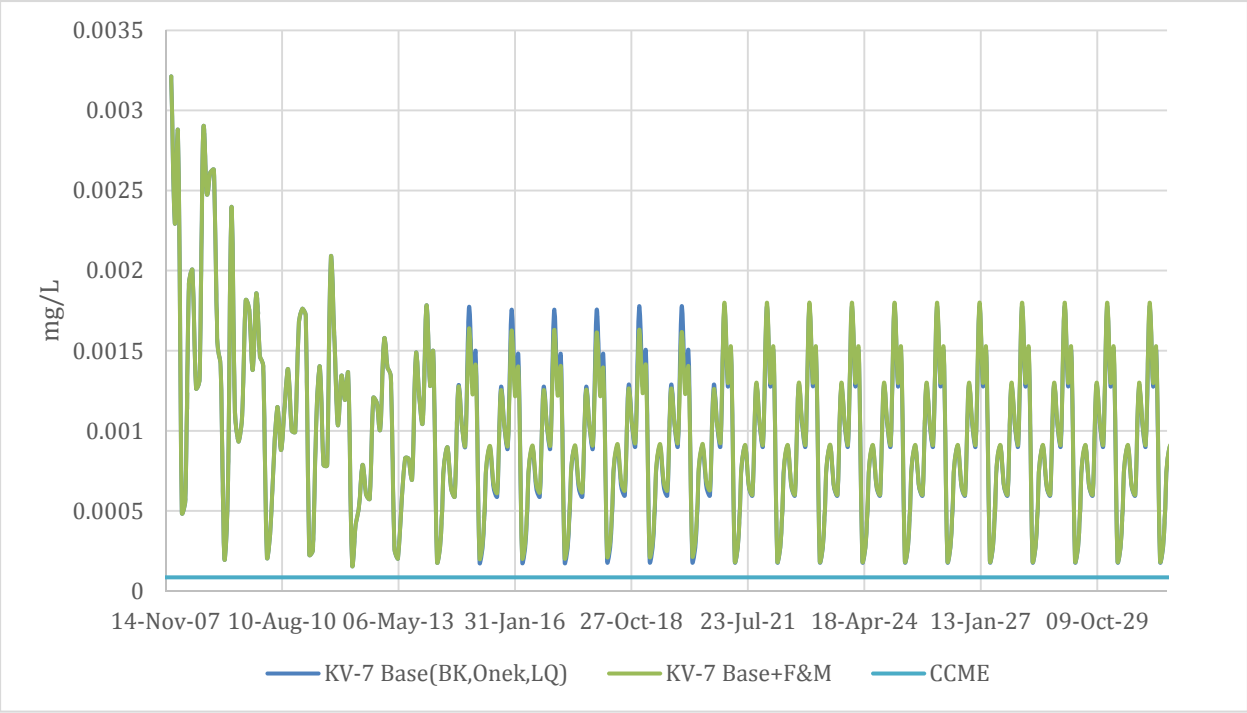

Figure 4 Calculated Total Cadmium at KV-7, Base Case vs. Base Case plus Flame and Moth

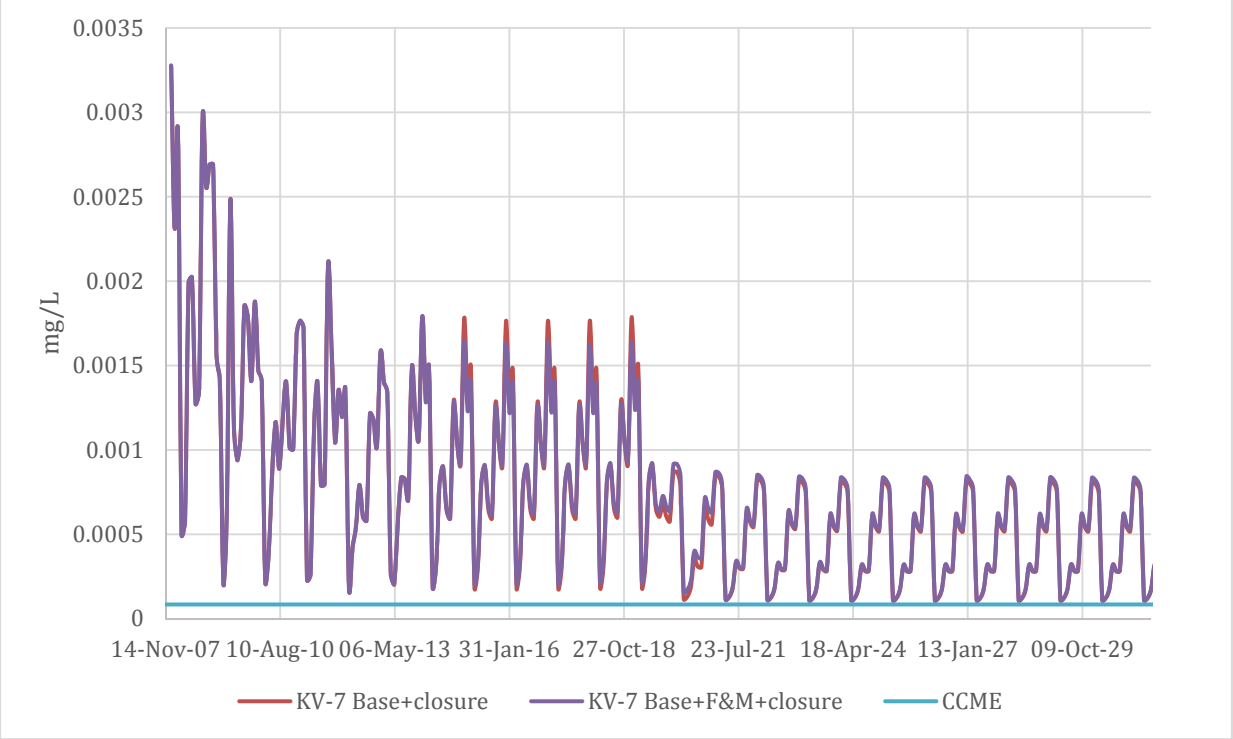

Figure 5 Calculated Total Cadmium at KV-7, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

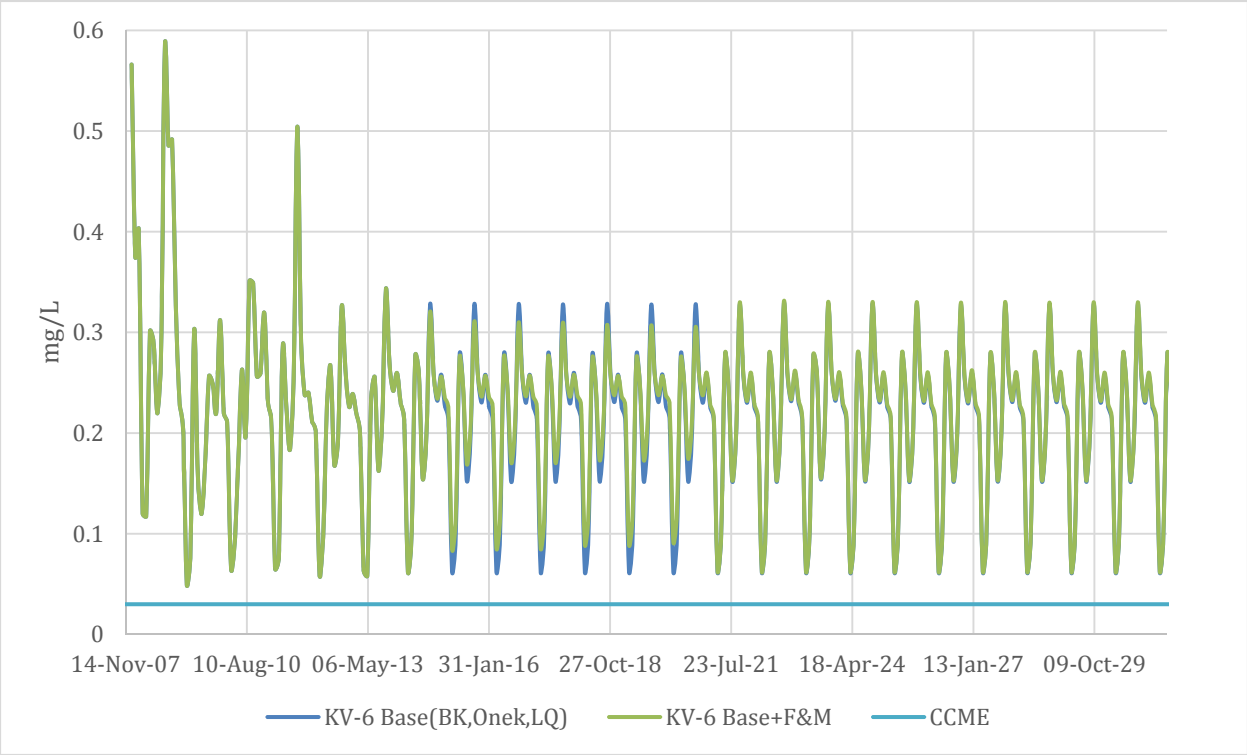

Figure 7 Calculated Total Zinc at KV-6, Base Case vs. Base Case plus Flame and Moth

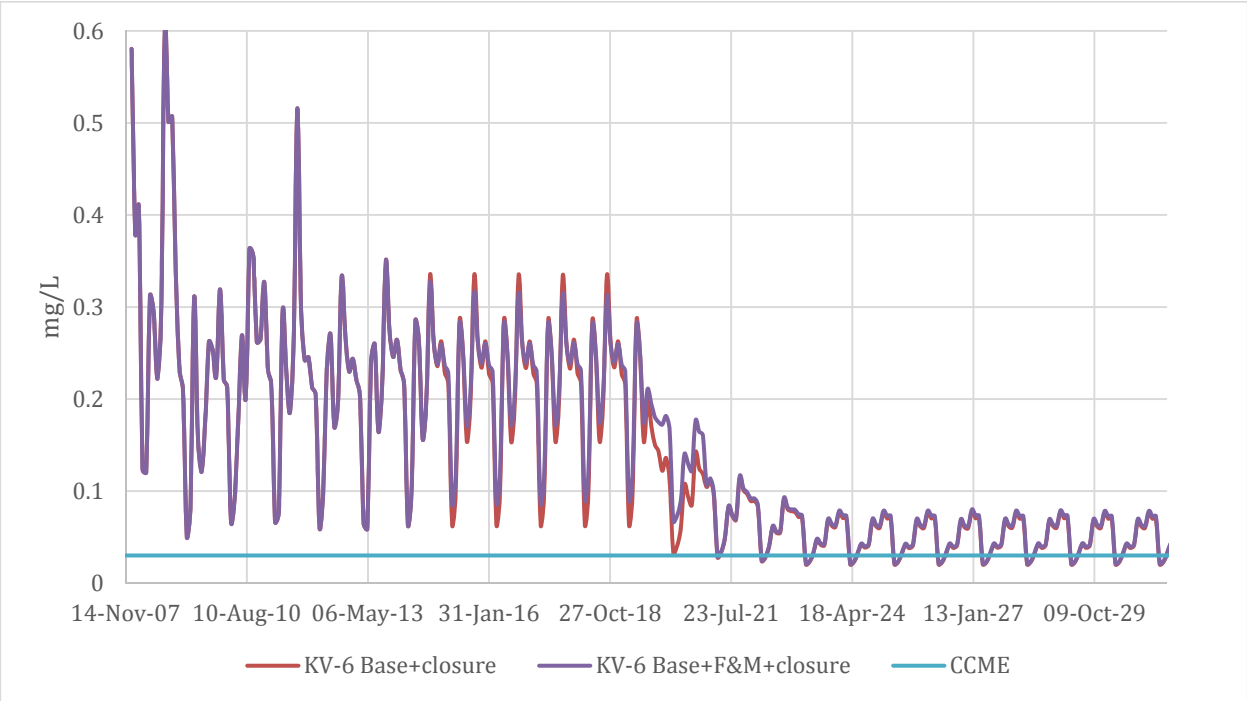

Figure 8 Calculated Total Zinc at KV-6, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

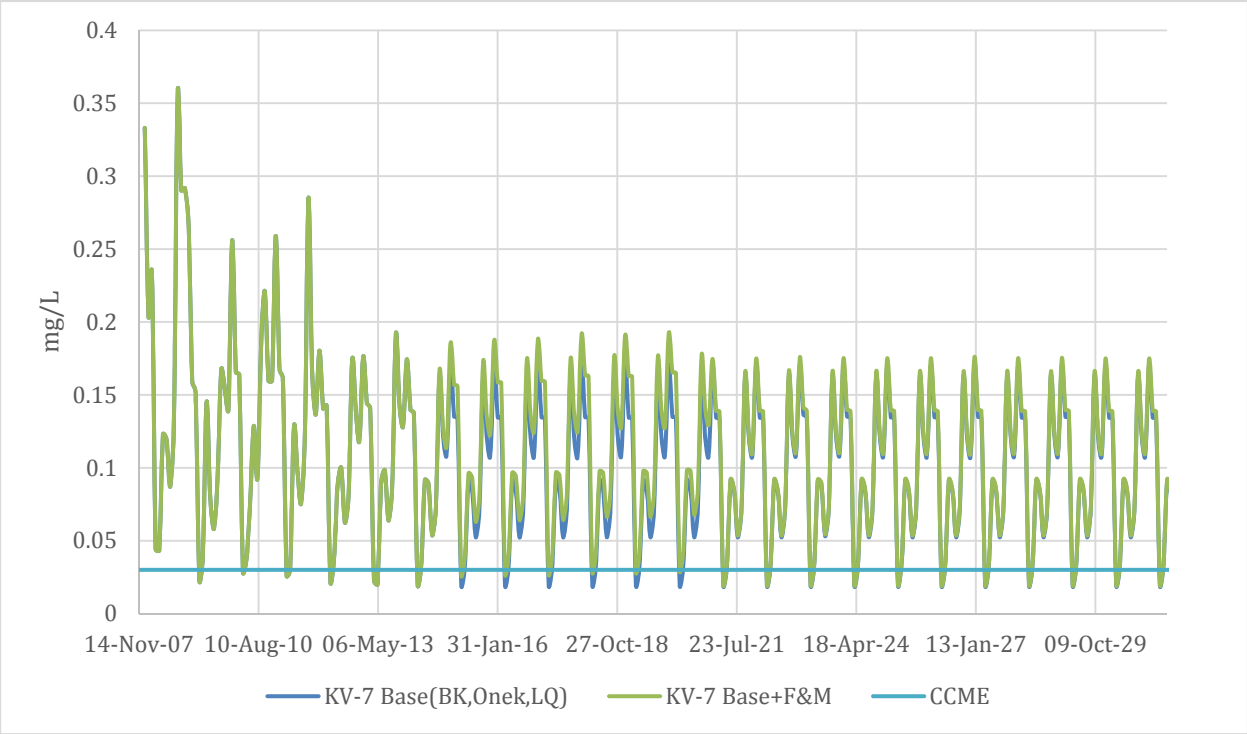

Figure 9 Calculated Total Zinc at KV-7, Base Case vs. Base Case plus Flame and Moth

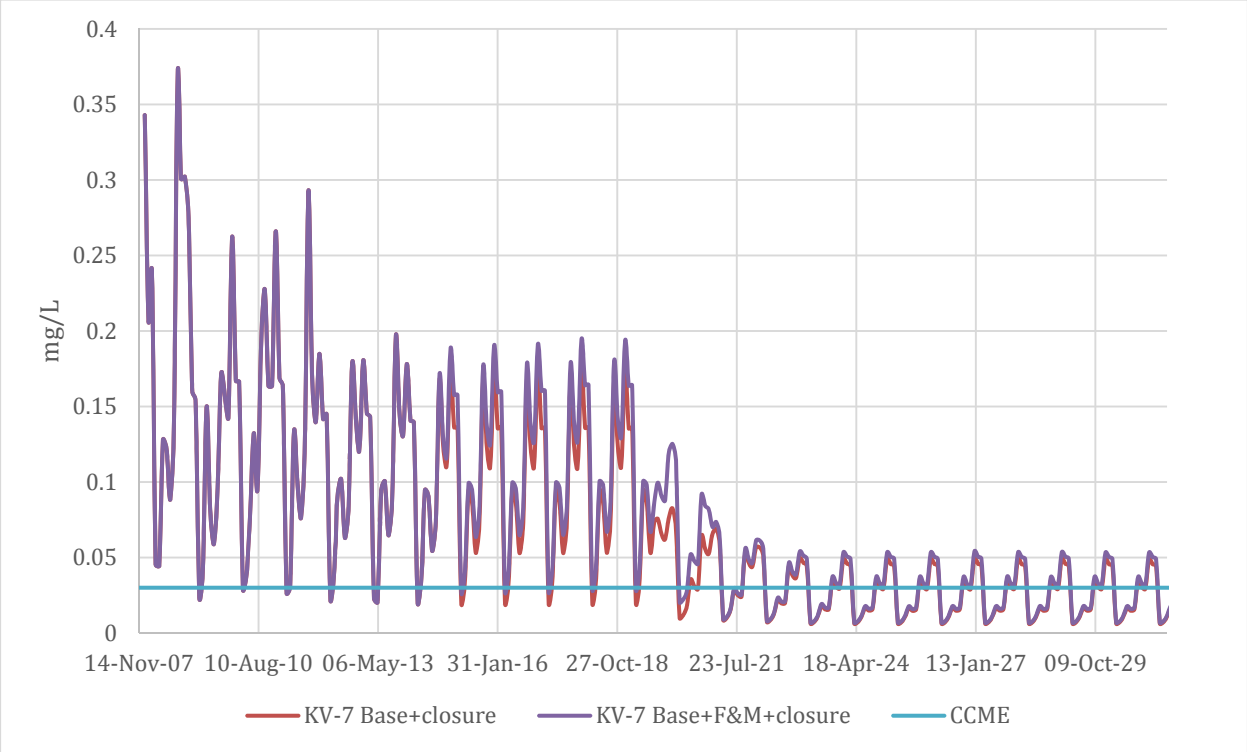

Figure 10 Calculated Total Zinc at KV-7, Base Case with Closure vs. Base Case plus Flame and Moth with Closure

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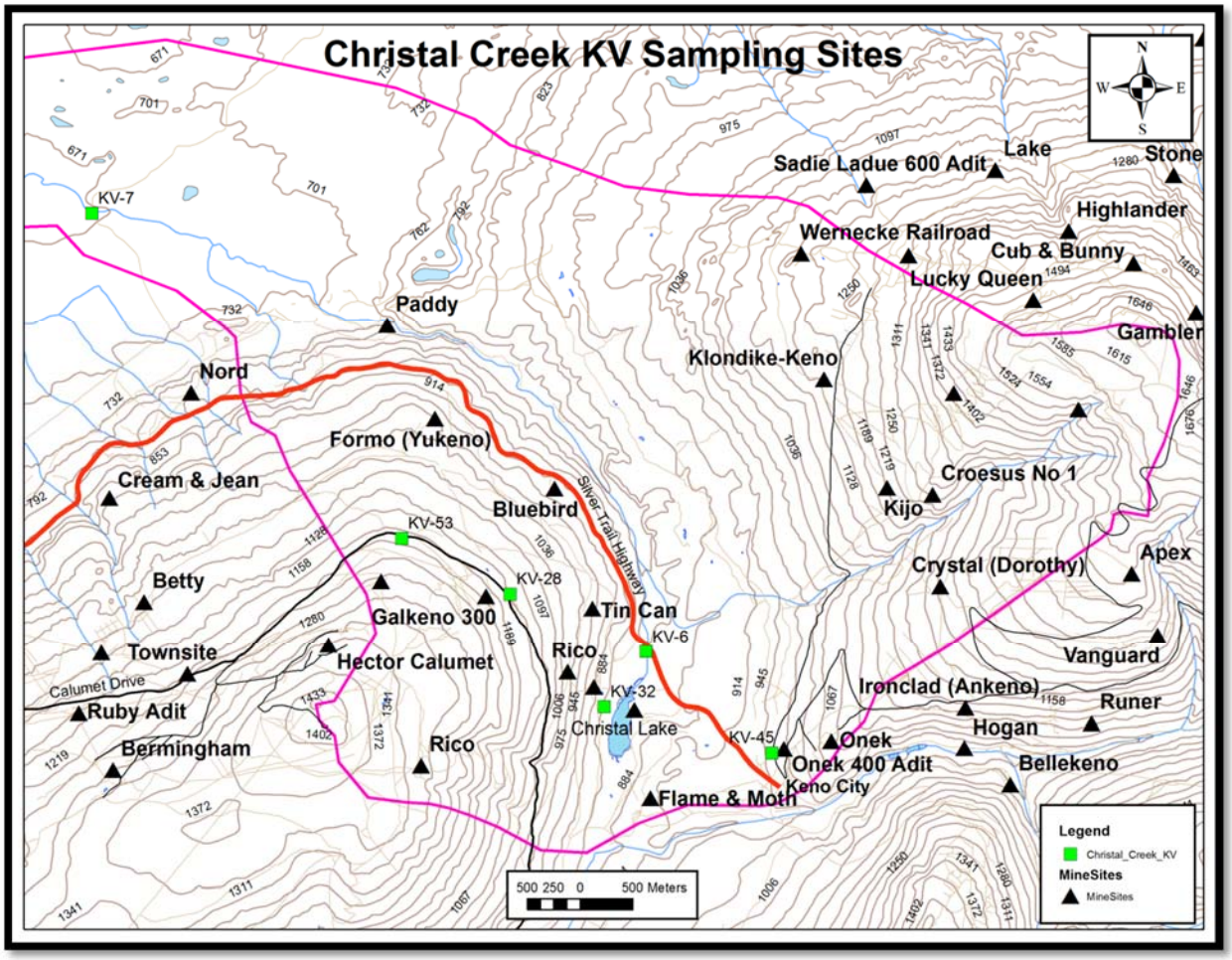
ATTACHMENT A

CHEMICAL MASS LOAD MODEL FOR CHRISTAL CREEK: DESCRIPTION AND RESULTS: 2013 UPDATE, DRAFT REPORT, NOVEMBER 12, 2013, INTERRALOGIC, INC.

Chemical Mass Load Model for Christal Creek: Description and Results: 2013 Update

Draft Report

November 12, 2013



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1.0 INTRODUCTION

Christal Creek receives chemical loads from a number of legacy mine sites. The types of sites that contribute chemical loads to Christal Creek include:

- Galkeno 300 and 900 water treatment plant discharge
- Untreated discharge from the Onek 400, Lucky Queen, and UN adits
- Mackeno tailings and dispersed tailings along Christal Creek
- Waste rock from both open pit and underground mine development on Keno Hill, Erikson Gulch, and Galena Hill
- Formo and Paddy mine sites located outside the United Keno Hill Mine (UKHM) reclamation boundaries

Reclamation alternatives to reduce chemical loads to Christal Creek are being investigated as part of closure studies for the UKHM. A simulation model of chemical loads to Christal Creek has been developed for the purpose of assisting in the evaluation of reclamation options.

Our original model was focused on cadmium, zinc, and sulphate (Interralogic, 2012a). In this 2013 update of the model, we have added input data and calculations to simulate loads of arsenic, copper, lead, nickel, silver, and selenium in a similar manner as previously developed for cadmium, zinc, and sulphate. While the focus of this report remains with cadmium and zinc, we also present results for the arsenic, copper, lead, and silver as part of this updated report on simulation modeling to estimate chemical loading effects of potential reclamation options. The purpose of this report is to present the results developed from a simulation model of the Christal Creek watershed designed to explore the potential reductions in chemical loads that could be achieved by different reclamation alternatives. The modeling framework, conceptual model, input data, calculation approaches, key assumptions, calibration procedures, are also presented.

The model has evolved over time as reclamation alternatives are developed and refined. The numerical results provided in this report for loads and concentrations differ slightly from Interralogic (2012a) because we were able to take advantage of an additional year and a half of monitoring data for Christal Creek and monitoring locations for inflows to Christal Creek for calibration and calculations of average monthly concentrations to represent future chemistry. In addition, we have made refinements in the water quality expectations for different water treatment approaches associated with the reclamation options.

2.0 SIMULATION FRAMEWORK

The model was developed in the GoldSim simulation framework (www.goldsim.com). GoldSim provides a framework for mathematically representing the dynamics of both water balance and chemical mass balance, which are the components needed to simulate chemical loadings in a watershed. GoldSim also provides capabilities to represent uncertainties in simulation results through probabilistic calculations. GoldSim relies on *Stochastic* elements to represent a range of possible uncertainties in an input parameter as a probability distribution. In a probabilistic simulation, GoldSim uses a Monte Carlo algorithm to select input parameters according to the specified uncertainty distribution during multiple runs of the simulation model, that is, the model is run many (e.g., 250 times) each time with a new set of input values for the uncertain parameters. The multiple runs are referred to as realizations of the simulation model. GoldSim assembles the results from the multitude or realizations and converts them to probability distribution outputs that describe the level of uncertainty in model results.

2.1 Simulation Settings

The simulation settings for the simulation model were:

- **Simulation type and length**: Calendar time with a start date of January 1, 2008 and end date of January 1, 2041 for a total length of 33 years. These dates were selected to provide a 30-year simulation period beyond current time.
- **Simulation time periods**: The simulation period is broken into two portions comprised of the following:
    - *Calibration Period* from January 1, 2008 through July 3, 2013: This period is when measured data are available for monitoring locations in the Christal Creek watershed, allowing for iterative adjustment of model parameters to obtain a match between observed and simulated results for water balance and chemical loads.
    - *Future Simulation Period* from July 3, 2013 to January 1, 2041: There are two aspects to the future simulation period: the first is the baseline condition in which no reclamation options are considered for mitigating chemical loads to Christal Creek, and the second is the representation of the potential effects of different reclamation options for decreasing chemical loads relative to the baseline condition.
- **Time step**: A time step of one day is used for all simulations. Most measured data are available on a weekly to monthly to quarter-year basis, although some data are at random intervals. A one-day time step provides a sufficiently small time increment for accurate representation of the measured data while not requiring extensive simulation run time.
- **Probabilistic simulations**: Generally, 250 realizations were run for probabilistic simulations to provide a sufficient population of results for statistically accurate representations of ranges of uncertainty in model simulation results.

3.0 CONCEPTUAL MODEL

Figure 3-1 shows a conceptual model of the hydrogeochemical processes controlling chemical loads in the Christal Creek watershed. The simulation model is based on the conceptualization of hydrogeochemical processes and available data depicted in Figure 3-1. The loads are a function of both rates of releases of chemical constituents from various sources and rates of flow in the transport routes from source areas to Christal Creek. The major known sources of chemical constituents and transport routes include included in the model are:

- Discharge from the water treatment plants at Galkeno 300 and Galkeno 900 through surface channels to Christal Lake and Christal Creek
- Discharge from non-treated adit discharge sources, including the Onek 400 Adit and UN Adit, and transport as surface water and groundwater
- Leaching of tailings in the Mackeno Mill area adjacent to the northeast side of Christal Lake and transport through the vadose and saturated zones to Christal Lake and Christal Creek
- Leaching of waste rock at legacy mine sites on Keno Hill and Galena Hill and transport through surface water and groundwater to Christal Lake and Christal Creek
- Natural background sources of chemicals in surface runoff and groundwater
- Discharge from the historical Lucky Queen mine and waste rock
- Discharge from the Formo and Paddy Mine areas, which are privately owned sites outside of the reclamation boundary and not subject to evaluation and reclamation measures

There are two other potential sources of chemical constituents that are not currently included in the model. These are:

- Tailings deposited in Christal Lake and
- Dispersed tailings located in sediments along Christal Creek downstream of Christal Lake.

These two potential sources are not included in the model at the current time for two reasons. First, there is a lack of information available to quantify their relative importance as contributors to metal loads. Second, measured data indicate much smaller masses of Zn and Cd are exiting the system at monitoring point KV-7 than known to be entering the watershed via the major load sources listed above. Thus, the excess in chemical loads from known sources masks the potential contributions from tailings in Christal Lake dispersed tailings in sediments, making it difficult to discern their importance. The excess of loading from known sources also indicates there is substantial attenuation of metals in the transport pathways. The effect of attenuation for reducing metal loads is taken into account in the model through the calibration process described below.

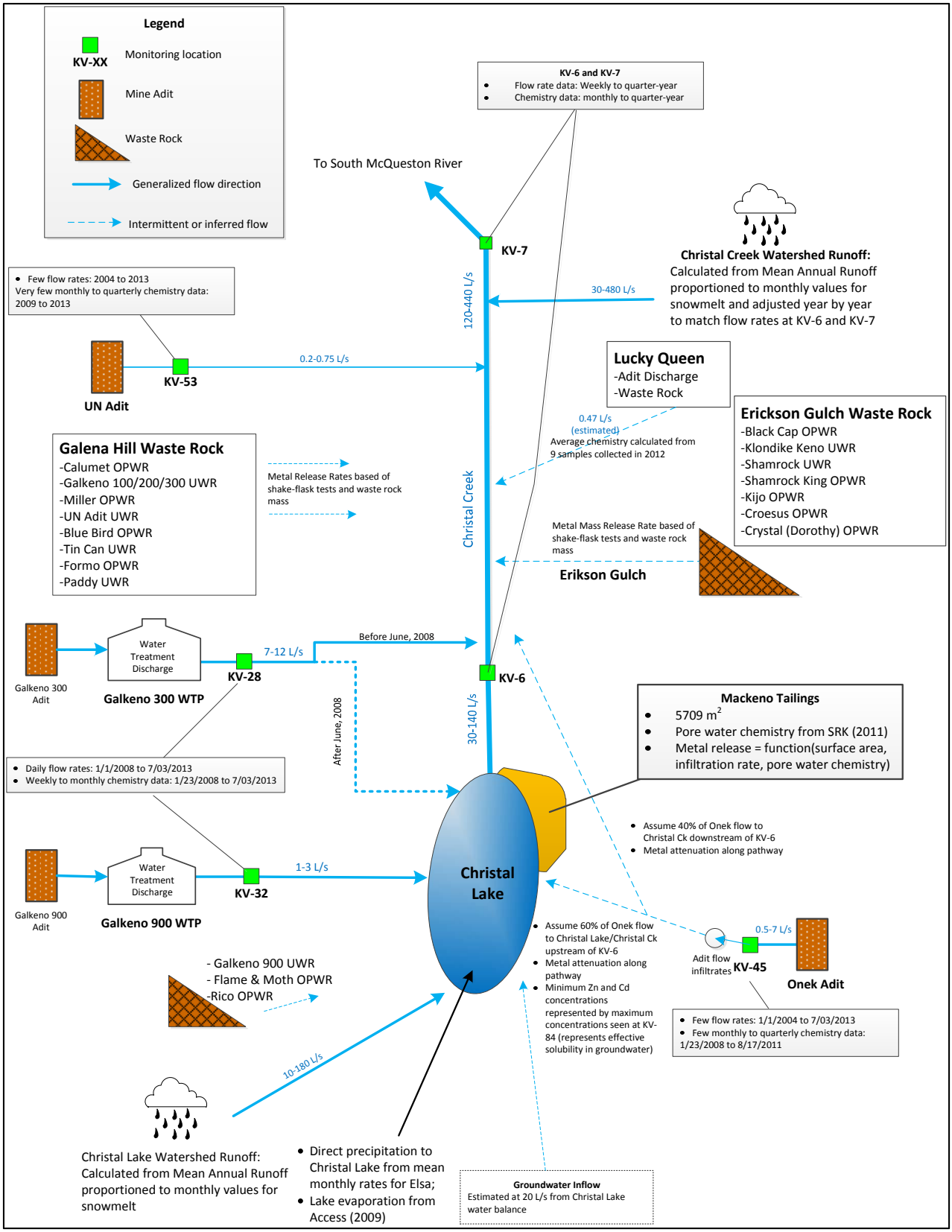

Figure 3-1: Conceptual model of metal loads for the Christal Creek watershed

4.0 MATHEMATICAL FORMULATIONS

The GoldSim simulation model is based on a series of mathematical equations to calculate chemical loads as a function of the dynamics of the watershed and effects expected to occur as a result of implementation of different reclamation options. The load calculations are split into two main simulation periods:

- Calibration period
- Future simulation period

The calibration period is the time for which measured data on concentrations and flow rates are available for model calibration. When measured concentrations were reported to be less than detection levels, concentrations were set equal to the detection concentration in calculations of chemical loads for the calibration period. Measured concentrations of lead, silver, and selenium were commonly less than detection levels.

The future simulation period refers to the simulation time after the availability of measured data during which extrapolations and estimates are used to predict future chemical loads based on the model calibration and estimated effects of different hypothetical reclamation options. The potential reclamation options considered in the model are described in more detail Section 9.

4.1 Load Source: Galkeno 300 Discharge

Calibration Period: Chemical loads ($L_{chemical}$) in units of mass per unit of time are calculated from:

$$L_{chemical} = C_{meas} \times F_{meas} \qquad \text{(Eq. 1)}$$

where C_{meas} is the measured concentrations of chemical constituents in mg/L and F_{meas} is the measured flow rate in L/s. Measured flow rates are available on a daily basis from monitoring point KV-28 for the time period of 1/1/2008 to 7/3/2013. Measured concentrations are available on a weekly to monthly basis for the same time period from KV-28. Monthly average flow rates and concentrations are given in Table 4-1 and Table 4-2, respectively.

Future Simulation Period: Chemical loads ($L_{chemical}$) in units of mass per unit of time are calculated from:

$$L_{chemical} = C_{yr_ave} \times F_{mon_ave} \qquad \text{(Eq. 2)}$$

where C_{yr_ave} is the average of measured concentrations for the last year of Galkeno 300 operation (August 2010 to August 2011), and F_{mon_ave} is the monthly average flow rate calculated from the period of record for discharge from the Galkeno 300 water treatment plant (Table 4-1). The averages are used repeatedly for the entirety of the future simulation period (Table 4-1 and Table 4-2).

Reclamation Option of Improved Water Treatment for the Future Simulation Period: Chemical loads are calculated according to:

$$L_{chemical} = C_{treatment} \times F_{mon_ave} \qquad \text{(Eq. 3)}$$

In Eq. 3, $C_{treatment}$ is the target concentration that would be achieved if improved water treatment measures were implemented at Galkeno 300. Target concentrations for improved water treatment are provided in Section 9.0.

4.2 Load Source: Galkeno 900 Discharge

Calibration Period: Chemical loads ($L_{chemical}$) in units of mass per unit of time are calculated in the same manner as for Galkeno 300 (Eq. 1) except that measured data from KV-32 are used. Measured flow rates are available on a daily basis from monitoring point KV-32 for the time period of 1/1/2008 to 7/3/2013. Measured concentrations are available on a weekly to monthly basis for the same time period from KV-28. Monthly average flow rates and concentrations are given in Table 4-1 and Table 4-3, respectively.

Future Simulation Period: Chemical loads ($L_{chemical}$) in units of mass per unit of time are calculated in the same manner as for Galkeno 300 (Eq. 2) except that average concentrations and average monthly flow rates are derived from KV-32 data. The averages are used repeatedly for the entirety of the future simulation period (Table 4-1 and Table 4-3).

Reclamation Option of Improved Water Treatment for the Future Simulation Period: Chemical loads are calculated according to Eq. 3 with target concentrations for improved treatment. Target concentrations for water treatment are provided in Section 9.0.

Table 4-1: Monthly average flow rates for Galkeno 300 (KV-28) and Galkeno 900 (KV-32) water treatment plant discharges

Month	Galkeno 300 Average Flow Rate (L/s) (2008-2013 Data)	Galkeno 900 Average Flow Rate (L/s) (2008-2013 Data)
Jan	10.85	2.91
Feb	9.65	2.87
Mar	9.29	2.76
Apr	8.79	2.79
May	10.00	2.82
Jun	12.52	2.76
Jul	11.30	2.77
Aug	11.73	2.82
Sep	12.47	2.84
Oct	12.70	2.69
Nov	12.43	2.75
Dec	11.77	2.78

Table 4-2: Monthly average chemistry (mg/L) observed for Galkeno 300 (KV-28) water treatment plant discharges

Month	Zn	Cd	SO_4	NH_3*	As	Cu	Pb	Ni	Se	Ag
Jan	0.237	0.0094	875	0.06	0.0002	0.0002	0.0001	0.0010	0.00012	0.00001
Feb	0.274	0.0054	913	0.10	0.0012	0.0009	0.0002	0.0048	0.00057	0.00006
Mar	0.279	0.0080	933	0.10	0.0010	0.0009	0.0002	0.0052	0.00060	0.00006
Apr	0.241	0.0060	872	0.10	0.0343	0.0022	0.0086	0.0118	0.03366	0.00171
May	0.218	0.0055	824	0.10	0.0010	0.0015	0.0002	0.0048	0.00077	0.00007
Jun	0.991	0.0235	871	0.10	0.0011	0.0015	0.0010	0.0071	0.00074	0.00008
Jul	0.478	0.0168	877	0.10	0.0014	0.0015	0.0025	0.0041	0.00064	0.00014
Aug	0.166	0.0113	896	0.10	0.0010	0.0009	0.0006	0.0044	0.00062	0.00007
Sep	0.254	0.0090	941	0.10	0.0012	0.0009	0.0004	0.0052	0.00072	0.00008
Oct	0.195	0.0083	954	0.10	0.0008	0.0008	0.0001	0.0040	0.00056	0.00006
Nov	0.280	0.0074	933	0.10	0.0016	0.0008	0.0039	0.0040	0.00054	0.00007
Dec	0.199	0.0061	925	0.10	0.0011	0.0009	0.0012	0.0022	0.00058	0.00007

*No measured concentrations available (0.1 mg/L is estimated)

Table 4-3: Monthly average chemistry (mg/L) observed for Galkeno 900 (KV-32) water treatment plant discharges

Month	Zn	Cd	SO_4	NH_3*	As	Cu	Pb	Ni	Se	Ag
Jan	0.142	0.00006	962	0.026	0.015	0.0008	0.0032	0.0675	0.0004	0.000056
Feb	0.214	0.00014	1017	0.026	0.015	0.0009	0.0002	0.0653	0.0007	0.000058
Mar	0.145	0.00011	980	0.026	0.015	0.0008	0.0016	0.0484	0.0005	0.000054
Apr	0.110	0.00172	988	0.026	0.045	0.0022	0.0085	0.0516	0.0337	0.001706
May	0.081	0.00009	969	0.026	0.011	0.0024	0.0021	0.0480	0.0006	0.000093
Jun	0.128	0.00020	996	0.026	0.012	0.0015	0.0028	0.0593	0.0006	0.000221
Jul	0.292	0.00011	989	0.026	0.010	0.0019	0.0027	0.0468	0.0007	0.000076
Aug	0.076	0.00008	951	0.026	0.014	0.0013	0.0002	0.0621	0.0006	0.000067
Sep	0.443	0.00016	988	0.026	0.020	0.0009	0.0004	0.0797	0.0006	0.000101
Oct	0.144	0.00010	1015	0.026	0.015	0.0007	0.0002	0.0564	0.0005	0.000053
Nov	0.080	0.00007	983	0.026	0.015	0.0008	0.0002	0.0440	0.0005	0.000044
Dec	0.211	0.00010	1004	0.026	0.014	0.0008	0.0002	0.0665	0.0005	0.000057

*Only one measured concentration available (0.026 mg/L)

4.3 Load Source: Onek 400 Adit Discharge

Calibration Period: Chemical loads ($L_{chemical}$) in units of mass per unit of time are calculated from:

$$L_{chemical} = C_{mon_ave} \times F_{mon_ave} \times A_f \qquad \text{(Eq. 4)}$$

where C_{mon_ave} is the monthly average of measured concentrations in mg/L, F_{mon_ave} is the monthly average of measured flow rates in L/s or estimates for months with no measured data (Table 4-5), and A_f is an attenuation factor specific to each chemical constituent. Monthly averages for concentrations and flow rates were used to

represent seasonal patterns observed for Onek 400 Adit flows and chemistry (Table 4-4 and Table 4-5). The monthly averages are used repeatedly for the entirety of the future simulation period.

We assume that 40% of the chemical load from the Onek 400 Adit enters the groundwater system and eventually reaches Christal Lake or Christal Creek upstream of KV-6 and 60% enters Christal Creek downstream of KV-6. The travel time is estimated at about 4 years. The chemical loads from the Onek 400 Adit are decreased due to attenuation processes in the groundwater system by processes such as solubility, cation exchange, and adsorption with the minimum concentration constrained by the expected presence of elevated levels of some metals, such as zinc and cadmium, in the groundwater path below the Adit. The values of specific attenuation factors were determined through the calibration process (discussed in Section 6.2).

Future Simulation Period: Chemical loads are also calculated according to Eq. 4.

Reclamation Option of Onek 400 Adit Water Treatment for the Future Simulation Period: The possible reclamation options for the Onek 400 Adit discharge include water treatment or reclamation of the Onek pit to decrease the rate of discharge. For options that continue to discharge the Onek 400 Adit discharge water at or near the current adit location, we assume the minimum possible loads specifically for zinc and cadmium are constrained by various geochemical processes (e.g., solubility, adsorption, ion exchange) in the flow path directly below the adit during the past years of discharge. We used the average concentrations of zinc (1.08 mg/L) and cadmium (0.01 mg/L) measured at well KV-84, which is located immediately downgradient of the Onek 400 Adit, as approximations of the effective solubilities of zinc and cadmium in the groundwater flow path. These concentrations are substantially lower than those in the Onek 400 discharge water (see Table 4-5). For reclamation options that involve continued discharge of adit water to the current location, we assume that zinc and cadmium concentrations in the groundwater flow path downgradient of the Onek 400 Adit cannot be lower than these maximum concentrations measured for KV-84 in calculations of chemical loads. In addition, we assume that and decrease in load due to reclamation would not be instantaneous but would occur gradually over a four year time span because of the distance between the Onek 400 Adit and Christal Creek. The time for Onek 400 Adit water to travel through the groundwater zone to Christal Creek is estimated to be about 4 years.

Table 4-4: Average flow rates for the Onek 400 Adit

Month	Onek 400 Adit Flow Rate (L/s)
Jan	1.84
Feb	0.50
Mar	1.00
Apr	1.50
May	0.92
Jun	2.93
Jul	1.22
Aug	0.63
Sep	2.20
Oct	2.42
Nov	1.84
Dec	1.84

Table 4-5: Monthly average chemistry (mg/L) for the Onek 400 Adit (KV-45) discharge

Month	Zn	Cd	SO_4	NH_3*	As	Cu	Pb	Ni	Se	Ag
Jan	34.4	0.389	292	0.025	0.0321	0.0044	0.0011	0.0202	0.0008	0.00007
Feb	32.0	0.351	283	0.025	0.0334	0.0027	0.0019	0.0182	0.0008	0.00008
Mar	32.6	0.348	303	0.025	0.0320	0.0036	0.0009	0.0188	0.0008	0.00008
Apr	29.4	0.314	287	0.025	0.0842	0.0040	0.0170	0.0283	0.0672	0.00340
May	112.1	3.901	416	0.025	0.0354	0.0376	0.0120	0.0255	0.0011	0.00016
Jun	117.4	2.555	462	0.025	0.0360	0.0195	0.0062	0.0305	0.0014	0.00015
Jul	84.1	1.373	424	0.025	0.0600	0.0240	0.0085	0.0285	0.0007	0.00009
Aug	71.2	1.035	382	0.025	0.0346	0.0076	0.0047	0.0253	0.0008	0.00010
Sep	48.3	0.537	337	0.025	0.0290	0.0026	0.0010	0.0210	0.0008	0.00010
Oct	56.8	0.747	351	0.025	0.0746	0.0082	0.0068	0.0227	0.0005	0.00008
Nov	41.2	0.516	358	0.025	0.0320	0.0025	0.0011	0.0210	0.0005	0.00006
Dec	36.5	0.439	308	0.025	0.0288	0.0018	0.0013	0.0204	0.0008	0.00010

*Only two measured concentration available (average = 0.025 mg/L)

4.4 Load Source: UN Adit Discharge (KV-53)

Calibration Period: Chemical loads are calculated according to Eq. 1. There are few data available for measured flow rates (13 measurements made during May to August between 2010 and July 2013). Flow rates for the winter months were estimated from the average of the measured rates at 0.3 L/s. Table 4-6 gives a summary of the monthly average flow rates for the UN Adit. Concentration data were available from 17 samples collected between October 2009 and July 2013. Table 4-7 gives the monthly average concentrations determined from the available data for the UN Adit. The flow rate and concentration data in Table 4-6 and Table 4-7 were used to calculate chemical loads for the entirety of the simulation period, assuming that the entire chemical load enters Christal Creek downstream of KV-6.

Future Simulation Period: Chemical loads are also calculated according to Eq. 1.

Reclamation Option of UN Adit Water for the Future Simulation Period: The chemical loads from the UN adit are low; hence a specific reclamation option for the discharge is not currently being considered. Reclamation of waste rock at the UN Adit and nearby sites (Miller) is included in the representation of the waste rock reclamation option.

Table 4-6: Average flow rates for the UN Adit (KV-53)

Month	UN Adit Flow Rate (L/s)
Jan	0.30
Feb	0.30
Mar	0.30
Apr	0.30
May	0.13
Jun	0.22
Jul	0.47
Aug	0.50
Sep	0.60
Oct	0.30
Nov	0.30
Dec	0.30

Table 4-7: Monthly Average concentrations (mg/L) for the UN Adit (KV-53)

Month	Zn	Cd	SO_4	NH_3	As	Cu	Pb	Ni	Se	Ag
Jan	0.044	0.0002	104	No data	0.0104	0.0010	0.0010	0.0020	0.0008	0.00010
Feb	0.159	0.0010	97	No data	0.0263	0.0015	0.0026	0.0034	0.0006	0.00010
Mar	0.159	0.0010	97	No data	0.0263	0.0015	0.0026	0.0034	0.0006	0.00010
Apr	0.159	0.0010	97	No data	0.0263	0.0015	0.0026	0.0034	0.0006	0.00010
May	0.017	0.0001	76	No data	0.0079	0.0010	0.0006	0.0030	0.0008	0.00010
Jun	0.028	0.0002	13	No data	0.0038	0.0030	0.0049	0.0033	0.0005	0.00015
Jul	0.065	0.0011	96	No data	0.0084	0.0019	0.0007	0.0037	0.0005	0.00010
Aug	0.044	0.0002	113	No data	0.0074	0.0010	0.0020	0.0026	0.0008	0.00010
Sep	0.093	0.0004	105	No data	0.0107	0.0010	0.0010	0.0040	0.0009	0.00010
Oct	0.567	0.0030	110	No data	0.0870	0.0014	0.0065	0.0041	0.0006	0.00008
Nov	0.131	0.0006	100	No data	0.0371	0.0002	0.0014	0.0020	0.0001	0.00002
Dec	0.030	0.0001	97	No data	0.0100	0.0010	0.0005	0.0030	0.0008	0.00010

4.5 Load Source: Mackeno Mill Tailings

Calibration Period: Approximately, 8440 tons of tailings from historic operations at the Mackeno were deposited in an undammed pile near the northeast side of Christal Lake (Access, 2009). These tailings contain sulfide minerals that are exposed to oxidative weathering processes. A sample of porewater from the tailings collected in September 2011 had 0.299 mg Cd/L and 195 mg Zn/L (Table 4-8). We used these concentrations to calculate the rate of chemical loads with the following equation:

$$L_{chemical} = A_{tail} \times Precip_{mon_ave} \times I_{fraction} \times C_{porewater} \qquad \text{(Eq. 5)}$$

where A_{tail} is the surface area (5709 m^2), $Precip_{mon_ave}$ is the monthly average rate of precipitation (Table 4-9), $I_{fraction}$ is the fraction of precipitation that infiltrates through the tailings (estimated at 45%), and $C_{porewater}$ are the recently SRK-measured porewater concentrations. We assume the entire chemical load from the Mackeno tailings enters Christal Lake or Christal Lake upstream of KV-6.

Future Simulation Period: Equation (5) is also used for the future simulation period.

Reclamation Option of Removal and/or Cover for the Future Simulation Period: The potential effects of reclamation on chemical loads require a number of assumptions about future performance. The key assumptions are:

- The reclamation of the Mackeno tailings would result in a decrease in chemical loads to Christal Creek due to decreased exposure to weathering, decreased infiltration, and potentially fewer tailings in the event that the tailings were removed.
- If lime is tilled into the tailings as part of the reclamation process, then chemical loads would be decreased by 90% due to the acid neutralizing effects of the lime and associated precipitation of stable metal oxyhydroxides and sulfate minerals.

- Re-grading and placement of clean soil cover will reduce the infiltration rate to 22% of mean annual precipitation based on experience at Brewery Creek (J. Harrington, personal communication).
- Reductions in chemical releases will take place over about three years.
- For the option of removal of the Mackeno tailings to the Valley Tailings facility at Elsa, the disruption of the surface during the removal process will lead to a temporary doubling of chemical releases for one year with loads decreasing to 5% of the current estimated non-reclaimed load over a period of 4 years. The minimum value of 5% is assumed to be due to residual tailings located in areas not accessible to excavation and areas of unknown tailings mixed in with natural soils.

Table 4-8: Porewater chemistry for Mackeno Tailings (sample MDP-3 collected Oct 6, 2011; D. MacGregor, SRK personal communication)

Constituent	Concentration (mg/L)
Zn	195
Cd	0.299
SO_4	1290
NH_3	0.1
As	0.565
Cu	0.004
Pb	0.339
Ni	0.308
Se	0.0008
Ag	0.0002

Table 4-9: Climate data (Access, 2004)

Month	Elsa Average Precipitation (mm/mon)	Lake Evaporation (mm/mon)
Jan	20	0
Feb	28	0
Mar	18	0
Apr	18	40
May	25	90
Jun	40	108
Jul	60	107
Aug	52	85
Sep	42	25
Oct	45	5
Nov	38	0
Dec	35	0

4.6 Load Source: Waste Rock

Calibration Period: The rates of metal leaching from waste rock were based on the procedure developed by SRK (2007/08) from shake flask leaching tests on various waste rock samples. The leaching data for open pit waste rock were averaged together and data for underground mine waste rock were averaged together. This averaging yielded two sets of rates of metal release (R_{metal}) in units of kg metal/kg rock/yr for each of open pit waste rock and underground mine waste rock. Table 4-10 gives a summary of the waste rock tonnages and types. Table 4-11 gives the rates of metal leaching determined for waste rock.

The rates of metal loadings for open pit waste rock sites (L_{WR_Pit}) in units of kg/yr are calculated using the data in Table 4-10 and Table 4-11 according to:

$$L_{WR_Pit} = R_{metal} \times M_{WR_Pit} \qquad \text{(Eq. 6)}$$

where M_{WR_Pit} is the tonnage of open pit waste rock. Likewise, for underground waste rock, the rates of metal loading ($L_{WR_Underground}$) are defined by:

$$L_{WR_Underground} = R_{metal} \times M_{WR_Underground} \qquad \text{(Eq. 7)}$$

where $M_{WR_Underground}$ is the tonnage of underground mine waste rock.

Future Simulation Period: Equations 6 and 7 are also used for the future simulation period.

Reclamation Option of Cover and Re-grading for the Future Simulation Period: For the scenario where the waste rock sites would potentially re-graded and covered with clean soil to reduce exposure to weathering processes and water, the rates of metal loading were decreased to 22% of current levels defined by Eqs. 6 and 7. The total decrease to 22% is based on experience at Brewery Creek where cover performance has been assessed. The decrease in loading was assumed to occur over a 4-year period.

Table 4-10: Summary of waste rock sites in the Christal Creek watershed

Waste Rock Location	Metric tons	Type
Calumet Pit	1000000	Open Pit
Onek Pit	402000	Open Pit
BlackCap	390000	Open Pit
Galkeno100_200_300	150000	Adit
Lucky Queen	61900	Adit
Miller	63000	Open Pit
Formo	27800	Open Pit
Galkeno_900	20800	Adit
Shamrock_King	16200	Open Pit
Shamrock	9000	Adit
UN_Adit	7500	Adit
Klondike-Keno	3200	Adit
Paddy	2000	Adit
Flame&Moth	1562	Open Pit
Tin Can	1000	Adit
Kijo	100	Open Pit
Croesus	100	Open Pit
Bluebird	240	Open Pit
Rico	100	Open Pit

Table 4-11: Rates of chemical release from mine waste rock based on Shake-Flask Extraction tests from SRK (2007/08)

Constituent	Open Pit Waste Rock Release Rates (mg/kg/yr)*	Adit Waste Rock Release Rates (mg/kg/yr)
As	1.22E-04	0.0062
Cd	8.34E-04	0.0229
Cu	3.98E-04	0.014
Pb	0.048	0.029
Ni	8.57E-05	0.021
Ag	2.53E-05	4.80E-05
Zn	0.0093	0.208
SO_4	150*	150*
Se	1.51E-04	0.0019

*Averaged from 28 shake flask leaching tests

** Averaged from 18 shake flask leaching tests

4.7 Load Source: Natural Background Surface Runoff

The rate of surface runoff (S_{runoff}) in L/s was represented in the simulation model from the product of the watershed area ($A_{watershed}$) and the mean annual runoff (MAR) proportioned according to an estimate of the seasonal runoff pattern month by month (SR_{month}) in units of percent of total runoff:

$$S_{runoff} = A_{watershed} \times MAR \times SR_{month} \qquad \text{(Eq. 8)}$$

The mean annual runoff rates were 240 mm/yr for the watershed upstream of KV-6 based on the value used in the spreadsheet mass load model developed by Access Consulting and 213.3 mm/yr for the watershed draining to the KV-6 to KV-7 stretch of Christal Creek reported in Clearwater (2010). The seasonal runoff monthly pattern was also obtained from the Access Consulting spreadsheet model (Table 4-12). The chemical loads from surface runoff were calculated by multiplying the flow rate from Eq. 8 times the estimate concentrations for surface runoff in Table 4-13. The concentrations in Table 4-13 were estimated through the calibration process.

Table 4-12: Values used to represent a seasonal pattern of surface runoff

Month	Percent of Mean Annual Runoff
Jan	1.6%
Feb	1.6%
Mar	1.6%
Apr	18.3%
May	18.3%
Jun	18.3%
Jul	9.5%
Aug	9.5%
Sep	9.5%
Oct	4.0%
Nov	4.0%
Dec	4.0%

Table 4-13: Estimated concentrations for surface runoff

Constituent	Surface Runoff to KV-6 (mg/L)	Surface Runoff to KV-7 (mg/L)
As	0.002	0.00001
Cd	0	0
Cu	0.002	0.001
Pb	0.001	0.0005
Ni	0.0004	0.0008
Ag	7.8E-06	2.0E-05
Zn	0	0
SO_4	200	120
Se	0.00065	0.0006
NH_3	0.01	0.01

4.8 Load Source: Natural Background Groundwater

Calibration Period: Calibration of the water balance for Christal Lake indicated a deficit of about 20 L/s compared to the sum of all measured inflows to Christal Lake and Christal Creek upstream of KV-6 (discussed below). Consequently, we assumed that this deficit was most likely to be groundwater entering Christal Lake from the upgradient catchment that extends to the southeast area of Keno City. The chemical load from groundwater was calculated from the following equation:

$$L_{chemical} = C_{KC_ave} \times 20\ L/s \qquad \text{(Eq. 9)}$$

where C_{KC_ave} is the average concentration from monitoring well KC-MW-2 (Table 4-14). This well is located outside the expected flowpath between the Onek 400 Adit and Christal Creek and is assumed to provide a reasonable approximation of background groundwater chemistry.

Future Simulation Period: Equation 9 was also used for the future simulation period.

Reclamation Option of Removal and/or Cover for the Future Simulation Period: There are no reclamation options under consideration for natural groundwater.

Table 4-14: Estimated chemistry of groundwater

Constituent	Average Concentration (mg/L)
As	0.00084
Cd	0.0013
Cu	0.0009
Pb	0.0010
Ni	0.0015
Ag	7.8E-06
Zn	0.062
SO_4	163
Se	0.0014
NH_3	0.01

4.9 Load Source: Formo and Paddy Mines

The Formo and Paddy Mines are privately held properties not located within the UKHM reclamation planning area. They have open areas of mining-related disturbances where elevated concentrations of zinc and sulfate have been reported. There are few flow rate and concentration data available to quantify the loads from these sources; hence the load calculation approaches presented below are estimations based on available information.

Calibration Period: Chemical loads from the Paddy Mine are based on concentration data reported for a small tributary near the access road by Graff and Burns (2011 - site PMRD TRIB) (Table 4-15). Graff and Burns (2011) did not measure a flow rate for this tributary. We used a flow rate of 1 L/s for the tributary based on visual estimation of the stream multiplied by the concentrations (Table 4-15) to estimate the load from Paddy.

Chemical loads from the Formo Mine are based on concentration data reported for a seep located about 10 m from Christal Creek (location 57-WQ-SCD-01 in PWGSC, 2000) (Table 4-15) and an estimated rate of runoff for the area around the seep from the location map in PWGSC (2000).

Table 4-15 Formo and Paddy concentration and flow rate data

Constituent	Formo Mine Area Concentrations (mg/L)	Paddy Mine Area Concentrations (mg/L)
As	0.01	0.0011
Cd	1.25	0.000006
Cu	0.0024	0.0011
Pb	0.0003	0.00032
Ni	0.1	(0.0) No data
Ag	0.00024	(0.0) No data
Zn	25.6	0.0025
SO_4	2030	28
Se	0.019	(0.0) No data
NH_3	(0.0) No data	(0.0) No data
Source	PWGSC (2000) Location: 57-WQ-SCD-01	Graff and Burns (2011); Location PMRD-TRIB
Flow Rate (L/s)	1.0	0.01 to 0.03*

* Drainage area of 9600 m^2 multiplied monthly precipitation rate and runoff coefficient of 15%

Future Simulation Period: Chemical loads are also calculated in the same manner as for the calibration period.

Reclamation Option of UN Adit Water for the Future Simulation Period: Chemical loads are also calculated in the same manner as for the calibration period because the Formo and Paddy Mines are not subject to future reclamation for the purposes of this report.

5.0 STOCHASTIC PARAMETERS

Stochastic elements were incorporated into the model to estimate the uncertainties future chemical loads in probabilistic simulations. Table 5-1 gives a list of the stochastic elements used in the model. These elements were simple multipliers that are applied as a percentage of uncertainty to specific inputs used in model calculations. For example, the stochastic element named *Stoch_Onek_FlowRate* has a truncated normal distribution that is described in Figure 5-1. In a probabilistic simulation, a new value is selected from this distribution for each model realization. The monthly average flow rate for the Onek 400 Adit is multiplied by this new value, which is a percentage range with a mean of 100% such that the mean value of the input parameter is always equal to the best estimate defined by the equations in Section 4. After a large number of realizations (e.g., 250), a range of flow rate for the Onek 400 Adit will have been produced with a distribution that is the same as that shown in Figure 5-1. The effects of this range of flow rates will be incorporated into a set of results for chemical loads that are also probability distributions. The simple multipliers provide a means to estimate uncertainties based on variability observed in measured data and professional judgment.

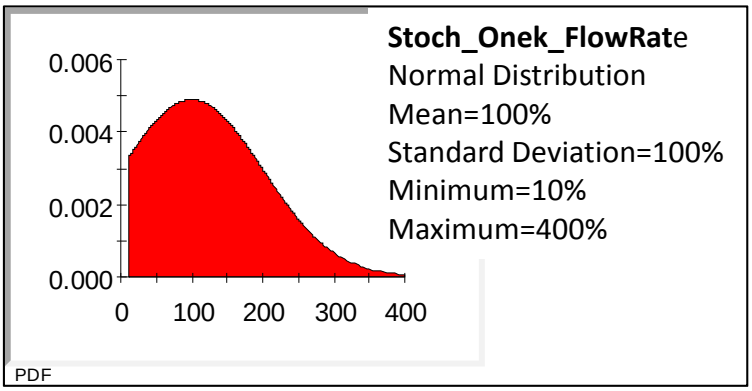

Figure 5-1 Example of probability distribution function for a simple multiplier stochastic element

Table 5-1 Stochastic elements used to define uncertainties in metal loads

Element Name in Model	Use in Model	Probability Distribution	Mean	Standard Deviation	Minimum	Maximum
Stoch_WR_ReleaseUncert	Directly applied to release rate from open pit and adit waste rock	Truncated Normal	100%	50%	25%	200%
Stoch_Gk300_900_FlowRate	Multiplier for rates of discharge from the Galkeno 300 and 900 water treatment plants	Truncated Normal	100%	10%	75%	125%
Stoch_GWInflowToChristalLake	Multiplier for the rate groundwater inflow to Christal Lake	Truncated Normal	100%	25%	50%	150%
Stoch_MAR	Multiplier for the mean annual runoff in calculations catchment surface runoff rate	Truncated Normal	100%	10%	75%	125%
Stoch_Onek_FlowRate	Multiplier for to the rate of discharge from the Onek 400 Adit	Truncated Normal	100%	100%	50%	400%
Stoch_AveKV_28_Chem	Multiplier for concentrations in discharge from the Galkeno 300 water treatment plant	Truncated Normal	100%	15%	50%	150%
Stoch_AveKV_32_Chem	Multiplier for concentrations in discharge from the Galkeno 900 water treatment plant	Truncated Normal	100%	15%	50%	150%
Stoch_AveKV_45_Chem	Multiplier for concentrations in discharge from the Onek 400 Adit	Truncated Normal	100%	50%	25%	200%
Stoch_MTInfiltrationUncert	Multiplier for the potential rate of infiltration into the Mackeno Tailings	Truncated Normal	100%	15%	50%	150%
Stock_GW_Chem	Multiplier for concentrations in background groundwater entering Christal Lake; also applied to runoff chemistry	Truncated Normal	100%	25%	50%	150%

6.0 Model Calibration

Measured data are available for flow rates and chemical concentrations at the monitoring locations shown in Figure 3-1 at varying levels of detail. Monitoring locations KV-6 and KV-7 on Christal Creek, in particular, provide an opportunity to calibrate the model against measured data through iterative adjustment of input parameters. Calibration of the model was conducted for the following two main components of the simulation model:

- Water balance at KV-6 and KV-7 and
- Chemical balances for loads at KV-6 and KV-7.

The parameters adjusted for calibration of the water and chemical balances are described in the following two sections.

6.1 Water Balance Calibration at KV-6 and KV-7

The focus of the water balance was to achieve agreement between simulated and measured cumulative volumes of water flowing down Christal Creek at KV-6 and KV-7. Location KV-6 represents the water balance for Christal Lake watershed and upper reach of Christal Creek (Figure 3-1). Location KV-7 represents the water balance for the reach of Christal Creek between KV-6 and KV-7 (Figure 3-1).

Figure 6-1 shows a comparison of simulated to observed cumulative volume of water at KV-6 after calibration. Two model parameters were adjusted to achieve agreement between the simulated and measured flow volumes. First, an inflow of groundwater at a rate of 20 L/s was added to the model to provide an overall increase in cumulative flow volume. Second, the mean annual rate of runoff (MAR) for 2009 was increased to 150% of the average value to represent the high runoff for 2009. The calibration adjustments improved agreement for runoff in 2009 and achieved a much closer match to total volume for the entirety of the calibration period, indicating the model produced a reasonable representation of the water balance for Christal Lake and the upper reach of Christal Creek upstream of KV-6.

After calibration of the upper portion of the watershed, the reach of Christal Creek between KV-6 and KV-7 was examined. This calibration shown in Figure 6-2 was achieved by decreasing the mean annual runoff (MAR) for the watershed area draining to the KV-6 to KV-7 reach of Christal Creek to 70-80% of the mean annual value for 2008 through 2010. No other parameters in the model were changed.

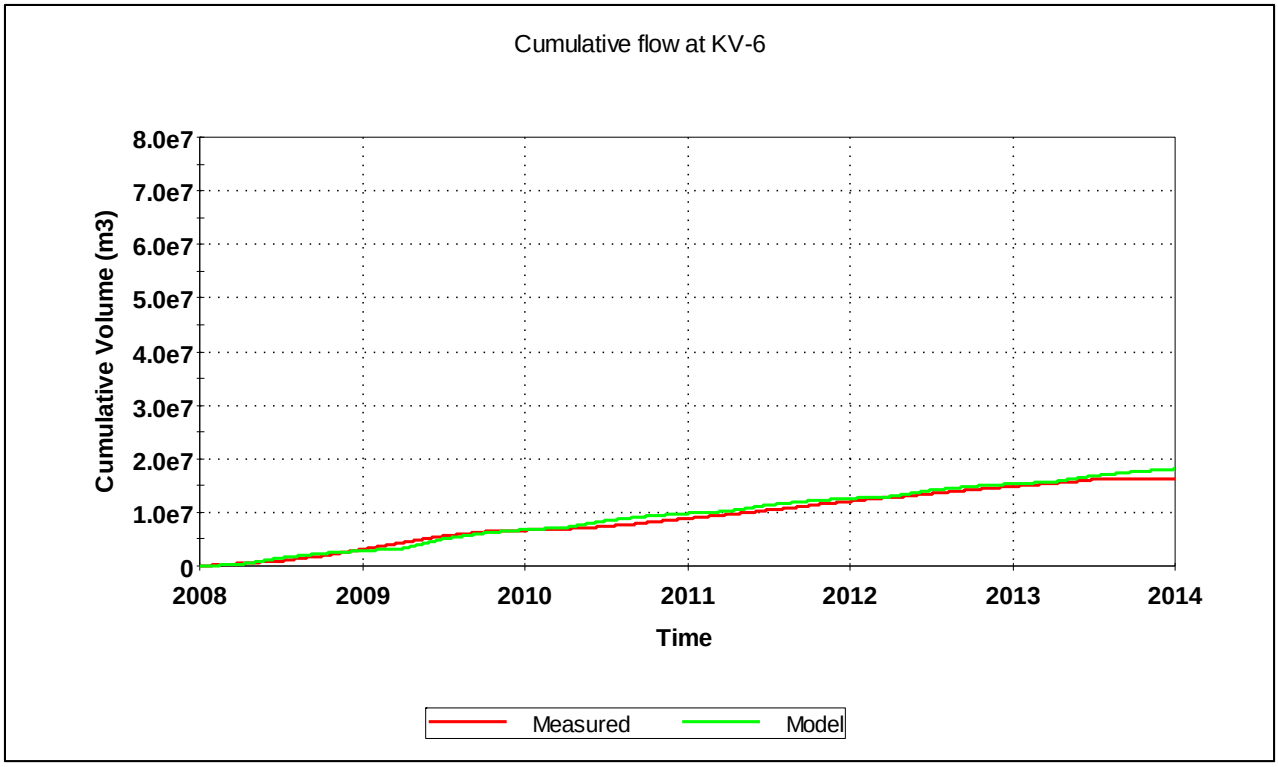

Figure 6-1 Comparison of simulated and measured cumulative volumes of water at KV-6 after model calibration

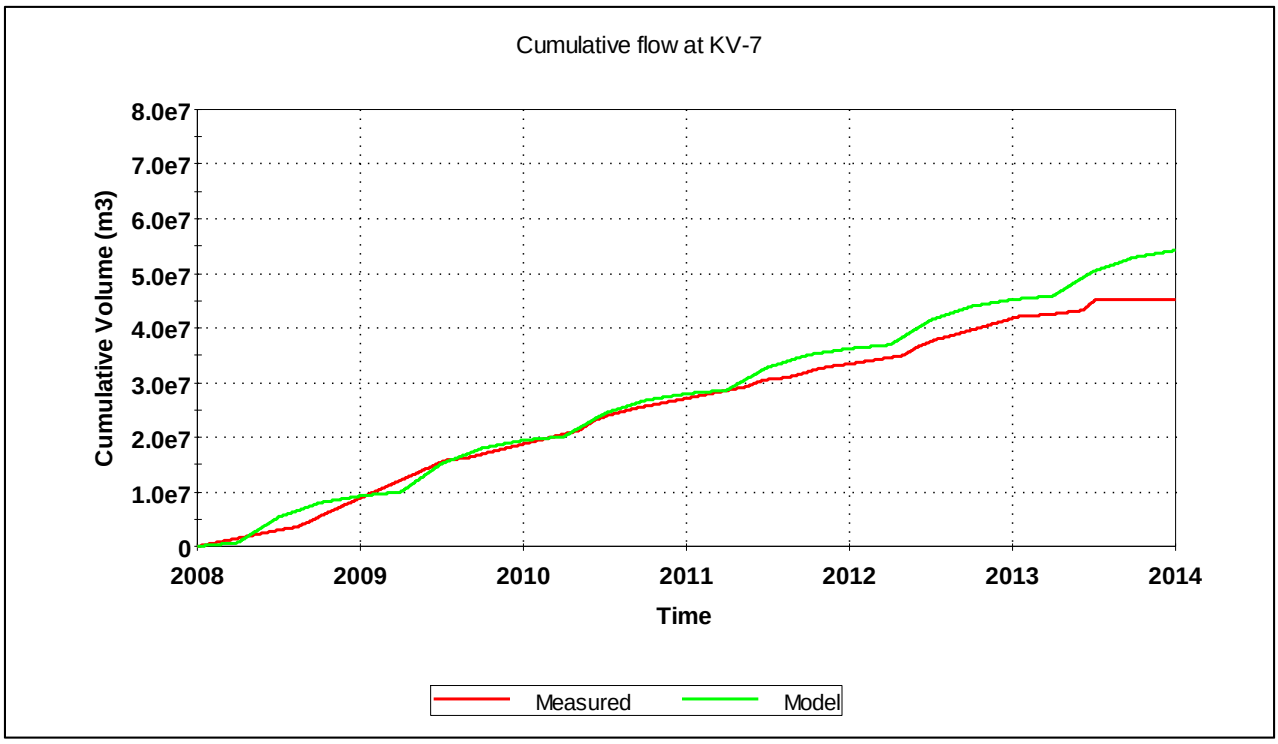

Figure 6-2 Comparison of simulated and measured cumulative volumes of water at KV-7 after model calibration

A check of the calibration for cumulative water flow at KV-6 and KV-7 was made by comparing simulated cumulative masses of sulfate to measured data at KV-6 and KV-7, assuming that sulfate would be conservatively transported through the watershed. Comparison of the simulated and measured cumulative sulfate loads are shown in Figure 6-3 and Figure 6-4. The good agreement between the simulation and measured results provides additional assurance that the model is producing a reliable estimation of flow rates in Christal Creek.

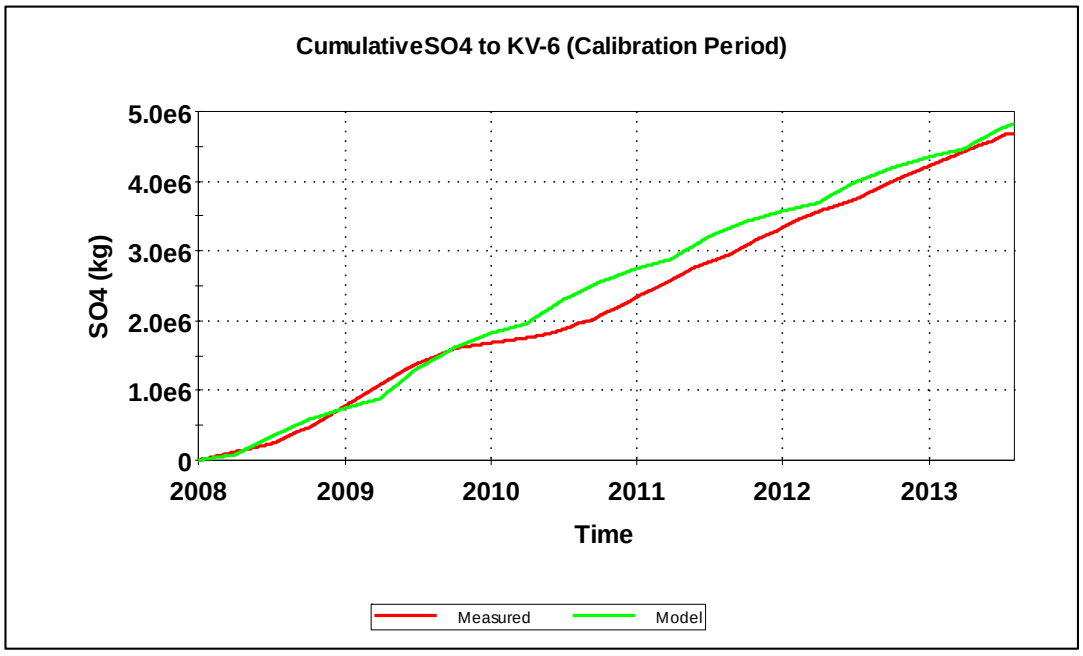

Figure 6-3: Measured and modeled cumulative sulfate at KV-6

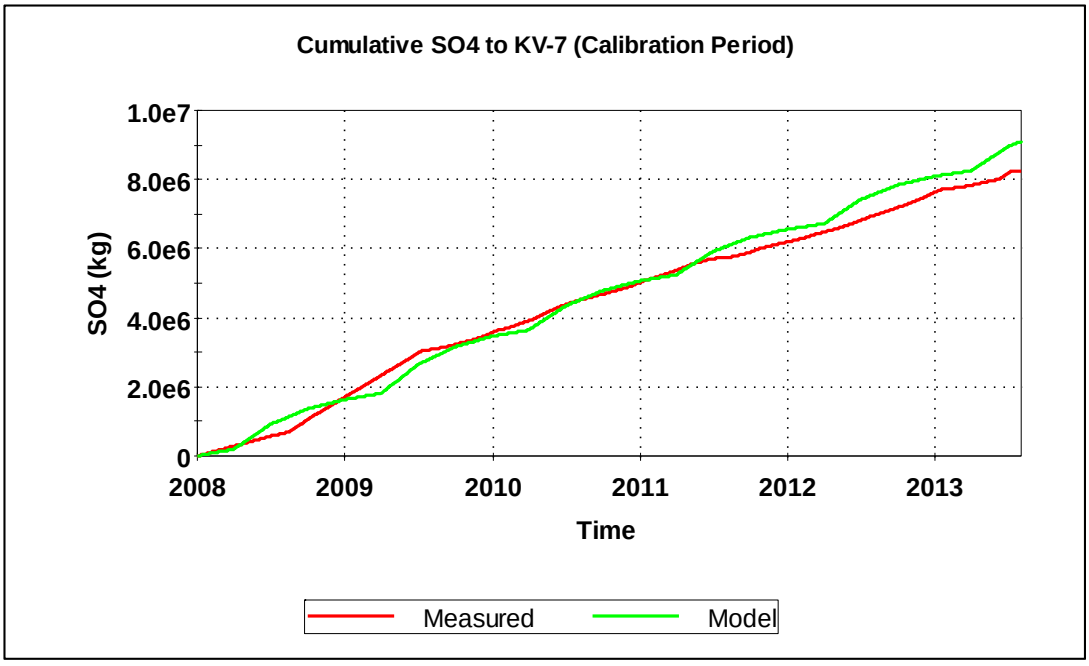

Figure 6-4 Measured and modeled cumulative sulfate at KV-7

6.2 Calibration of the Chemical Balance for Cadmium, Zinc, and Arsenic Loads at KV-6 and KV-7

Initial simulations of cadmium, zinc, and arsenic cumulative loads at KV-6 and KV-7 indicated higher loads than calculated from measured flow rates and concentrations. For example, the simulated cumulative cadmium load at KV-6 was about 7 to 8 times greater than the measured data and about 4 to 5 times greater than measured for zinc over the calibration period. Likewise, for KV-7, simulated cumulative cadmium loads were about 10 to 12 times greater and zinc loads from 3 to 4 times greater than measured over the calibration period.

To obtain agreement between the simulated and measured loads, attenuation factors were added to the model as part of the calibration process. These attenuation factors were applied to two pathways:

- Pathway 1: Groundwater flow path between the Onek 400 Adit and Christal Creek
- Pathway 2: Groundwater flow path leading to Christal Creek downstream of KV-6

The values of the attenuation factors determined by the calibration process are given in Table 6-1. The concentrations at the source location, such as the Onek 400 Adit, were multiplied by the attenuation factors to reduce chemical loads to match the observed data for Christal Creek at KV-6 and KV-7. However, in the case of Pathway 1 for the Onek 400 Adit discharge, specifically cadmium and zinc concentrations were not allowed to become lower than the effective limits determined from the KV-84 data (see Section 4.3), based on the assumption there is some amount of mineral solid phases containing these elements that will continue to leach into the groundwater in the future. Overall, the comparisons of simulated and observed loads examined during the calibration process indicate there is significant loss of cadmium and zinc in the transport pathways between the potential sources of these metals and Christal Creek.

Comparisons of measured and modeled loads for zinc, cadmium, arsenic, and copper for Christal Creek at monitoring locations KV-6 and KV-7 are shown in Figure 6-5 to Figure 6-8. In these comparisons, measured loads refer to loads calculated directly from measured flow rates and concentrations at KV-6 and KV-7, whereas modeled loads refer to loads simulated by the GoldSim model for Christal Creek based on the various inputs and transport pathways to Christal Creek from the surrounding watershed. The comparisons show that the model can reproduce the observed chemical loads in Christal Creek after the application of calibration factors.

Table 6-1: Attenuation factors used to calibrate chemical loads

	Attenuation Factors (%)	
Constituent	Pathway 1: Groundwater flow path between the Onek 400 Adit and Christal Creek	Pathway 2: Groundwater flow path leading to Christal Creek downstream of KV-6
As	100	5
Cd	2.5	15
Cu	100	100
Pb	100	100
Ni	100	100
Ag	100	100
Zn	11.9	100
SO_4	100	100
Se	100	100
NH_3	100	100

*100% indicates no attenuation effect

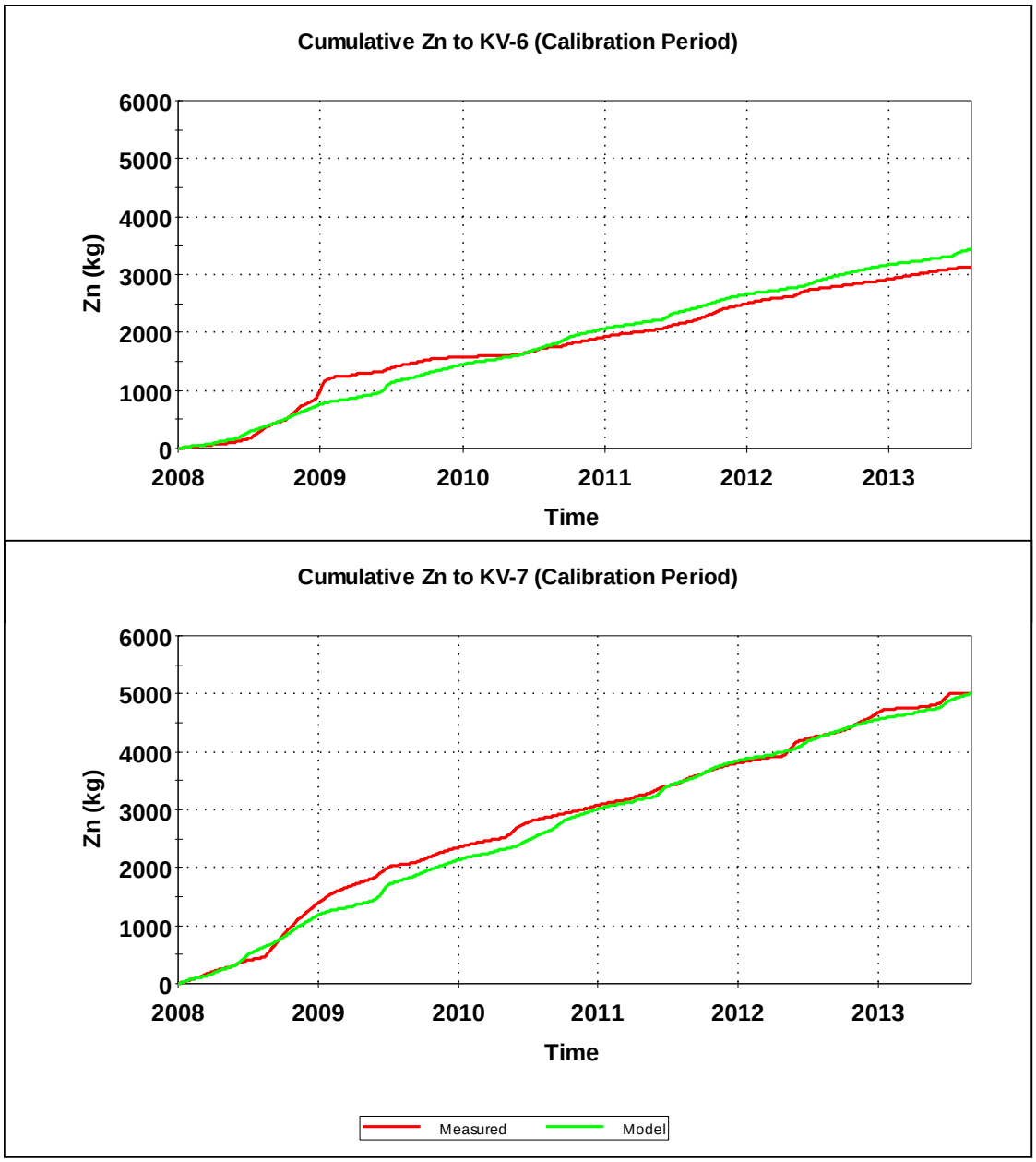

Figure 6-5: Measured and modeled zinc loads at KV-6 and KV-7 after calibration

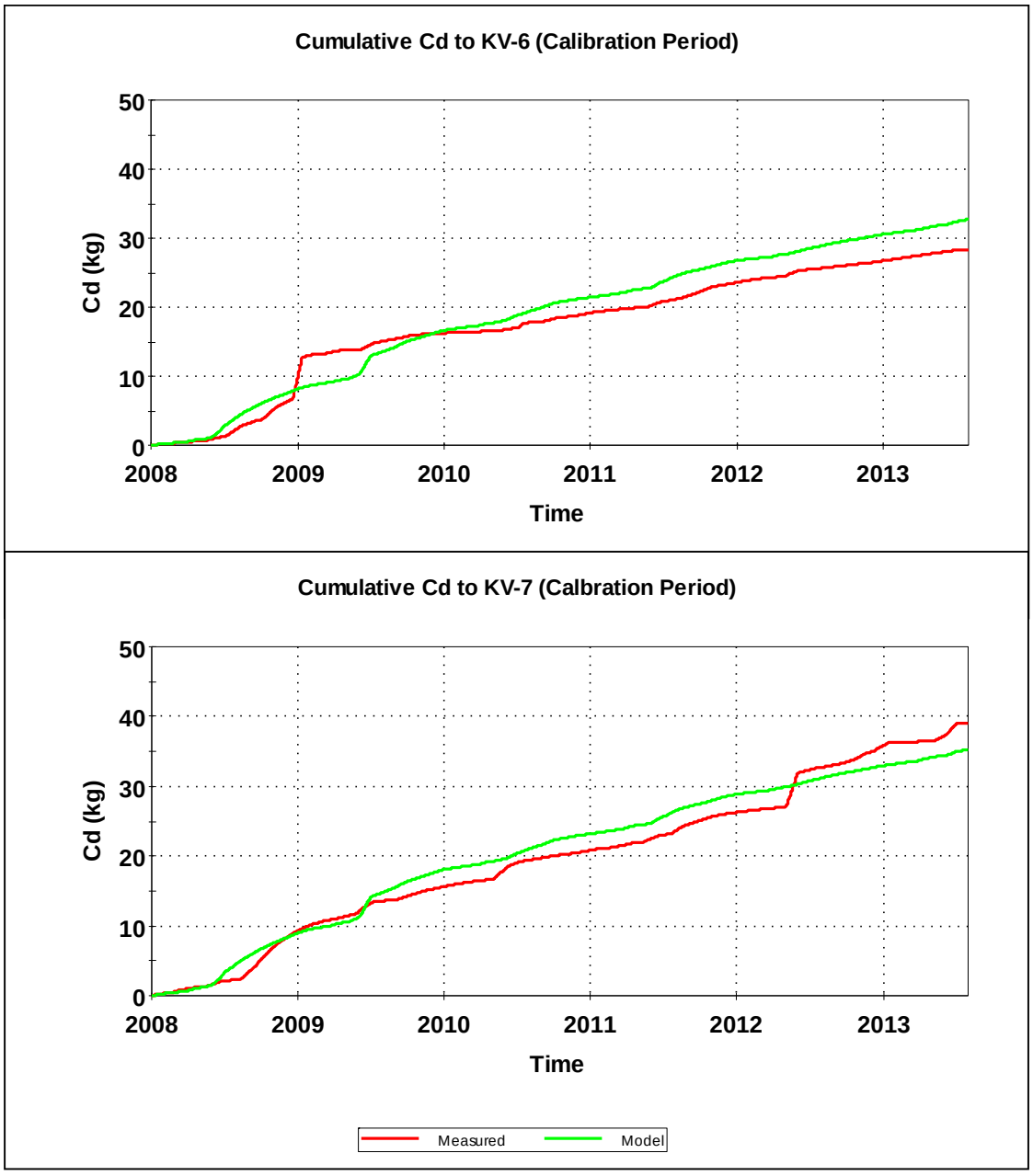

Figure 6-6: Measured and modeled cadmium loads at KV-6 and KV-7 after calibration

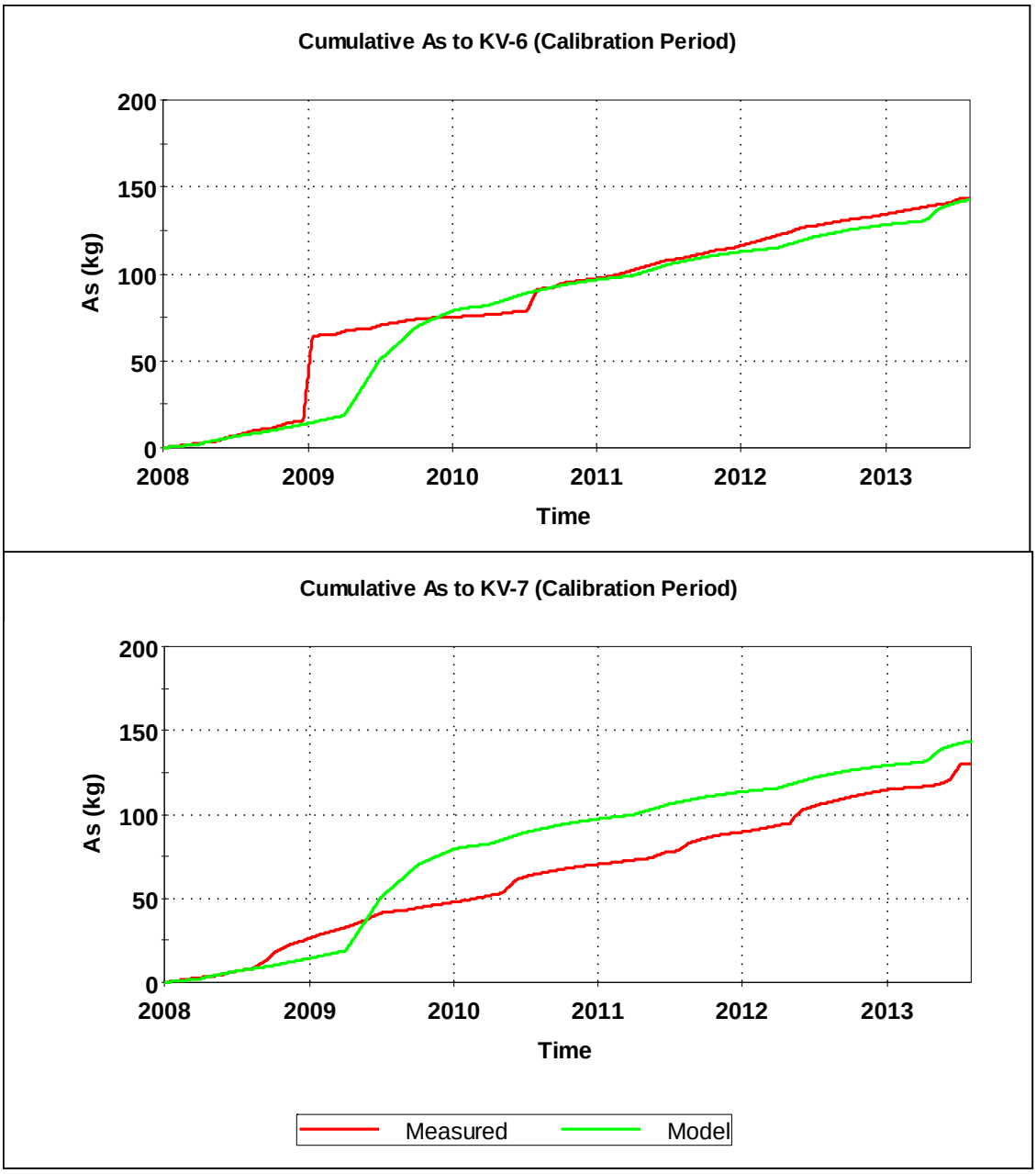

Figure 6-7: Measured and modeled arsenic loads at KV-6 and KV-7 after calibration

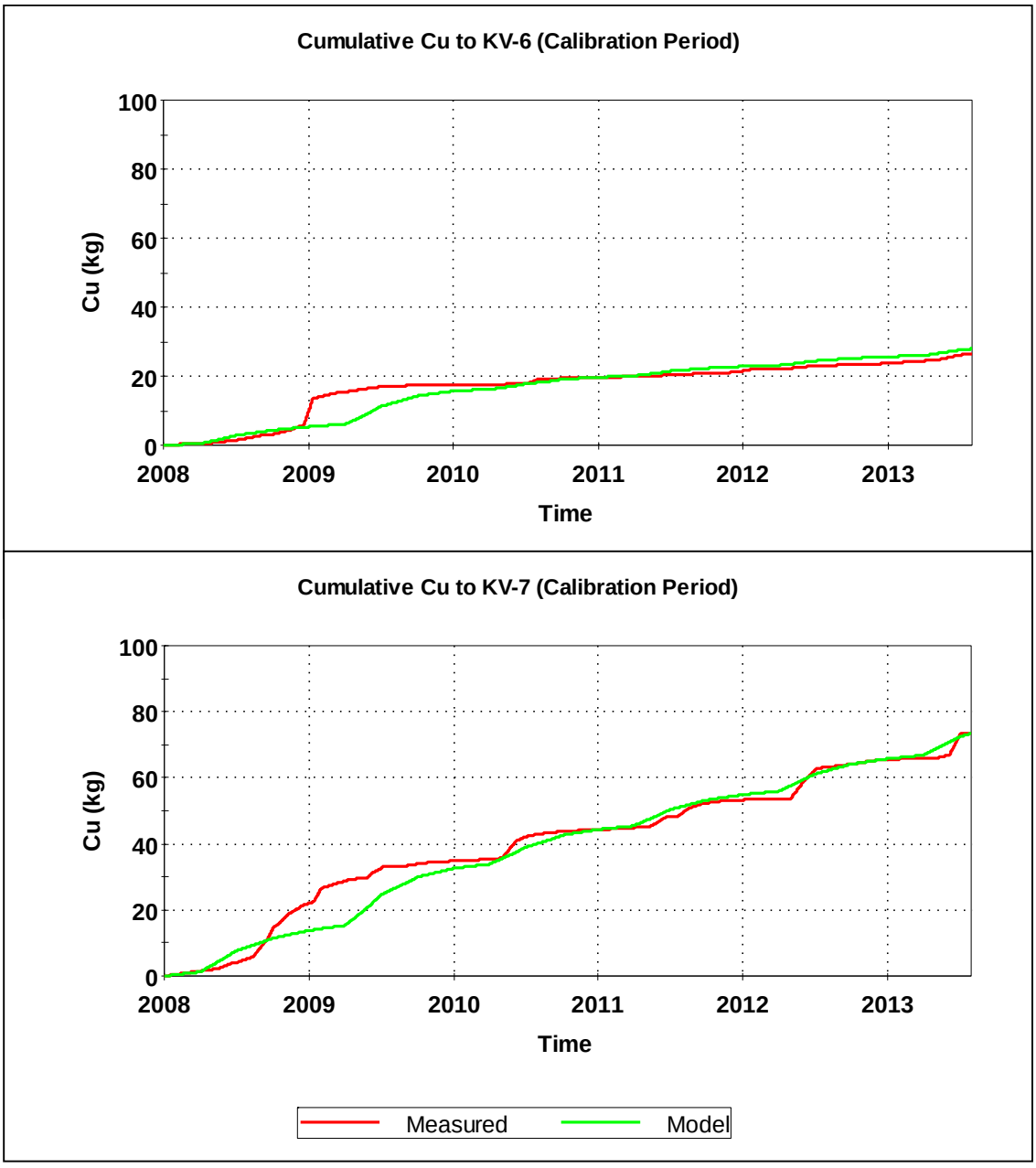

Figure 6-8: Measured and modeled copper loads at KV-6 and KV-7 after calibration

7.0 SUMMARY OF CHEMICAL LOAD SOURCES

Results from probabilistic simulations of chemical loads at KV-7 for the Base Case condition of no reclamation in the future are shown in Figure 7-1 to Figure 7-4. The probabilistic results in these figures provide a depiction of the expected ranges of probable future loads for the future based on the uncertainty distributions given in Table 5-1. The Base Case simulations show a steady upward trend in loads for cadmium, zinc, arsenic, and copper at KV-7.

The yearly average loads for the Base Case of no future reclamation are summarized in Table 7-1 for the calibration period when measured data are available and a representative future year. The summary in Table 7-1 is representative of average conditions of flow and concentrations projected into the future based on the data for the calibration period. The metal loads for the Base Case provide a baseline for comparing the predicted effects of reclamation options in Section 9.0.

Table 7-1: Base Case chemical loads at KV-7 for the calibration period and a representative future year (2015)

	Galkeno 300	Galkeno 900	Mackeno Tailings	Onek 400 Adit	Waste Rock	UN Adit	Surface Runoff	Groundwater	DCR Seep	Formo & Paddy	Lucky Queen Adit	Totals
2009												
Zn	146.58	11.84	187.68	474.30	32.85	4.78	0.00	39.24	10.41	20.87	10.63	939
Cd	3.48	0.01	0.29	6.22	0.13	0.02	0.00	0.84	0.08	1.01	0.13	12.2
As	0.54	1.92	0.54	4.24	0.03	0.52	55.53	0.53	4.16	0.08	0.54	68.6
Cu	0.34	0.11	0.00	1.36	1.55	0.01	14.43	0.57	0.14	0.07	0.29	18.9
Pb	1.16	0.03	0.33	0.67	28.64	0.05	5.83	0.65	0.12	0.00	3.26	40.7
Ag	0.041	0.006	0.000	0.006	0.018	0.001	0.144	0.005	0.001	0.000	0.057	0.28
2010												
Zn	83.62	7.09	187.68	478.72	32.85	6.73	0.00	39.24	10.41	20.87	10.63	878
Cd	2.18	0.01	0.29	2.28	0.13	0.04	0.00	0.84	0.08	1.01	0.13	7.0
As	0.31	0.78	0.54	2.53	0.03	0.96	9.30	0.53	4.16	0.08	0.54	19.8
Cu	0.37	0.09	0.00	1.33	1.55	0.02	7.20	0.57	0.14	0.07	0.29	11.6
Pb	0.10	0.20	0.33	0.41	28.64	0.07	4.52	0.65	0.12	0.00	3.26	38.3
Ag	0.037	0.009	0.000	0.005	0.018	0.001	0.121	0.005	0.001	0.000	0.057	0.26
2011												
Zn	65.01	30.69	187.68	435.12	32.85	2.91	0.00	39.24	10.41	20.87	10.63	835
Cd	3.01	0.02	0.29	1.87	0.13	0.02	0.00	0.84	0.08	1.01	0.13	7.4
As	0.26	1.35	0.54	1.59	0.03	0.64	8.37	0.53	4.16	0.08	0.54	18.1
Cu	0.29	0.08	0.00	0.47	1.55	0.01	7.01	0.57	0.14	0.07	0.29	10.5
Pb	0.10	0.30	0.33	0.15	28.64	0.05	4.34	0.65	0.12	0.00	3.26	37.9
Ag	0.029	0.013	0.000	0.004	0.018	0.001	0.120	0.005	0.001	0.000	0.057	0.25
2012												
Zn	48.66	12.92	188.09	345.27	32.94	0.35	0.00	39.35	10.44	20.92	10.66	710
Cd	1.78	0.01	0.29	1.34	0.13	0.00	0.00	0.84	0.08	1.01	0.13	5.6
As	0.19	0.82	0.54	1.49	0.03	0.10	8.39	0.53	4.17	0.08	0.54	16.9
Cu	0.08	0.02	0.00	0.39	1.55	0.01	7.78	0.57	0.14	0.07	0.29	10.9
Pb	0.15	0.09	0.33	0.16	28.72	0.01	4.72	0.65	0.12	0.00	3.27	38.2
Ag	0.008	0.003	0.000	0.006	0.018	0.001	0.135	0.005	0.001	0.000	0.057	0.23
2025*												
Zn	113.81	14.68	187.68	356.00	32.85	1.29	0.00	39.24	10.41	20.87	10.63	787
Cd	3.43	0.02	0.29	1.32	0.13	0.01	0.00	0.84	0.08	1.01	0.13	7.3
As	1.11	1.45	0.54	2.17	0.03	0.22	9.32	0.53	4.16	0.08	0.54	20.2
Cu	0.43	0.11	0.004	0.48	1.55	0.01	9.49	0.57	0.14	0.07	0.29	13.2
Pb	0.38	0.16	0.33	0.25	28.64	0.02	5.67	0.65	0.12	0.00	3.26	39.5
Ag	0.062	0.019	0.000	0.018	0.018	0.001	0.167	0.005	0.001	0.000	0.057	0.35

***Representative future simulation year**

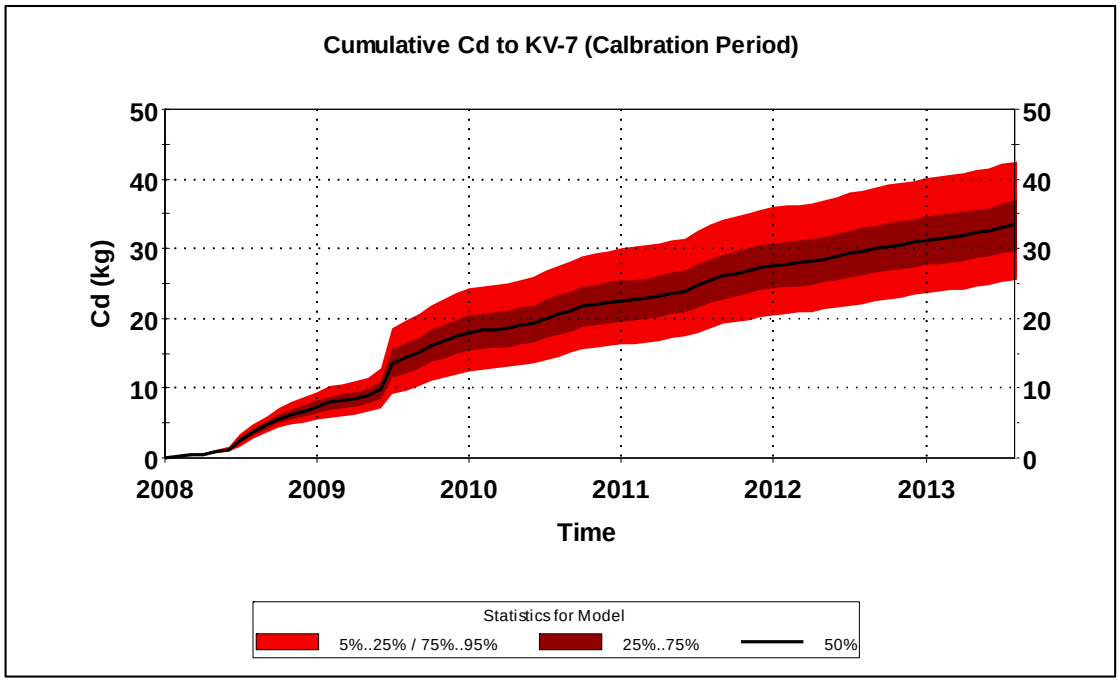

Figure 7-1: Base Case probabilistic simulation of cumulative cadmium total load at KV-7

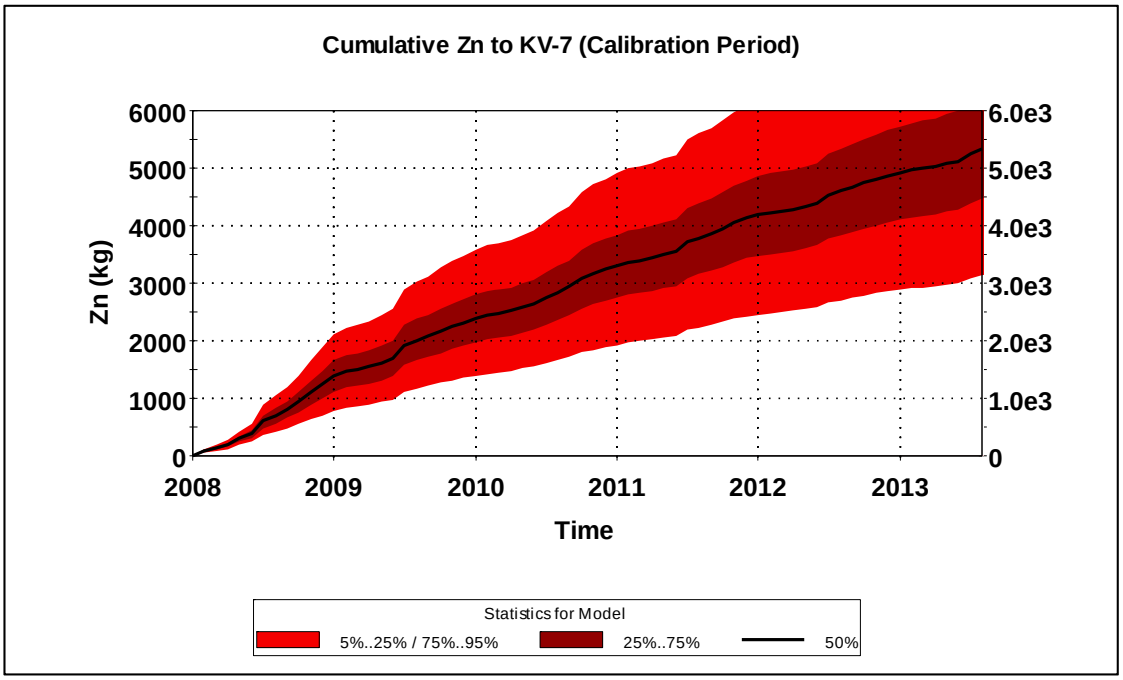

Figure 7-2: Base Case probabilistic simulation of cumulative zinc total load at KV-7

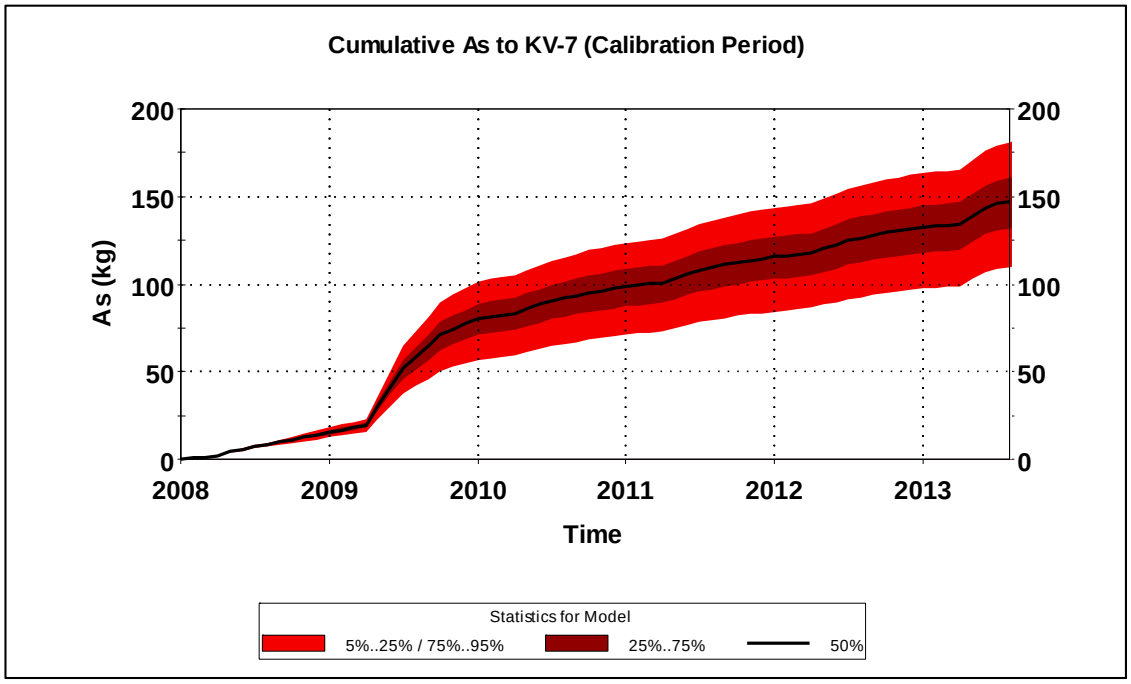

Figure 7-3: Base Case probabilistic simulation of cumulative arsenic load at KV-7

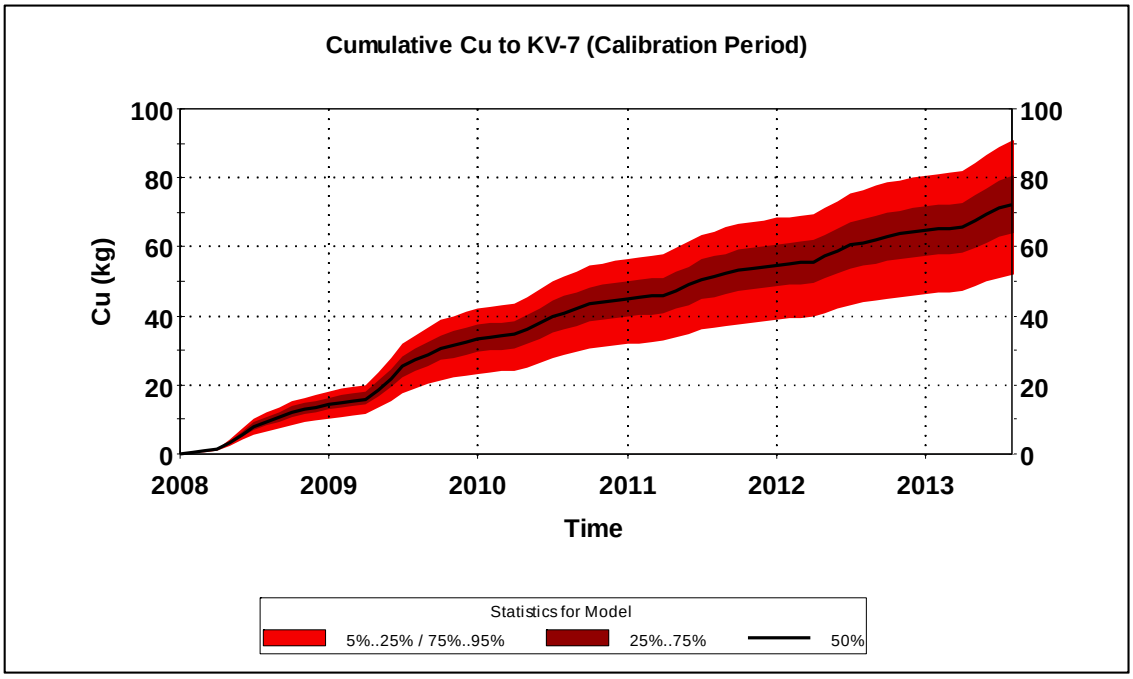

Figure 7-4: Base Case probabilistic simulation of cumulative copper load at KV-7

8.0 Previous Reclamation Effects

Previous reclamation efforts in the Christal Creek watershed included construction and operation of water treatment plants to reduce metal loads from adit discharges at Galkeno 900 and Galkeno 300.

8.1 Galkeno 900 Water Treatment

In October 1993, concerns about the high zinc concentrations and loadings in the Galkeno drainage water led to the installation of a hydraulic bulkhead in the Galkeno 900 adit and the establishment of a water treatment system. Discharge from the Galkeno 900 adit treatment plant travels via an underground pipe from the adit to the settling pond. After passing through the treatment pond, discharges flow downgradient and over energy dispersion sheeting before entering the vegetative area between the settling pond and Christal Lake. The flow path travels through approximately 190 m of surface vegetation and marshes before draining into Christal Lake. We do not have sufficient flow rate and concentration data for the time period before and shortly after 1993 to determine the decrease in metal loads achieved by operation of the Galkeno 900 water treatment plant.

8.2 Galkeno 300 Water Treatment

Adit discharge from Galkeno 300 was originally another large source of chemical loads to Christal Creek; hence, a water treatment plant was constructed to reduce chemical loads from the Galkeno 300 Adit. Plant construction was completed in December 2007. Optimization of the system for zinc removal was completed in February 2008. Consistent compliance (<0.5 mg/l zinc) was reached on February 15, 2008 and Galkeno 300 discharge has consistently met compliance standards since that time.

Figure 8-1 shows the decrease in annual zinc loads that occurred after operation of the treatment plant at Galkeno 300 and the associated decrease at KV-7. Water treatment reduced the zinc load discharged from Galkeno 300 from 4332 kg/yr in 2007 to a range of 64 to 147 kg/yr during 2008 to 2012. These reductions are equivalent to a percentage range of decrease of greater than 95%.

A reduction in zinc loads occurred in Christal Creek at KV-7 in response to water treatment but the reduction was not directly proportional to the decreases at Galkeno 300 (Figure 8-1). For example, the zinc load at KV-7 prior to water treatment was 2092 kg/yr in 2007. In subsequent years of 2009 to 2012, zinc loads decreased to 958 to 728 kg/yr, which is equivalent to a percentage range of decrease of 54 to 65% relative to the 2007 load of 2092 kg. The average load for the most recent five year time span of 2008 through 2013[1] is 787 kg Zn/yr, which is a 62% decrease relative to the pre-treatment value of 2092 kg/yr in 2007.

[1] Load for 2013 is estimated from measured data through July 2, 2013 plus model simulation for the remainder of the year

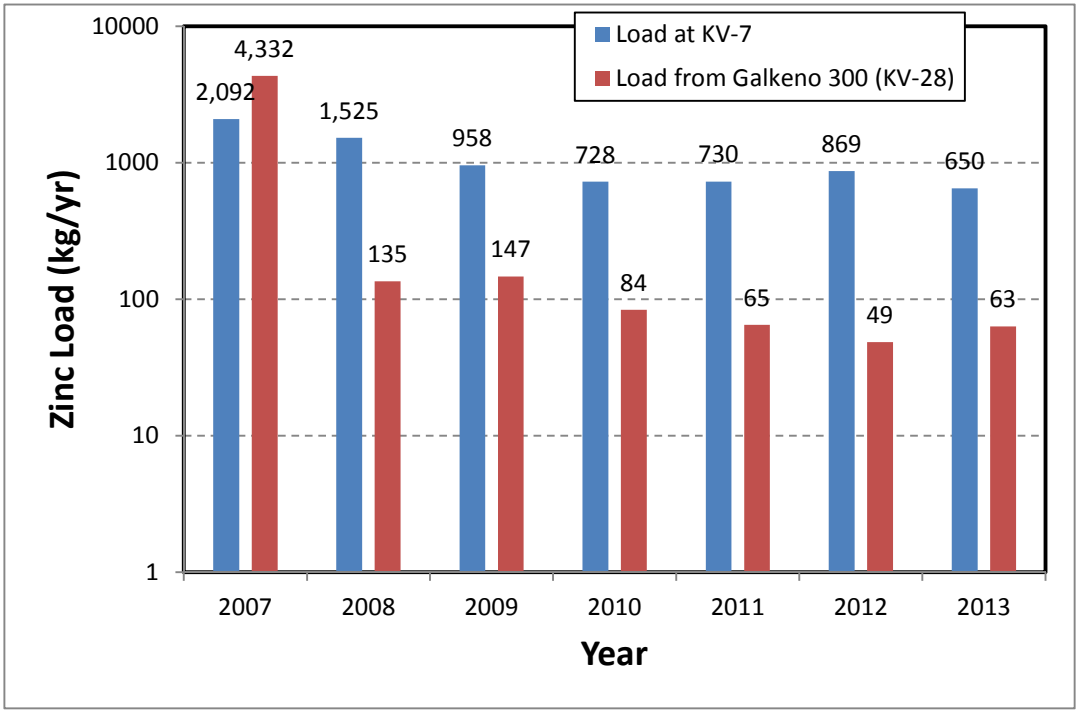

Figure 8-1 History of annual zinc loads from Galkeno 300 and response at KV-7

9.0 Simulation Results for Future Reclamation Scenarios

9.1 Chemical Loads for Reclamation Options

A summary of the effects of various reclamation options for reducing chemical loads to Christal Creek is provided in Table 9-1 along with the assumptions used to develop the options. The reclamation options for reducing loads from point sources, such as Galkeno 300, are assumed to result in a rapid response of reduced loads in Christal Creek. However, reclamation options for non-point sources (e.g., Mackeno Tailings) are expected to take a number of years before a complete response is observed in Christal Creek. The chemical loads in Table 9-1 are annual values obtained from the simulation model for year 2025. Year 2025 is used because it is after the time period when the potential effects of reclamation options are predicted to reach steady-state, assuming a start date of August 2016 for initiation of reclamation effects for all of the options in Table 9-1.

The results are presented as average loads in kg per year at KV-7 that might potentially be achieved, assuming a proportional effect between load reduction at sources and response in Christal Creek. The assumption of a proportional response is important consideration because past behavior observed in Christal Creek after the startup of the Galkeno 300 indicates that a proportional response may not occur (Figure 8-1). We also assume that some amount of residual loading will always be present due to tailings remaining in the sediments of Christal Lake and Christal Creek as well as the transport path downgradient of the Onek 400 Adit that are not included in viable reclamation scenarios. These residual loads are described in the assumptions given in Table 9-1.

Table 9-1 Average zinc and cadmium loads predicted for implementation of potential reclamation options

Reclamation Option	Operational Objectives and Assumptions	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
Base Case	Current conditions (averages from measured data for 2008 to 2013 at KV-7)	Model=787; Measured = 787	Model = 7.3; Measured = 7.5	Model = 20.2; Measured = 27.3	Model = 39.5; Measured = 38.8	Model = 0.35; Measured =0.27
Galkeno 300 Options						
1) Existing facility at Galkeno 300 is upgraded to: a) Enhance sludge management b) Improve adit water collection management c) Provide redundant water recovery from Hector Calumet c) Improve winter access d) Improve reagent handling facilities	**A)** Galkeno 300 treatment results remain the same as those established for 2009 and later: averages of 0.22 mg Zn/L; 0.007 mg Cd/L (0.322 mg Zn/L and 0.01 mg Cd/L - effective flow-weighted averages) (*Discharge load enters Christal Lake through Hinton Creek as currently configured.*) **B)** Galkeno 300 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L. (*Discharge load enters Christal Lake through Hinton Creek as currently configured.)*	**A) 787** **B) 709**	**A) 7.3** **B) 4.2**	**A) 20.1** **B) 20.1**	**A) 39.5** **B) 39.5**	**A) 0.34** **B) 0.32**
2) New treatment facility at Elsa: a) Pipeline from G300 or well into Hector Calumet to Elsa, capacity for other mine discharges b) New water treatment plant including reagent handling and mixing, treatment plant, sludge handling facilities c) Capacity of treatment plant sufficient to handle No Cash additional flow (adaptive management alternative)	**A)** Galkeno 300 treatment results same as established at Galkeno 300 for 2009 and later: averages of 0.22 mg Zn/L; 0.007 mg Cd/L (0.322 mg Zn/L and 0.01 mg Cd/L - effective flow-weighted averages) (*Discharge load is removed from Christal Creek and added to Flat Creek.)*	**A) 674**	**A) 3.8**	**A) 19.0**	**A) 39.1**	**A) 0.29**
3) New treatment facility at Silver Trail Highway near Galkeno 300: a) Pipeline from G300 or well into Hector Calumet to Silver Trail area b) New water treatment plant including reagent handling and mixing, treatment plant, sludge handling facilities c) Capacity of treatment plant sufficient to handle Onek 400, Galkeno 300, and Galkeno 900 additional flow (adaptive management alternative)	**A)** Galkeno 300 treatment results same as currently established averages of 0.22 mg Zn/L; 0.007 mg Cd/L (0.322 mg Zn/L and 0.01 mg Cd/L - effective flow-weighted averages) (*Discharge load is moved downstream to enter at KV-6.*) **B)** Galkeno 300 treatment improved to reduce zinc to average of 0.1 mg Zn/L and Cd average of 0.001 mg Cd/L. (*Discharge load is moved downstream to enter at KV-6.)*	**A) 787** **B) 709**	**A) 7.3** **B) 4.2**	**A) 20.1** **B) 20.1**	**A) 39.5** **B) 39.5**	**A) 0.34** **B) 0.32**

Reclamation Option	Operational Objectives and Assumptions	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
Galkeno 900 Options						
1) Bioreactor treatment with the following design: a) Lined facility at Galkeno 900 adit built into hillside on contour b) Carbon source addition in both solid phase and dissolved phase; c) Ongoing monitoring at bioreactor discharge to demonstrate treatment	**A)** Average concentrations in bioreactor effluent are 0.02 mg Zn/L and 0.0001 mg Cd/L. *Assume bioreactor treatment assumes achievement of results similar to the 0.75 L/s operational phase of the Galkeno 900 bioreactor pilot test and passive filtration will remove suspended solids and yield discharge effluent similar to the bioreactor "dissolved" effluent concentrations. (Discharge load remains at current location.)*	**A) 775**	**A) 7.3**	**A) 20.0**	**A) 39.5**	**A) 0.36**
(2) Stand-alone small mechanical plant similar to Galkeno 300 plant to provide: a) Improved clarifier b) Improved options for reagents b) New sludge management facilities c) Discharge to bog at edge of Christal Lake	**A)** Galkeno 900 treatment plant improved performance to achieve averages of 0.12 mg Zn/L, 0.00005 mg Cd/L; Note that current averages at Galkeno 900 are 0.15 mg Zn/L and 0.00013 mg Cd/L. *Assume mechanical plant achieves same performance as Galkeno 300 plant.* (*Discharge load remains at current location.)*	**A) 783**	**A) 7.3**	**A) 20.0**	**A) 39.5**	**A) 0.36**
3) New treatment facility at Silver Trail Highway near Galkeno 900: a) Pipeline from Galkeno 900 to Silver Trail area b) New water treatment plant including reagent handling and mixing, treatment plant, sludge handling facilities c) Capacity of treatment plant designed initially to handle Galkeno 300, Onek 400, and Galkeno 900 flow (adaptive management alternative)	**A)** Galkeno 900 treatment results same as established at Galkeno 300 for 2009 and later: averages of 0.22 mg Zn/L; 0.007 mg Cd/L. Note that current averages at Galkeno 900 are 0.15 mg Zn/L and 0.00013 mg Cd/L. (*Discharge load remains at current location.)* **B)** Galkeno 900 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L. Note that current averages at Galkeno 900 are 0.15 mg Zn/L and 0.00013 mg Cd/L. (*Discharge load remains at current location.)*	**A) 792** **B) 781**	**A) 7.9** **B) 7.3**	**A) 20.0** **B) 20.0**	**A) 39.5** **B) 39.5**	**A) 0.36** **B) 0.36**

Reclamation Option	Operational Objectives and Assumptions	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
Onek 400 Adit Options						
1) Bioreactor treatment with the following design features (natural attenuation assumed to continue) a) Lined facility at Onek 400 adit area b) Carbon source addition in both solid phase and dissolved phase; c) Ongoing monitoring at bioreactor discharge to demonstrate sufficient pre-treatment for MNA d) Natural attenuation by aeration after bioreactor, settling pond, distribution on north side of Christal creek in peat beds e) Natural attenuation monitoring at settling pond, and in Christal creek upstream and downstream of expected discharge zone	**A)** Bioreactor effluent achieves 90% reduction in metal concentrations in Onek 400 Adit discharge to produce averages of 9.8 mg Zn/L and 0.15 mg Cd/L. *(Assume that bioreactor treatment assumes conservatively that a 90% reduction in metal concentrations can be achieved. The target concentrations are assumed to be greater than those achieved for the Galkeno 900 pilot test bioreactor, because the starting concentrations at Onek 400 are comparatively much higher than at Galkeno 900. Natural attenuation continues to occur but only to minimum concentrations defined by hydrozincite and otavite solubilities.)*	**A) 488**	**A) 6.4**	**A) 18.2**	**A) 39.3**	**A) 0.33**
2) Stand-alone small mechanical plant with the following design: a) Similar to Galkeno 300 plant with clarifier and option of reagents b) New sludge management facilities c) Discharge directly to Christal Creek	**A)** Onek 400 treatment results same as averages established for 2009 and later at Galkeno 300 - averages of 0.22 mg Zn/L; 0.007 mg Cd/L. *(Assume no additional natural attenuation in flow path to Christal Creek because discharge is directly to Christal Creek; assume that residual load from accumulated zinc and cadmium in the groundwater pathway continues to contribute load at 5% of current flow rate multiplied by solubility concentrations.)*	**A) 460**	**A) 6.4**	**A) 18.2**	**A) 39.3**	**A) 0.34**
	B) Onek 400 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L. *(Assume no additional natural attenuation in flow path to Christal Creek because discharge is directly to Christal Creek; assume that residual load from accumulated zinc and cadmium in the groundwater pathway continues to contribute load at 5% of current flow rate multiplied by solubility concentrations.)*	**B) 454** (Note: Onek load controlled by residual load)	**B) 6.1** (Note: Onek load controlled by residual load)	**A) 18.2**	**A) 39.3**	**A) 0.34**

Reclamation Option	Operational Objectives and Assumptions	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
3) Treat in new treatment facility at Silver Trail Highway near Galkeno 900: a) Pipeline from Galkeno 900 to Silver Trail area b) New water treatment plant including reagent handling and mixing, treatment plant, sludge handling facilities c) Discharge to Christal Creek above KV-6 d) Capacity of treatment plant designed initially to handle Galkeno 300, Onek and Galkeno 900 flow (adaptive management alternative)	A) Assume similar results to averages achieved at Galkeno 300 since 2009 of 0.22 mg Zn/L and 0.007 mg Cd/L. *(Assume no additional natural attenuation in flow path to Christal Creek because discharge is directly to Christal Creek; assume that residual load from accumulated zinc and cadmium in the groundwater pathway continues to contribute load at 5% of current flow rate multiplied by solubility concentrations.)*	**A) 460**	**A) 6.4**	**A) 18.2**	**A) 39.3**	**A) 0.34**
4) Enhancement and monitoring of existing natural attenuation through: a) Source control to reduce metal loadings b) Route flows to areas downgradient of Keno City c) Discharge flows to ground in exfiltration channel d) Monitoring program downgradient of discharge area	A) Flow reduction from Onek 400 adit by 70% due to cover in pit and diversions. *(Assume existing processes of attenuation continue to operate with minimum concentrations of Zn and Cd controlled by solubilities of hydrozincite and otavite remaining in transport path.)*	**A) 538**	**A) 6.6**	**A) 18.6**	**A) 39.3**	**A) 0.34**
Mackeno Tailings						
1) Close in place with the following design features: a) Create stable water channel through and around tailings, remove tailings from watercourse if required b) Cover un-vegetated tailings with growth media c) Optimize cover performance by contouring and lime addition c) Monitor after remediation to determine if load reductions are achieved	A) Lime is tilled into the tailings before re-grading. *Assume that 90% reduction in porewater concentrations relative to concentrations in pore water measured by SRK in 2011) is achieved by lime. Infiltration is reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) by re-grading and placing clean soil cover over the existing footprint of the tailings.* B) Lime not tilled into the tailings. *Assume infiltration is reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) by re-grading and placing clean soil cover over the existing footprint of the tailings.*	**A) 614** **B) 746**	**A) 7.0** **B) 7.2**	**A) 19.7** **B) 20.0**	**A) 39.2** **B) 39.4**	**A) 0.35** **B) 0.35**

Reclamation Option	Operational Objectives and Assumptions	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
(2) Consolidate and cover a) isolate work site from stream b) excavate tailings from shoreline c) install new shoreline with barrier/riprap d) grade tailings and cover e) cover system optimization	**A)** Lime is tilled into the tailings before re-grading. *Assume that 90% reduction in porewater concentrations relative to concentrations in pore water measured by SRK in 2011) is achieved by lime. Infiltration is reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) by re-grading and placing clean soil cove. Assume that consolidation reduces footprint to 60% of current area thereby reducing infiltration by 60%.*	**A) 606**	**A) 7.0**	**A) 19.6**	**A) 39.2**	**A) 0.35**
3) Source removal by combining with Valley Tailings a) Remove un-vegetated tailings and transport to Valley Tailings b) Scarify and seed existing tailings areas c) Closure by combination with Valley tailings	**A)** Tailings removed results in increased loading in year 2015 when the removal action is undertaken. *Assume that disruption of tailings area results in a doubling of load due to construction effects during removal year. Assume 5 year decay to 5% or current loading from Mackeno Tailings is achieved starting in 2016. The residual 5% load assumed to be due to remnant pockets of tailings not easily removed or hidden and remaining tailings in Christal Lake.*	**A) 609**	**A) 7.0**	**A) 19.6**	**A) 39.2**	**A) 0.35**
Waste Rock						
1) Re-grade and cover all waste rock sites a) Waste rock sites re-graded to consolidate and blend into surroundings b) Covers placed to reduce infiltration and leaching of metals	**A)** Waste rock covered. *Assume that loads are reduced to 40% of mean annual rainfall over a 4-year period by reduction in infiltration through waste rock and associated reduction in leaching of metals.*	**A) 767**	**A) 7.2**	**A) 20.0**	**A) 22.3**	**A) 0.34**
2) **Re-grade and optimize cover all waste rock sites** a) Waste rock sites re-graded to consolidate and blend into surroundings b) Optimized covers placed to reduce infiltration and leaching of metals by maximum amount technically feasible	**B)** Waste rock cover optimized to reduce infiltration to full extent possible. *Assume that loads are reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) over a 4-year period by reduction in infiltration through waste rock and associated reduction in leaching of metals.*	**B) 761**	**B) 7.2**	**B) 20.0**	**B) 17.1**	**B) 0.33**

9.2 Chemical Loads for Reclamation Alternatives

The load results in Table 9-1 are specific to individual reclamation options. Combinations of options to create Reclamation Alternatives may also be considered. For example, the Onek 400 Adit and Mackeno tailings are the largest sources of zinc and cadmium; hence reclamation of both of those two sites may be a reasonable alternative. Table 9-2 gives a summary of the zinc and cadmium loads for the options that provide the greatest reductions in loads and also two alternatives that involve implementation of multiple options. The results in Table 9-2 show that Alternatives 4 and 5 that involved reclamation of both the Onek 400 Adit discharge and Mackeno tailings have the greatest potential to reduce zinc and cadmium loads in Christal Creek.

Table 9-2: Average zinc and cadmium loads in Christal Creek at KV-7 predicted for implementation of potential Reclamation Alternatives

Reclamation Alternatives (Combinations of Options)	Zinc Average Predicted Load at KV-7 (kg Zn/yr)	Cadmium Average Predicted Load at KV-7 (kg Cd/yr)	Arsenic Average Predicted Load at KV-7 (kg As/yr)	Lead Average Predicted Load at KV-7 (kg Pb/yr)	Silver Average Predicted Load at KV-7 (kg Ag/yr)
Base Case: Current conditions (averages from measured data for 2008 to 2013 at KV-7)	Model=787; Measured = 787	Model = 7.3; Measured = 7.5	Model = 20.2; Measured = 27.3	Model = 39.5; Measured = 38.8	Model = 0.35; Measured =0.28
Alternative 1: Treat Galkeno 300 & 900: Galkeno 300 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L. Galkeno 900 treatment plant improved performance to achieve averages of 0.12 mg Zn/L, 0.00005 mg Cd/L; Note that current averages at Galkeno 900 are 0.15 mg Zn/L and 0.00013 mg Cd/L.	704	4.2	21.5	39.5	0.34
Alternative 2: Treat Onek: Onek 400 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L.	454	6.1	18.2	39.3	0.34
Alternative 3: Reclaim Mackeno Tailings (Consolidate and cover): Lime is tilled into the tailings before re-grading. Assume that 90% reduction in porewater concentrations relative to concentrations in pore water measured by SRK in 2011) is achieved by lime. Infiltration is reduced to 22% of mean annual rainfall by re-grading and placing clean soil cover. Assume that consolidation reduces footprint to 60% of current area thereby reducing infiltration by 60%.	606	7.0	19.6	39.2	0.35
Alternative 4: Reclaim Waste Rock Sites: Waste rock cover optimized to reduce infiltration to full extent possible. Assume that loads are reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) over a 4-year period by reduction in infiltration through waste rock and associated reduction in leaching of metals.	761	7.2	20.0	17.1	0.33
Alternative 5: Treat Onek and reclaim Mackeno: (same as above)	272	5.8	17.7	39.0	0.34
Alternative 6: All of the above (Options 1 to 5) (same as above)	163	2.6	17.3	16.6	0.31

9.3 Concentrations

Trends in measured concentrations in Christal Creek at KV-6 and KV-7 are shown in Figure 9-1 and Figure 9-2, respectively. The measured data typically show approximately a tenfold variation between winter and summer with lowest concentrations typically occurring during January to March and highest concentrations occurring during July to September.

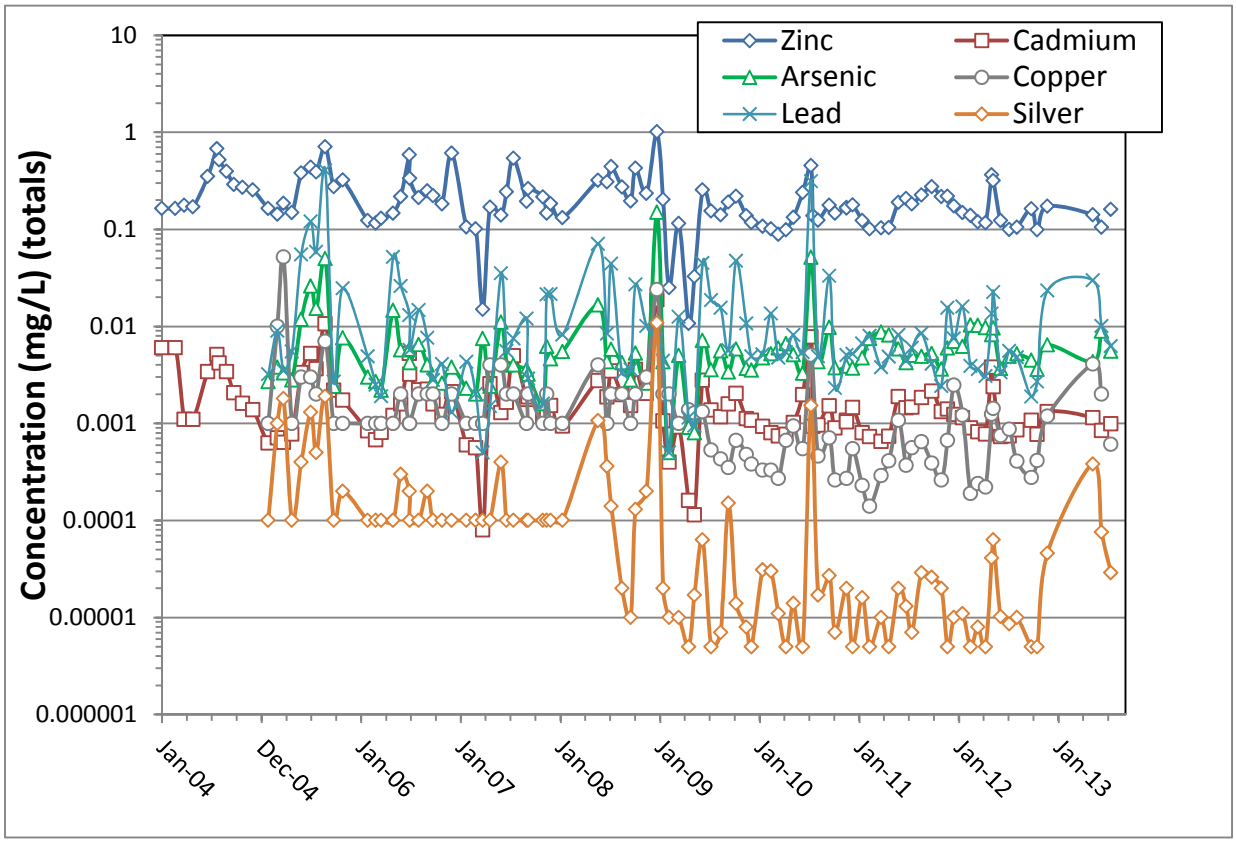

Figure 9-1: Measured cadmium, zinc, arsenic, copper, lead and silver concentrations (totals) at KV-6

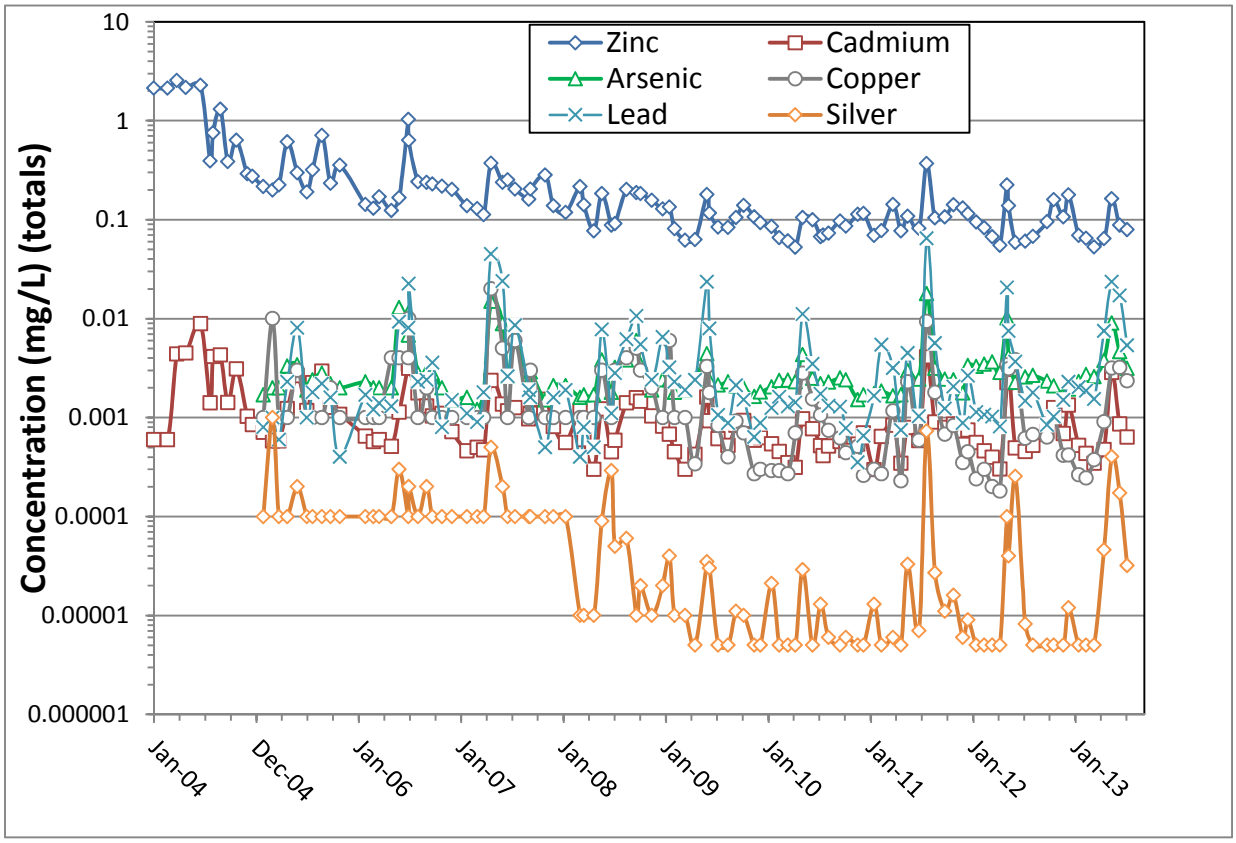

Figure 9-2: Measured cadmium, zinc, arsenic, copper, lead, and silver concentrations (totals) at KV-7

The structure of the GoldSim simulation model described in this report was designed to estimate chemical loads and is most suited to evaluating reclamation options in terms of changes in chemical loads. However, ERDC has requested estimates of metal concentrations (Cd, Zn) in Christal Creek from the model to aid in the evaluation of reclamation options. Figure 9-3 and Figure 9-4 show the results for zinc and cadmium from probabilistic simulations for Reclamation Alternative 6 (see Table 9-2). The predicted concentrations vary by about 10 times over the course of each year when considering the outer percentile limits of the probability distributions, which is approximately similar to the range observed in the measured data (Figure 9-1 and Figure 9-2). However, these predicted concentrations should be viewed with caution; while the simulation model is capable of making estimates of concentrations based on calculations of loads and water flow rates, those calculations do not take into account potential variability in hydrogeochemical, biological, and physical processes that can affect concentrations in natural stream systems particularly over short time frames. The concentrations produced by the model should be understood to be indicative of approximate ranges expected to occur over yearly to longer time-scales rather than precise predictions of day-to-day concentrations that might occur.

Estimates of average, median, and maximum concentrations for zinc and cadmium are shown in Table 9-3 for the Reclamation Alternatives (see Table 9-2) for the year 2025, which is 9 years after the initiation of reclamation, when the effects of those options are expected to reach steady state. The median concentration estimates in Table 9-3 were calculated by averaging the daily median concentrations predicted by the probabilistic model for the year 2025. The 95th percentile concentrations represent the single maximum daily concentration predicted by the probabilistic model for year 2025. These concentrations should be considered as estimates that provide a relative

measure of the potential concentrations and ranges potentially achievable for the simulated reductions in chemical loads.

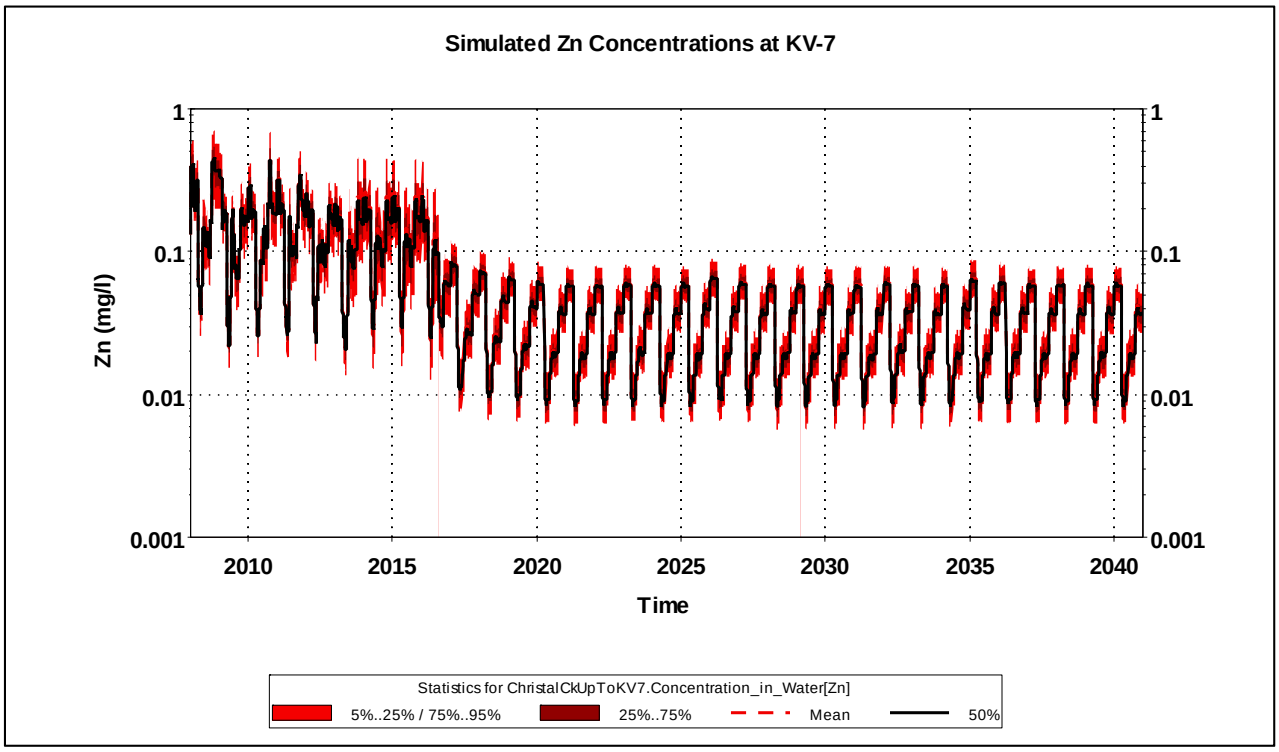

Figure 9-3: Probabilistic results for zinc concentration at KV-7

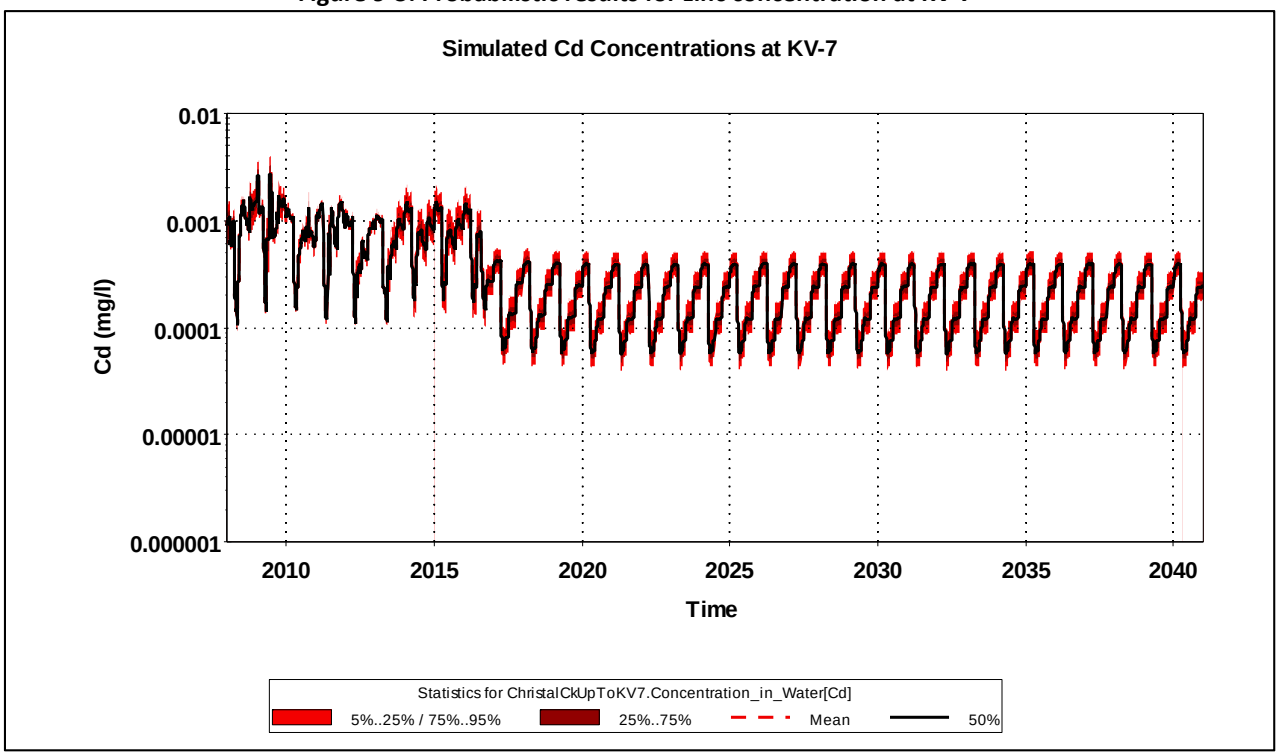

Figure 9-4: Probabilistic results for cadmium concentration at KV-7

Table 9-3: Mean, median, and maximum estimated concentrations of Cd and Zn in Christal Creek at monitoring location KV-7 based on probabilistic simulations results for 250 realizations for Reclamation Alternatives

Reclamation Alternatives (Combinations of Option)	Cadmium at KV-7 (mg/L)		Zinc at KV-7 (mg/L)	
	Average: Median	Maximum 95th Percentile	Average: Median	Maximum 95th Percentile
Base Case: No reclamation	0.0010*: 0.0007*(0.0008**)	0.0031* (0.0021**)	0.11*: 0.09*(0.11**)	0.20* (0.43**)
Option 1: Treat Galkeno 300 & 900: Galkeno 300 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L. Galkeno 900 treatment plant improved performance to achieve averages of 0.12 mg Zn/L, 0.00005 mg Cd/L; Note that current averages at Galkeno 900 are 0.15 mg Zn/L and 0.00013 mg Cd/L.	0.0004: 0.0004	0.0010**	0.11: 0.10	0.42**
Option 2: Treat Onek: Onek 400 treatment improved to reduce zinc and cadmium concentrations to averages of 0.1 mg Zn/L; 0.001 mg Cd/L.	0.0007: 0.0007	0.0018**	0.07: 0.07	0.20**
Option 3: Reclaim Mackeno Tailings (Consolidate and cover): Lime is tilled into the tailings before re-grading. Assume that 90% reduction in porewater concentrations relative to concentrations in pore water measured by SRK in 2011) is achieved by lime. Infiltration is reduced to 22% of mean annual rainfall by re-grading and placing clean soil cover. Assume that consolidation reduces footprint to 60% of current area thereby reducing infiltration by 60%.	0.0007: 0.0007	0.0020**	0.09: 0.08	0.37**
Option 4: Reclaim Waste Rock Sites: Waste rock cover optimized to reduce infiltration to full extent possible. Assume that loads are reduced to 22% of mean annual rainfall (based on experience at Brewery Creek) over a 4-year period by reduction in infiltration through waste rock and associated reduction in leaching of metals.	0.0008: 0.0007	0.0021**	0.12: 0.11	0.42**
Option 5: Treat Onek and reclaim Mackeno: (same as above)	0.0006: 0.0006	0.0018**	0.04: 0.04	0.10**
Option 6: All of the above (Options 1 to 5) (same as above)	0.0002: 0.0002	0.0007**	0.025: 0.024	0.065**

*Based on measured data for Cd(T) and Zn(T) at KV-7 from Jan 2011 to July 2013 (32 analyses)

**95th percentile upper limits from probabilistic model simulations

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Memorandum

To: Jim Harrington, President Alexco Environmental Group

Kai Woloshyn, Project Manager, Access Consulting Group

From: Cynthia Russel, Minnow Environmental Inc.

Date: November 13, 2013

Re: Evaluation of Contaminants of Concern for the United Keno Hill Mines Long Term Monitoring Program (revised).

Minnow Environmental Inc. has been involved in the assessment of water quality and the aquatic environment at United Keno Hill Mines (UKHM) since 2006. In 2011, Minnow prepared a study design for an Interim Long-Term Aquatic Monitoring Program (LTAMP). As part of this report, cadmium and zinc were identified as contaminants of concern (COCs) and a number of substances were identified as possible COCs (aluminum, arsenic, cyanide, chromium, copper, iron, lead, manganese, mercury, nitrate, nitrite, nickel, phosphorus, selenium, silver, sulphate, total Kjeldahl nitrogen (TKN) and uranium). These substances were identified as possible COCs because the existing data was generally insufficient to assess them (i.e., too few data points, poor method detection limits and limited reference data). In order to develop a final list of COCs for the UKHM area that could be used in the assessment and monitoring of closure conditions, recommendations were provided that allowed for the deficiencies in the data base to be addressed. Specifically:

- monitoring frequencies were increased to monthly,
- additional reference areas were added to the program,
- the list of substances to be analyzed was increased to include those for which limited or no information was available,
- method detection limits were established at levels less than relevant guidelines, and
- several laboratory measures were included to aid in the interpretation of the water quality data (hardness, dissolved organic carbon (DOC), total suspended solids (TSS)).

The revised program was implemented in January 2011 such that there is now two years of data for most of the monitoring stations. However, ammonia measurements were only routinely collected at the stations included in the water license (i.e., KV-6, KV-7 and KV-41). While ammonia concentrations were assessed at these stations, there continues to be insufficient data to assess all stations and as such ammonia will need to remain as a potential COC until additional data is collected[1]. In addition, cyanide has not been included in the monitoring program to date and as such it cannot be assessed at this time and will need to remain a potential COC until sufficient data has been compiled[1].

A list of substances that were proposed for monitoring are provided on Table 1 and the proposed monitoring stations are described on Table 2 (Minnow 2011). Access Consulting Group (Access) provided the monitoring data (2011 to 2012) Minnow in excel format. The assessment of COCs was limited to the immediate receiving stations in Christal Creek (KV-6 and KV-7), Flat Creek (KV-9 and KV-9A) and Lightning Creek (KV-38 and KV-41) and the tributary reference stations[2]. Stations within the South McQuesten River (KV-2, KV-3, KV-4 and KV-5) were not included in the assessment as these are downstream of the immediate receiving waters where the highest concentrations of mine-related substances would be expected to be observed[3]. This memo presents the findings of our assessment of the water quality data for the UKHM site and our recommendations for COCs for the LTAMP.

In order to identify the COCs, the following steps were undertaken:

1. Established an upper limit of background (95th percentile) for each analyte.
2. Compared the upper limit of background to the Canadian Water Quality Guidelines (CWQG; CCME, 2007 plus updates) to identify naturally elevated substances.
3. Compared the concentrations of each analyte at each mine-exposed station to background and CWQG and flagged those that exceeded these benchmarks.
4. Analytes that exceeded background but not CWQG were plotted over time (2005 to 2012) together with analytes with maximum concentrations above guidelines to determine if the concentrations of these analytes are increasing over time and as such represent potential future COCs.
5. Total and filtered concentrations for analytes which exceeded CWQG were plotted to determine if both fractions exceeded the guideline.

[1] Ammonia and Cyanide should be measured at all reference and mine-exposed stations as described in the Interim Long-Term Aquatic Monitoring Program design report.
[2] Reference stations on the South McQuesten River (KV-1 and KV-72) were not used in the determination of background as the habitat of these stations and catchment areas are not comparable to the tributary stations. In addition, KV-1 has shown impaired water quality associated with upstream Cache Creek.
[3] There are no additional sources to the South McQuesten River.

6. Analytes were considered for inclusion as COCs if the median concentration was higher than background and CWQG or if the maximum concentration was two times the CWQG for both total and dissolved measures.
7. Analytes for which no guideline exists were considered for inclusion as COC's if the median concentration was ten times background.[4]

Concentrations among tributary reference stations (KV-37, KV-60, KV-61, KV-64, KV-65, WILC and FIELC) were found to be similar with the exception of KV-60 (Galena Creek upstream of Silver King adit) and therefore the data from all reference stations, except KV-60[5], were combined and a 95th percentile was calculated for each substance which served as the upper limit of background (Table 3). The upper limit of background was compared to the most recent CWQG[6,7] to identify substances that are naturally elevated in the region (i.e., ammonia, aluminum, copper, iron and selenium, although selenium and copper were only slightly higher in background than the CWQG). The water quality data collected from January 2011 to December 2012 (i.e., 24 months) was compared to the upper limit of background and the CWQG (Table 4 and Appendix Tables A.1 to A.18). Based on this assessment, median values of arsenic, cadmium, sulphate and zinc were found to exceed both background and CWQG (Table 4 and 5). However, arsenic and sulphate were only elevated at KV-6 and arsenic was slightly above CWQG (i.e., 0.005 vs. 0.0059; Figure A.2)[8]. The median sulphate concentration at KV-6 (335 mg/L) was greater than the guideline calculated at 100 mg/L hardness (309 mg/L) but less than the guidelines value at 200 mg/L hardness (429 mg/L sulphate BCMOE 2013; Figure A.1). Review of hardness concentrations at KV-6 indicates that hardness values at this station are consistently above 200 mg/L (Appendix Figure A.8) and as such the higher guideline is applicable at this station.

[4] Analytes with no established water quality guidelines are generally considered non-toxic and would only be of potential concern at very high concentrations.

[5] The concentrations at KV-60 suggested possible mine-exposure influence due to elevated zinc and cadmium concentrations. The 95th percentile of background was calculated with KV-60 included and excluded to determine the potential influence of including KV-60 in the determination of background (Table A.19). The comparison indicated that the inclusion of KV-60 would increase the 95th percentile of the reference stations and may not be representative of true reference condition. For this reason KV-60 was excluded from the assessment of reference conditions.

[6] The guidelines used were the most recent CWQG with the following exceptions: the draft cadmium CWQG (Environment Canada 2012) and proposed zinc values (Roe, 2010) were used as they represent the most current information on cadmium and zinc toxicity; the Federal Water Quality Guideline for cobalt (Environment Canada 2013) was used as there is no CWQG; the BCMOE manganese and sulphate guidelines were used as a federal guideline does not exist for these substances (BCMOE 2006 and 2013) and the BCMOE guideline for iron was used as it represent the most recent and comprehensive iron review in Canada (BCMOE 2008).

[7] Where guidelines were hardness dependant, a value of 100 mg/L hardness was used to calculate the guideline. In Chrsital Creek and Flat Creek (highest metal concentrations), the minimum hardness observed is greater than 100 mg/L hardness and is typically greater than 200 mg/L hardness. Thus, the use of 100 mg/L hardness to calculate guidelines is conservative.

[8] All dissolved concentrations were less than the CWQG (Figure A.2).

Some analytes had median concentrations that were greater than background but less than the guideline values (ammonia, cobalt, iron, nickel, molybdenum, and uranium; Tables 4 and 5). Review of concentrations over time for these substances does not indicate any increasing trend and as such they are not expected to become COC's in the future (Figure A.7).

A number of analytes were higher than background but have no applicable water quality guidelines for the protection of aquatic life (i.e., hardness, specific conductance, calcium, lithium, magnesium, manganese, potassium, silicon, sodium, strontium and sulphur). Generally, there are no guidelines for these analytes as they are not known to cause toxicity to aquatic life. In all instances median concentrations at all mine-exposed stations were less than 10 times background (Tables 4 and 5). While these analytes should continue to be monitored as they represent indicators of mine-exposure they are not considered COCs.

Review of maximum values found that total suspended solids (TSS), aluminum, arsenic, cadmium, copper, iron, lead, silver and zinc were elevated well above CWQG (Tables 4 and 5). However, review of the raw data found that the maximum values tended to occur when TSS was also elevated, suggesting that the high maximum concentrations may have been associated with particulate matter in the water samples. To assess this, filtered metal concentrations were compared to total concentrations for these substances at stations KV-7, KV-9A and KV-41 (i.e., immediate receivers; Figures 1 to 3). With the exception of cadmium and zinc, the filtered concentrations of all other substances were below the CWQG, confirming that the elevated metal concentrations were likely associated with elevated TSS. Generally, it is the dissolved portion (largely represented by filtered metals) of the metal concentration that is the bioavailable fraction (Prothro 1993). Thus dissolved concentrations below guidelines are likely protective of aquatic species.

In addition, analytes with maximum concentrations that were greater than the guideline were plotted over time (2005 to 2011; Appendix Figure A.7 a-o). These plots show that concentrations of these substances were either decreasing or stable over time and therefore, do not represent future COC's.

Based on the assessment above, the following recommendations are provided:

- Station KV-60 should not be used as a reference station.
- Cadmium and zinc should remain COCs for the LTAMP and no additional COCs are warranted.
- The LTAMP should include monitoring of the following analytes; hardness, alkalinity, specific conductance, pH, DOC, TSS, aluminum, ammonia, arsenic, cadmium, calcium, copper, cobalt, cyanide, chromium, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, silicon, sodium, strontium, sulphate, silver, uranium and

zinc. These represent mine related analytes but only cadmium and zinc are currently observed at levels which could be harmful to aquatic life.

- Given the fluctuations in the concentrations of total metals, dissolved metals should be analyzed as well.
- The assessment provided herein is based on existing monitoring data. It is possible that in the future, additional COC could be identified if new sources were to connect to the downstream receiving environments. The adaptive management plan for the district should be structured to allow for identification of new COC's in the future in response to changes in source areas.

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Table 1: Water quality variables recommended for the Interim LTAMP (Minnow 2011).

Variables	Unit	Guideline	Target MDL[n]	Sampling Freqency
Laboratory Measures				Monthly during the ice-free period and once during the ice-on period. If possible, one additional sample per year should be collected after a runoff event (e.g., storm)[o]
Non-Metals and Nutrients				
Cyanide (free)	mg/L	0.005[a,b]	< 0.0025	
Hardness	mg/L	n/a	n/a	
Sulphate	mg/L	50[c]	< 25	
Total Suspended Solids	mg/L	6.6[a,d]	< 3.35	
Nitrate (as N)	mg/L	1.3[a]	< 6.5	
Nitrite (as N)	mg/L	0.06[a]	< 0.03	
Total Kjeldahl Nitrogen	mg/L	n/a	n/a	
Dissolved Organic Carbon	mg/L	n/a	n/a	
Phosphorus	mg/L	0.03[i,j]	< 0.015	
Total Metals				
Aluminum	mg/L	0.1[a,e]	< 0.05	
Arsenic	mg/L	0.005[a]	< 0.0025	
Cadmium[m]	mg/L	0.000033[a,f]	< 0.000025	
Chromium	mg/L	0.001[a,g]	< 0.0005	
Copper	mg/L	0.002[a,f]	< 0.0015	
Iron	mg/L	1.00[a]	< 0.15	
Lead	mg/L	0.0032[a,f]	< 0.002	
Magnesium	mg/L	-	< 41	
Manganese	mg/L	1.3[c,f]	< 6.5	
Mercury	mg/L	0.000026[a,h]	< 0.000013	
Nickel	mg/L	0.065[a,f]	< 0.055	
Selenium	mg/L	0.001[a]	< 0.0005	
Silver	mg/L	0.0001[a]	< 0.00005	
Uranium	mg/L	0.005[j,k]	< 0.0025	
Zinc[m]	mg/L	0.03[a]	< 0.015	
Field Measures				
Temperature	˚C	n/a	n/a	
Dissolved Oxygen	mg/L	6.5 - 9.5[a,k,l]	3.3	
Dissolved Oxygen	%	n/a	n/a	
Conductivity	uS/cm	n/a	n/a	
pH	pH units	6.5 - 9.0[a]	3.3	
Flow	m/s	n/a	n/a	

n/a - not available

[a] Canadian Water Quality Guidelines (CCME 1999)

[b] Based on free cyanide

[c] British Columbia Water Quality Guidelines (BCMOE 2006)

[d] No more than 5,000 ug/L above background; mean of background TSS values was used in calculating guideline shown.

[e] 5 ug/L at pH<6.5 or 100 ug/L at pH≥ 6.5; since pH measured at water quality stations in the vicinity of UKHM is typically ≥ 6.5, 100 ug/L was chosen as guideline.

[f] Hardness dependent; hardness of 100 mg/L representing the lower range of hardness values in the near-field receiving environment. Guideline will be re-calculated using hardness of monitoring station at the time of each survey.

[g] Hexavalent form

[h] Inorganic mercury

[i] Ontario Water Quality Objectives (OMOE 1994)

[j] Interim objective or guideline

[k] For cold water streams

[l] Upper end of range is applicable for protecting early life-stages

[m] Should draft CWQG for Cd and Zn become finalized, then the target MDLs should be adjusted to ensure they are less than the guideline.

[n] Target method detection limit (MDL) calculated as one half the guideline however these are maximum limits and efforts should be made to achieve MDLs of ≤ 1/10 guideline. For parameters lacking a guideline, the target MDL should be the lowest MDL that can be reasonably achieved by a reputable analytical laboratory (e.g., Maxxam Analytics)

[o] Sample should be collected within 24 hours of runoff event.

Table 2: Water quality stations monitored under the Water Licences and included in the interim LTAMP.

Station ID	Station Description	Reference/ Exposed	Water Licences[a]	Rationale for Inclusion
KV-1	South McQuesten River upstream of Christal Creek	Exposed	✓	Historical reference station recently determined to be impacted by an unknown upstream source. Include to characterize water quality on the South McQuesten River upstream of UKHM.
KV-2	South McQuesten River at Pumphouse downstream of Christal Creek	Exposed	✓	Characterizes water quality in the South McQuesten River downstream of Christal Creek and upstream of Flat Creek.
KV-3	South McQuesten River upstream of Flat Creek	Exposed	✓	Characterizes water quality in the South McQuesten River immediately upstream of Flat Creek and captures possible subsurface contributions between KV-2 and KV-3.
KV-4	South McQuesten River downstream of Flat Creek	Exposed	✓	Characterizes water quality in the South McQuesten River immediately downstream of Flat Creek.
KV-5	South McQuesten River 9 km downstream of Flat Creek	Exposed	✓	Delineates possible spatial extent of mine influence on water quality in the South McQuesten River.
KV-6	Christal Creek at Keno Highway	Exposed	✓	Characterizes water quality on Christal Creek in a reach where concentrations of substances in water and sediment have been elevated in past surveys.
KV-7	Christal Creek at Hanson Road	Exposed	✓	Characterizes water quality on Christal Creek downstream of all tributaries discharging into Christal Creek.
KV-9A	Flat Creek between Valley Tailings and station KV-9, upstream of Galena Creek	Exposed		Characterizes water quality in Flat Creek closer to the source (Valley Tailings) than KV-9.
KV-9	Flat Creek upstream of South McQuesten River	Exposed	✓	Downstream of the Valley tailings and Silver King sources.
KV-37	Lightning Creek upstream of Hope Gulch	Reference	✓	Located upstream of mine influence on Lightning Creek and would therefore serve as a reference station.
KV-38	Lightning Creek upstream of Thunder Gulch	Exposed	✓	Characterizes water quality in Lightning Creek upstream of Bellekeno Mine discharge into Thunder Gulch.
KV-41	Lightning Creek upstream of bridge at Keno City	Exposed	✓	Located within an area influenced by placer mining. Data collected from this station could be used to separate UKHM from placer mining influence on water quality.
KV-60	Galena Creek upstream of Silver King adit	Reference	✓	This station is upstream of Silver King adit and thus serves as an upstream reference area.
KV-61	Porcupine Gulch at Calumet Road Crossing	Reference	✓	This station is upstream of mine workings on Porcupine Creek and thus serves as an upstream reference area
KV-64	Flat Creek at Silver Trail Highway	Reference	✓	This reach of Flat Creek is upstream of mine influence on Flat Creek and therefore serves as a reference area.
KV-65	Thunder Gulch upstream of Bellekeno	Reference	✓	This station is upstream of Bellekeno influence and thus serves as an upstream reference area.
KV-72[b]	South McQuesten River upstream of Cache Creek	Reference	✓	Located upstream of mine influence on the South McQuesten River and would therefore serve as a pristine reference area.
WILC	Williams Creek downstream of Duncan Creek Road	Reference		Williams Creek is outside of mine infuence and habitat at this station is an adequate match to habitat at exposure stations.
FIEC	Field Creek upstream of Duncan Creek Road	Reference		Field Creek is outside of mine infuence and habitat at this station is an adequate match to habitat at exposure stations.

[a] Station included in one or both Water Licences.

[b] Once more suitable tributary reference areas are established, KV-72 should be excluded from the program.

Table 3: Water quality 95th (and/or 5th if noted[a]) percentile of reference stations (without KV-60) and the Canadian Water Quality Guidelines (CWQG). Shading denotes reference concentrations greater than CWQG.

Variables	Units	Reference 95th (and/or 5th)	Canadian Water Quality Guideline (for protection of aquatic life) 2007 (plus updates)
Laboratory Measures			
Non-Metals and Nutrients			
Hardness (from total)	mg/L	383.5	
Hardness (from dissolved)	mg/L	388.5	
Dissolved Sulphate[d]	mg/L	220.85	309
Total Suspended Solids	mg/L	20.7	25.7
Nitrite (N)	mg/L	0.056	0.06
Nitrate (N)	mg/L	0.3133	3.0
Total Kjeldahl Nitrogen	mg/L	0.435	
Dissolved Organic Carbon	mg/L	9.255	
Total Phosphate	mg/L	0.0271	
Total Alkalinity	mg/L	93.0	
Alkalinity bicarbonate HCO3	mg/L	113.3	
Ammonia (N)	mg/L	0.0308	
Specific Conductance (lab)	µS/cm	714	
Chloride	mg/L	1.32	120
pH (lab)	pH units	7.44 - 8.30[a]	
Totals Metals			
Total Aluminum (Al)	mg/L	0.153	0.1
Total Antimony (Sb)	mg/L	0.00096	
Total Arsenic (As)	mg/L	0.00342	0.005
Total Barium (Ba)	mg/L	0.082	
Total Beryllium (Be)	mg/L	0.000015	
Total Bismuth (Bi)	mg/L	0.000007	
Total Boron (B)	mg/L	0.05	1.5
Total Cadmium (Cd)	mg/L	0.00016	0.00016[b]
Total Calcium (Ca)	mg/L	125.5	
Total Chromium (Cr)	mg/L	0.000875	0.0089
Total Cobalt (Co)[e]	mg/L	0.00029	0.0025
Total Copper (Cu)	mg/L	0.00280	0.00236
Total Iron (Fe)[c]	mg/L	0.4085	1.0
Total Lead (Pb)	mg/L	0.00579	0.0032
Total Lithium (Li)	mg/L	0.00537	
Total Magnesium (Mg)	mg/L	18.40	
Total Manganese (Mn)	mg/L	0.243	1.0[f]
Total Mercury (Hg)	mg/L	0.00001	0.00026
Total Molybdenum (Mo)	mg/L	0.00035	0.073
Total Nickel (Ni)	mg/L	0.0015	0.0960
Total Phosphorus (P)	mg/L	0.0202	
Total Potassium (K)	mg/L	0.660	
Total Selenium (Se)	mg/L	0.00109	0.001
Total Silicon (Si)	mg/L	4.10	
Total Silver (Ag)	mg/L	0.000047	0.0001
Total Sodium (Na)	mg/L	1.95	
Total Strontium (Sr)	mg/L	0.354	
Total Sulphur (S)	mg/L	89.1	
Total Thallium (Tl)	mg/L	0.000034	0.0008
Total Tin (Sn)	mg/L	0.00033	
Total Titanium (Ti)	mg/L	0.0048	
Total Uranium (U)	mg/L	0.00326	0.015
Total Vanadium (V)	mg/L	0.00052	
Total Zinc (Zn)	mg/L	0.0138	0.017[b]
Total Zirconium (Zr)	mg/L	0.00027	
Field Measures			
Temperature (field)	C	5.2	
Dissolved Oxygen (field) mg/L	mg/L	10.3[a]	6.5 - 9.5
Dissolved Oxygen (field) %	%	72[a]	
Conductivity (field)	µS/cm	275	
Specific Conductance (field)	µS/cm	699	
pH (field)	pH units	7.17 - 8.49[a]	6.5-9.0
ORP (field)	mV	349.4	

[a] 5th percentile also presented

[b] Value presented based on draft equation for that analyte.

[c] Guideline based on BCMOE 2008.

[d] Guideline based on BCMOE 2013.

[e] Guideline based on Federal Environmental Quality Guideline (Environment Canada 2013).

[f] Guideline based on BCMOE 2006 at 100 mg/L water hardness.

Table 4: Mean and maximum concentrations in water for exposed Keno stations relative to background and guidelines.

Analytes	Units	guideline[f]	background	KV-6		KV-7		KV-9A		KV-9		KV-38		KV-41	
				median	maximum	median	maximum	median	maximum	median	maximum	median	maximum	median	maximum
Laboratory Measures															
Non-Metals and Nutrients															
Hardness (from total)	mg/L		384	**495**	**573**	383	**495**	**528**	**721**	315	341	84	89	108	127
Hardness (from dissolved)	mg/L		389	**480**	**566**	368	**487**	**532**	**751**	315	373	84	87	100	126
Dissolved Sulphate[a]	mg/L	309	221	**335**	**390**	200	**280**	**239**	**386**	129	160	42	53	56	70
Total Suspended Solids	mg/L	25.7	20.7	2	4	2	**72**	9	**182**	1	10	1	13	5	**540**
Nitrite (N)	mg/L	0.060	0.056	< 0.005	< 0.050	0.005	**<0.5**	0.050	**0.060**	< 0.050	< 0.050	< 0.050	< 0.050	0.022	**<0.5**
Nitrate (N)	mg/L	3.00	0.31	0.22	**1.06**	0.19	**2.00**	0.20	0.20	0.20	0.21	0.20	0.27	0.25	**2.63**
Total Kjeldahl Nitrogen	mg/L		0.44	0.23	**1.20**	0.26	**0.89**	**0.60**	**1.28**	0.22	0.33	0.20	**0.51**	0.20	**0.66**
Dissolved Organic Carbon	mg/L		9.26	1.80	**10.40**	1.70	**19.40**	6.63	**13.50**	4.35	**15.10**	0.93	4.60	0.96	3.63
Total Phosphate	mg/L		0.027	0.0070	0.0211	0.0040	**0.0605**	0.008	**0.064**	0.0032	0.0250	0.0070	0.0104	0.0090	**0.6520**
Total Alkalinity	mg/L		93	**124**	**140**	**140**	**160**	-	-	-	-	40	46	51	60
Alkalinity bicarbonate HCO3	mg/L		113	**151**	**171**	**170**	**200**	-	-	-	-	48	56	62	74
Ammonia (N)[b]	mg/L	0.343 - 23.1	0.031	**0.05**	**0.18**	**0.033**	**0.24**	-	-	-	-	-	0.00	0.016	**0.071**
Specific Conductance (lab)	µS/cm		714	**890**	**955**	690	**820**	**950**	**1270**	589	673	-	-	222	256
Chloride	mg/L	120	1.3	1.20	**1.80**	1	**1.7**	-	-	-	-	1	1	0.76	**2.40**
pH (lab)	pH units	6.5 - 9.0	7.44 - 8.30	7.82	8.16	8.08	8.26	8.09	8.36	8.19	8.35	7.72	7.93	7.75	7.98
Total Metals															
Total Aluminum (Al)	mg/L	0.10	0.15	0.009	0.041	0.009	**0.946**	0.022	**0.309**	0.007	0.059	0.007	0.077	0.048	**3.520**
Total Antimony (Sb)	mg/L		0.00096	0.00028	0.00052	0.00024	**0.00105**	0.0006	**0.0011**	0.0008	**0.0018**	0.0003	0.0004	0.00030	0.00074
Total Arsenic (As)	mg/L	0.0050	0.0034	**0.0059**	**0.0103**	0.0024	**0.0179**	**0.0046**	**0.0459**	0.0020	**0.0070**	0.0027	**0.0062**	0.0013	**0.0114**
Total Barium (Ba)	mg/L		0.082	0.054	0.069	0.053	0.080	0.082	**0.154**	0.073	**0.107**	0.057	0.069	0.053	**0.202**
Total Beryllium (Be)	mg/L		0.000015	0.000010	0.000010	0.000010	**0.000050**	0.000010	**0.000030**	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	**0.00018**
Total Bismuth (Bi)	mg/L		0.000007	0.000005	**0.000008**	0.000005	**0.000040**	0.000005	**0.000014**	< 0.000005	< 0.000005	< 0.000005	< 0.000009	0.000005	**0.001000**
Total Boron (B)	mg/L	1.50	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Cadmium (Cd)	mg/L	0.000158	0.000156	**0.00111**	**0.00378**	**0.000724**	**0.004110**	**0.000394**	**0.002120**	**0.000394**	**0.001680**	0.000112	**0.000784**	0.000081	**0.001130**
Total Calcium (Ca)	mg/L		126	**154.0**	**183.0**	115.0	**155.0**	**152.0**	**199.0**	87.9	95.7	25.6	27.9	33.7	39.7
Total Chromium (Cr)	mg/L	0.00890	0.00088	0.00020	**0.00090**	0.00020	**0.00160**	0.00010	**0.00090**	0.00010	0.00050	0.00011	0.00040	0.00041	**0.00700**
Total Cobalt (Co)[c]	mg/L	0.0025	0.00029	**0.001345**	**0.002430**	0.00019	**0.00214**	**0.000635**	**0.002860**	0.000057	0.000161	0.000021	0.000214	0.000110	**0.005230**
Total Copper (Cu)	mg/L	0.0024	0.0028	0.00041	0.00248	0.00062	**0.00940**	0.00123	**0.03740**	0.00138	**0.00439**	0.00035	0.00155	0.00091	**0.02530**
Total Iron (Fe)[d]	mg/L	1.00	0.41	0.382	**0.991**	0.145	**2.940**	**1.000**	**20.200**	0.081	**0.767**	0.030	0.384	0.082	**7.540**
Total Lead (Pb)	mg/L	0.0032	0.0058	0.00524	**0.02330**	0.00166	**0.06480**	0.0048	**0.0520**	**0.00639**	**0.07840**	0.00030	**0.01030**	0.00145	**0.02960**
Total Lithium (Li)	mg/L		0.0054	**0.016**	**0.018**	**0.0076**	**0.0107**	**0.0082**	**0.0118**	0.0027	0.0045	0.0011	0.0013	0.0017	**0.0055**
Total Magnesium (Mg)	mg/L		18	**25.5**	**28.5**	**22.2**	**29.0**	**35.9**	**54.3**	**23.1**	**25.2**	4.7	5.1	6.0	6.9
Total Manganese (Mn)[e]	mg/L	1.0	0.243	**0.8845**	**1.8400**	0.1650	**0.6700**	**0.9450**	**5.9600**	0.0586	**0.4290**	0.0057	0.0439	0.0097	**0.4140**
Total Mercury (Hg)	mg/L	0.00026	0.00001	< 0.00001	< 0.00001	0.00001	0.00001	< 0.00001	**< 0.00002**	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	**0.00005**
Total Molybdenum (Mo)	mg/L	0.0730	0.00035	0.00021	**0.00037**	**0.00036**	**0.00049**	0.00032	**0.00041**	0.00022	0.00030	0.00017	0.00025	0.00023	**0.00100**
Total Nickel (Ni)	mg/L	0.0960	0.0015	**0.00434**	**0.00677**	**0.00178**	**0.00680**	**0.00164**	**0.01060**	0.00061	**0.02500**	0.00027	0.00092	0.00053	**0.01370**
Total Phosphorus (P)	mg/L		0.020	0.008	**0.024**	0.005	**0.181**	0.011	**0.056**	0.003	0.020	0.007	**0.029**	0.010	**0.681**
Total Potassium (K)	mg/L		0.66	0.43	0.61	0.43	**0.92**	**0.82**	**2.27**	0.54	**0.80**	0.17	0.32	0.20	0.54
Total Selenium (Se)	mg/L	0.00100	0.00109	0.00085	**0.00111**	0.00082	0.00106	0.00028	0.00082	0.00012	0.00026	0.00071	0.00092	0.00090	**0.00117**
Total Silicon (Si)	mg/L		4.10	3.78	**4.82**	3.30	**4.49**	**4.70**	**7.20**	2.64	3.20	3.40	3.70	3.35	**6.86**
Total Silver (Ag)	mg/L	0.000100	0.000047	0.000010	**0.000063**	0.000007	**0.000732**	0.000021	**0.000393**	0.000022	**0.000681**	0.000005	**0.000081**	0.000012	**0.000520**
Total Sodium (Na)	mg/L		1.95	1.61	**2.43**	1.44	**2.05**	**3.05**	**6.52**	1.75	**3.05**	0.91	1.13	1.02	1.82
Total Strontium (Sr)	mg/L		0.35	0.252	0.274	0.238	0.278	**0.366**	**0.522**	0.198	0.226	0.085	0.088	0.0890	0.1020
Total Sulphur (S)	mg/L		89	**131**	**152**	82	**112**	**102**	**153**	45	53	15	20	20	50
Total Thallium (Tl)	mg/L	0.000800	0.000034	0.000003	0.000010	0.000002	**0.000036**	0.000009	**0.000038**	0.000011	0.000031	0.000002	0.000003	0.000002	**0.000050**
Total Tin (Sn)	mg/L		0.00033	0.00020	**0.00055**	0.00020	0.00029	0.00020	0.00028	0.00020	**0.00040**	0.00020	0.00020	0.00020	**0.00500**
Total Titanium (Ti)	mg/L		0.0048	0.0005	0.0033	0.0005	**0.0240**	0.0006	**0.0114**	0.0005	0.0017	0.0005	0.0024	0.0015	**0.1000**
Total Uranium (U)	mg/L	0.0150	0.0033	**0.0040**	**0.0049**	0.0025	0.0031	0.00145	0.00187	0.00104	0.00113	0.00019	0.00028	0.00044	0.00090
Total Vanadium (V)	mg/L		0.0005	0.0002	0.0002	0.0002	**0.0026**	0.0002	**0.0022**	0.0002	0.0002	0.0002	0.0002	0.0002	**0.0096**
Total Zinc (Zn)	mg/L	0.017	0.014	**0.1560**	**0.3640**	**0.1040**	**0.3700**	**0.0578**	**0.1570**	**0.0271**	**0.1030**	0.0108	**0.0666**	0.0107	**0.0801**
Total Zirconium (Zr)	mg/L		0.0003	0.0001	**0.0004**	0.0001	**0.0007**	0.0001	**0.0007**	0.0001	0.0002	0.0001	0.0001	0.0001	**0.0011**
Field Measures															
Discharge (Flow)	L/s		8 - 711	89	147	259	600	109	222	244	1574	205	2367	795	1958
Temperature (field)	C		5.2	0.7	**13.1**	0.2	**8.1**	0.1	**13.3**	1.9	**13.4**	0.8	**5.7**	0.8	**7.8**
Dissolved Oxygen (field)	mg/L	9.5	10.3	12.00	14.70	13.17	16.10	**9.71**	13.76	**9.40**	10.85	12.87	15.71	12.86	14.50
Dissolved Oxygen (field)	%		72	89	134	97	110	76	96	**68**	86	94	108	94	107
Conductivity (field)	µS/cm		275	**465**	**1127**	**410**	**632**	-	-	148	163	180	188	138	**331**
Specific Conductance (field)	µS/cm		699	**894**	**1056**	671	**846**	**968**	**1495**	589	**708**	183	217	220	267
pH (field)	pH units	6.5 - 9.0	7.17 - 8.49	7.75	8.23	8.05	8.47	7.61	7.99	7.78	8.23	7.74	8.20	7.83	8.52
ORP (field)	mV		349	185.0	**361.3**	115.4	**428.1**	156.7	345.4	149.7	300.4	105.3	**369.4**	156.1	**351.2**

Bold - value greater than background or less than background for dissolved oxygen and pH
light grey - value greater than guideline or less than guideline for dissolved oxygen and pH
dark grey - value greater than 2x guideline or less than 2x guideline for dissolved oxygen and pH

[a] - BCMOE guideline for sulphate at 100 mg/L hardness, BCMOE, April 2013.

[b] - Ammonia guideline range calculated from CCME guideline table, based on pH and temperature, see Appendix Table A.20

[c] - Federal Environmental Quality Guideline, Environment Canada, February 2013

[d] - BCMOE Iron guideline, February 2008.

[e] - BCMOE Manganese guideline, August 2006.

[f] - hardness based guidelines calculated based on 100 mg/L hardness.

Table 5: Summary of substances that exceed background and guidelines.

Station	Median				Maximum
	> guideline and > background	**> guideline < background**	**>background < guideline**	**> background no guideline**	**2 times > guideline**
KV-6	SO4, As, Cd, Zn		NH3, Co, Mn, Ni, U	hardness, alkalinity, specific conductance, Ca, Li, Mg, S	As, Cd, Pb, Zn
K-7	Cd, Zn		NH3, Ni, Mo	alkalinity, specific conductance, Li, Mg	TSS, Al, As, Cd, Cu, Fe, Pb, Ag, Zn
KV-9	Cd, Zn			Mg	Cd, Pb, Ag, Zn
KV-9A	Cd, Zn		Co, Fe, Mn, Ni	specific conductance, Ca, Li, Mg, K, Si, Na, Sr, S	TSS, Al, As, Cd, Cu, Fe, Pb, Ag, Mn, Zn
KV-38					Cd, Pb, Zn
KV-41	Cd,		NH3		TSS, Al, As, Cd, Cu, Fe, Pb, Ag, Zn

values > 10 times background are underlined

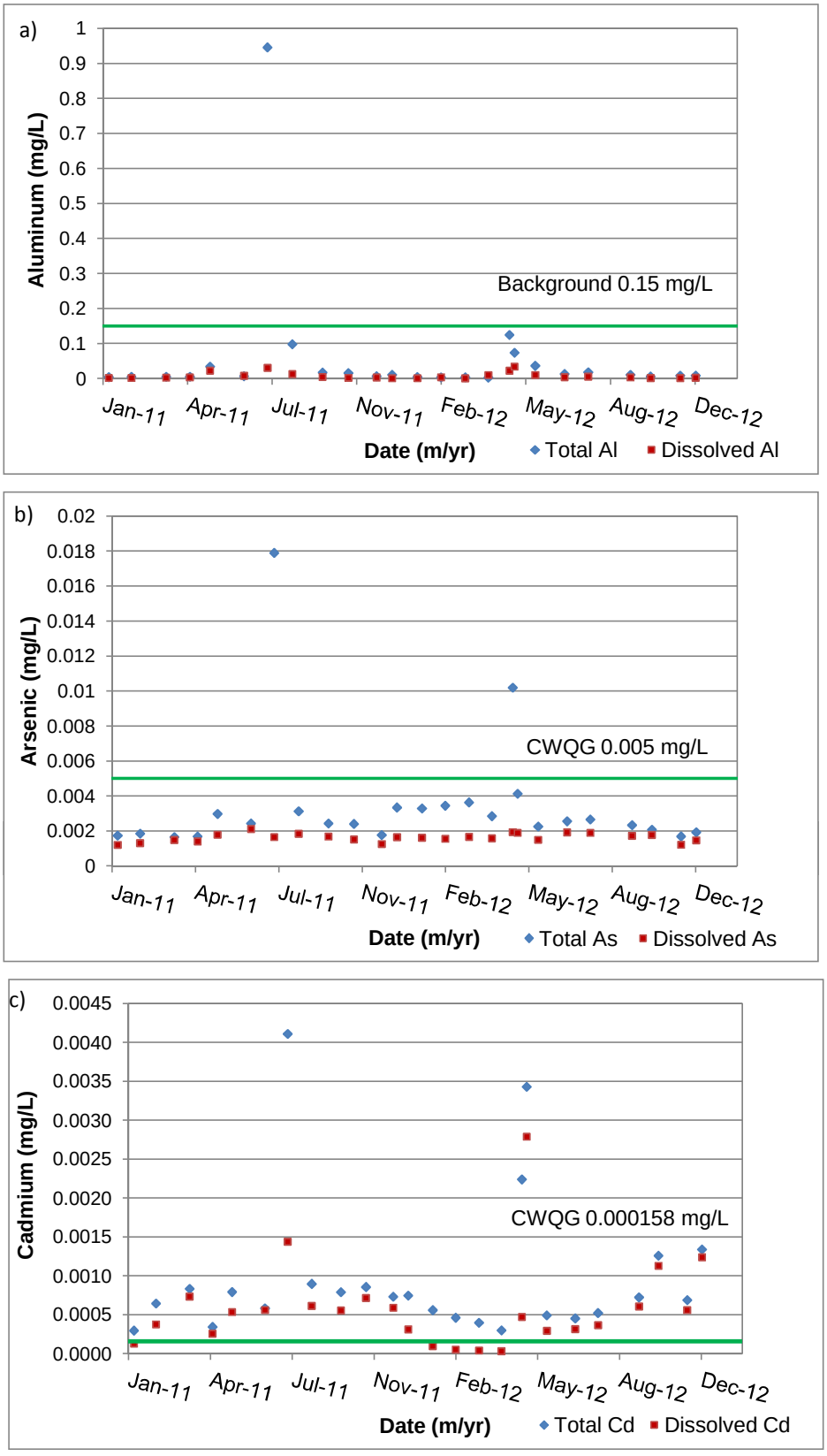


Figure 1: Selected total and dissolved analytes (2011-2012) at station KV-7 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

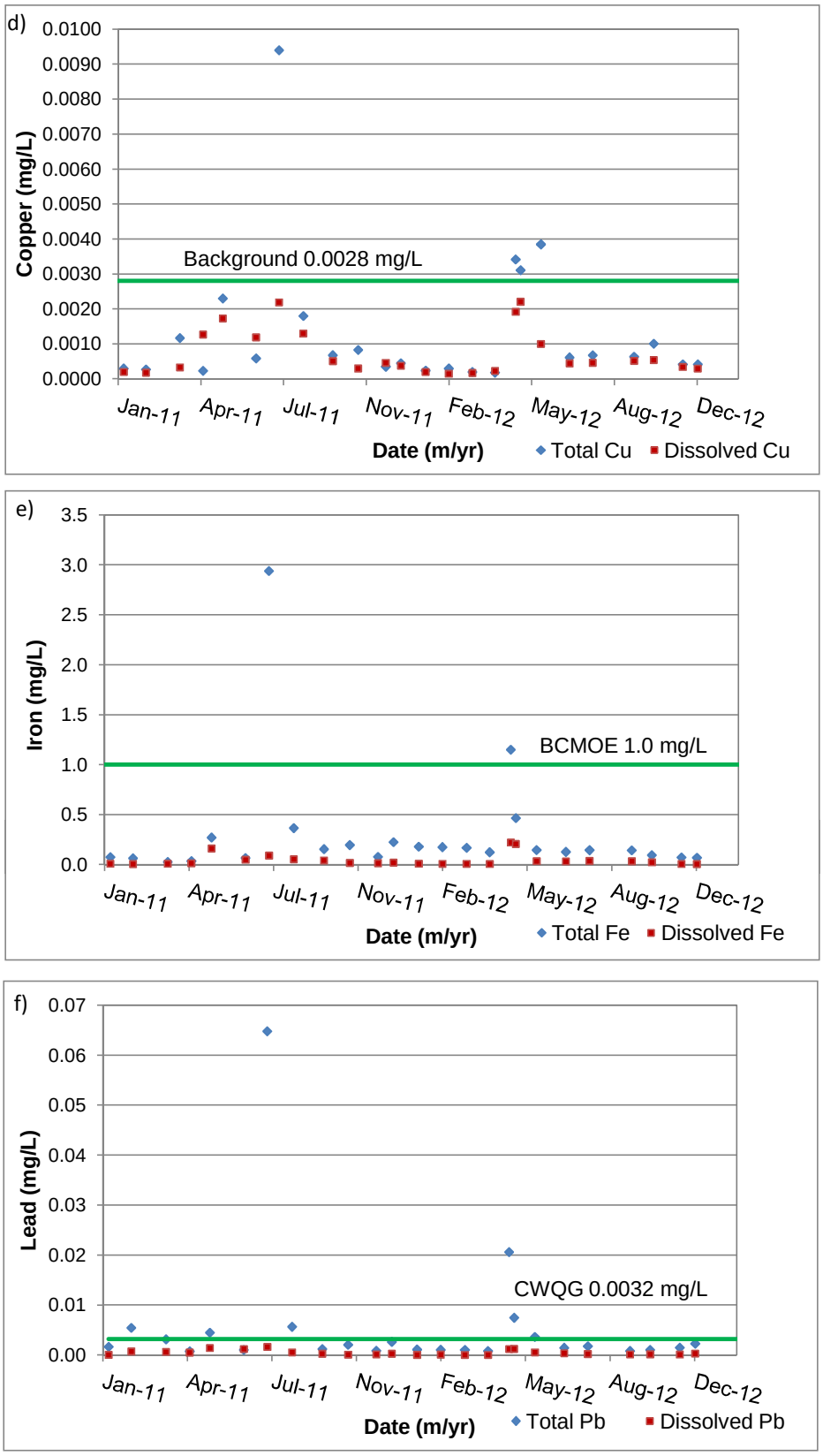


Figure 1: Selected total and dissolved analytes (2011-2012) at station KV-7 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

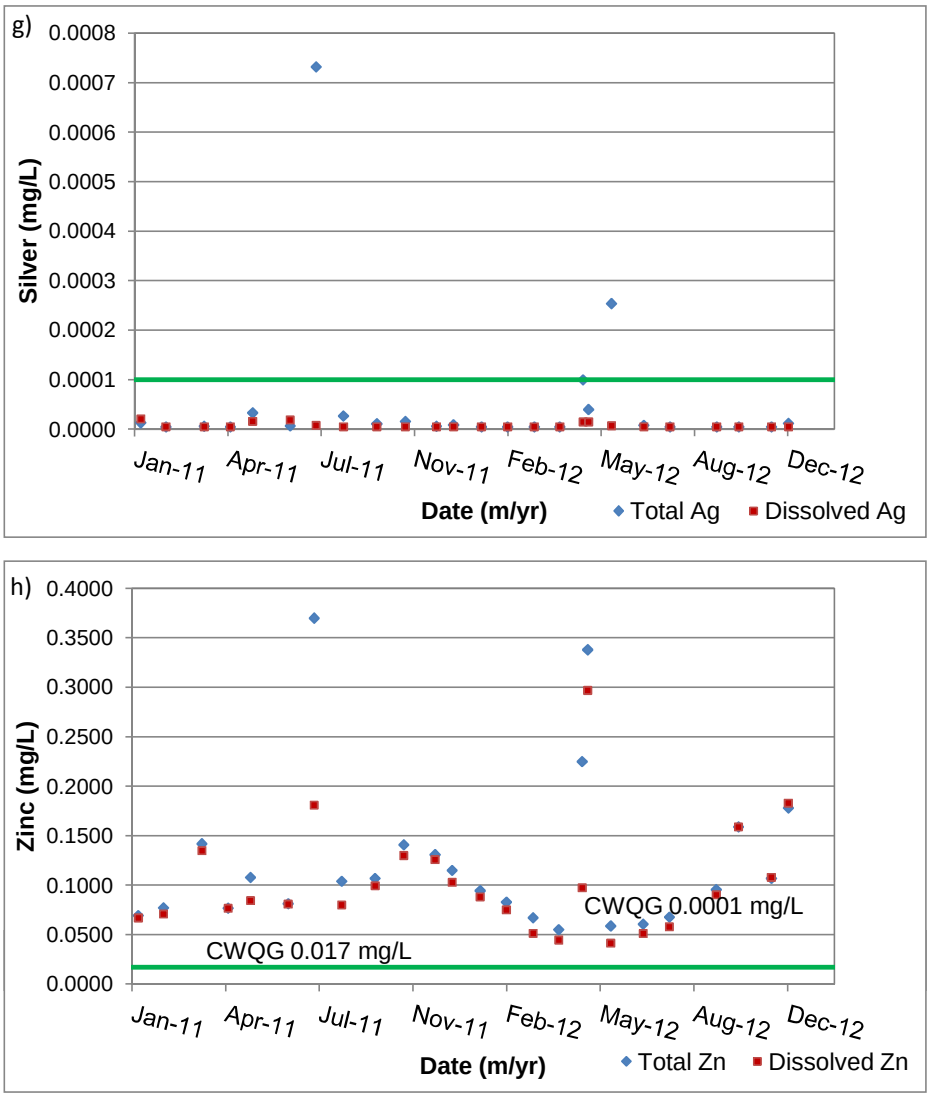


Figure 1: Selected total and dissolved analytes (2011-2012) at station KV-7 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

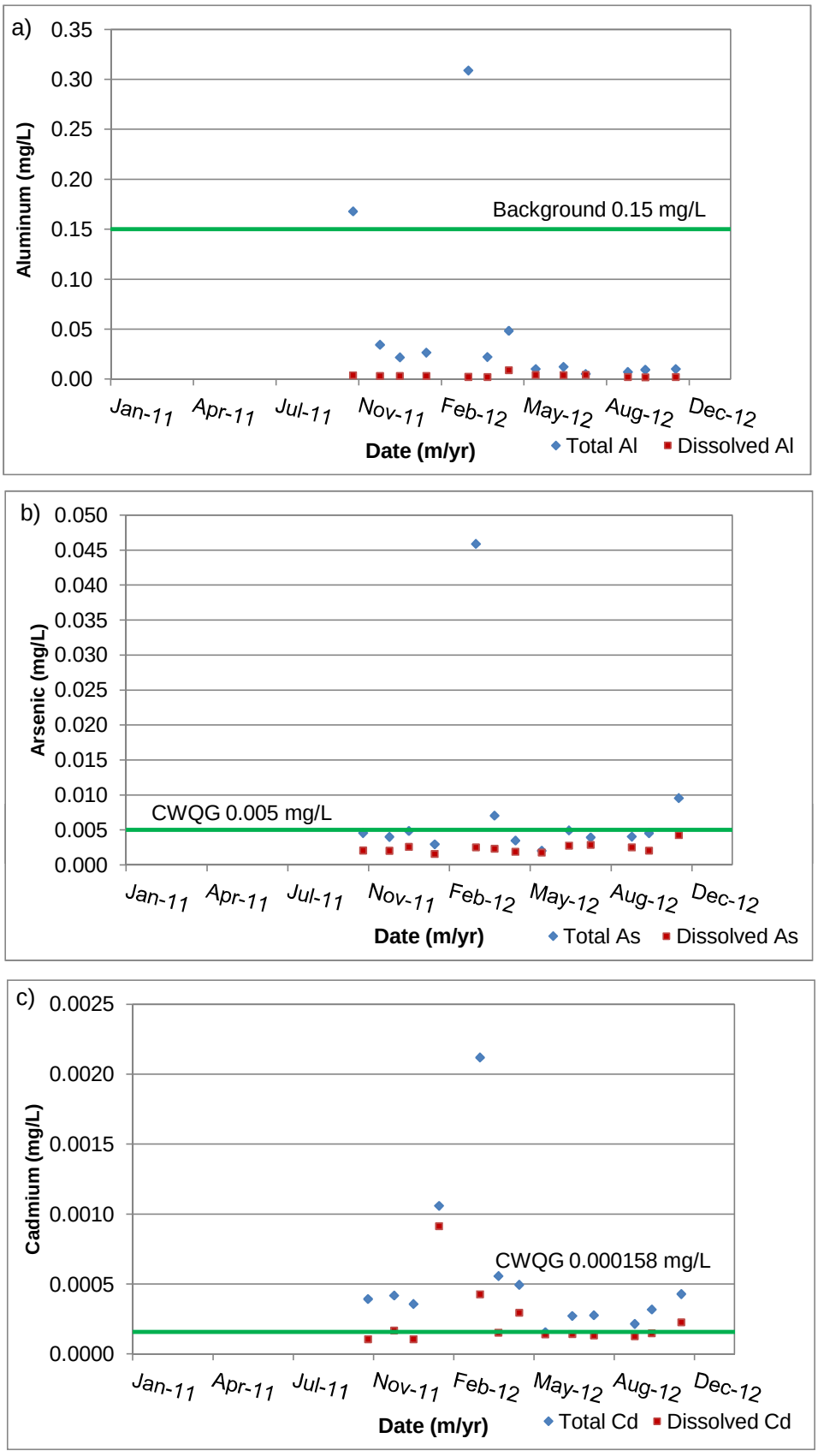
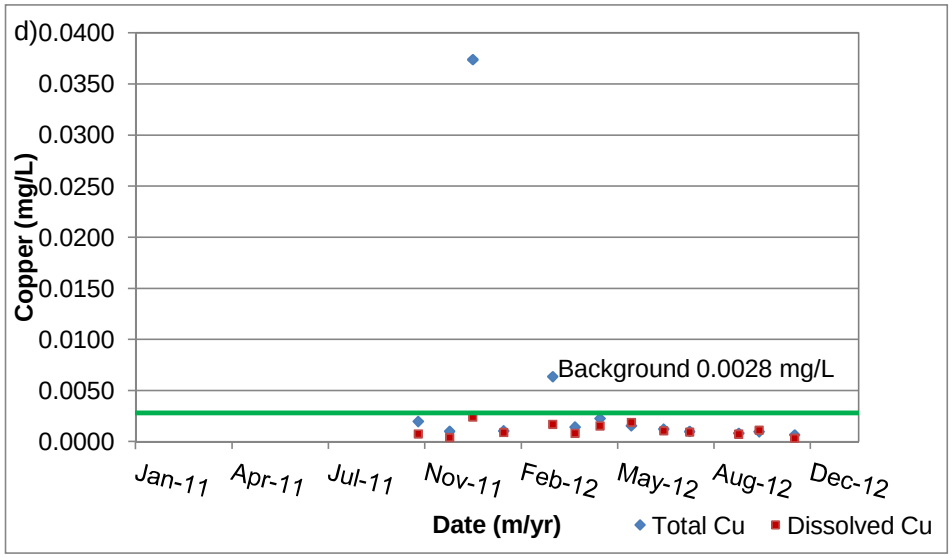
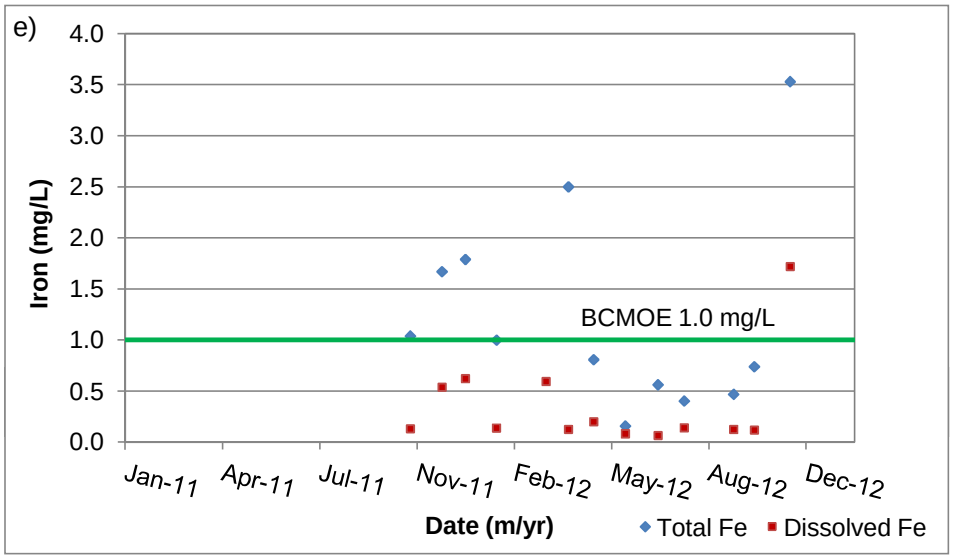


Figure 2: Selected total and dissolved analytes (2011-2012) at station KV-9A relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.





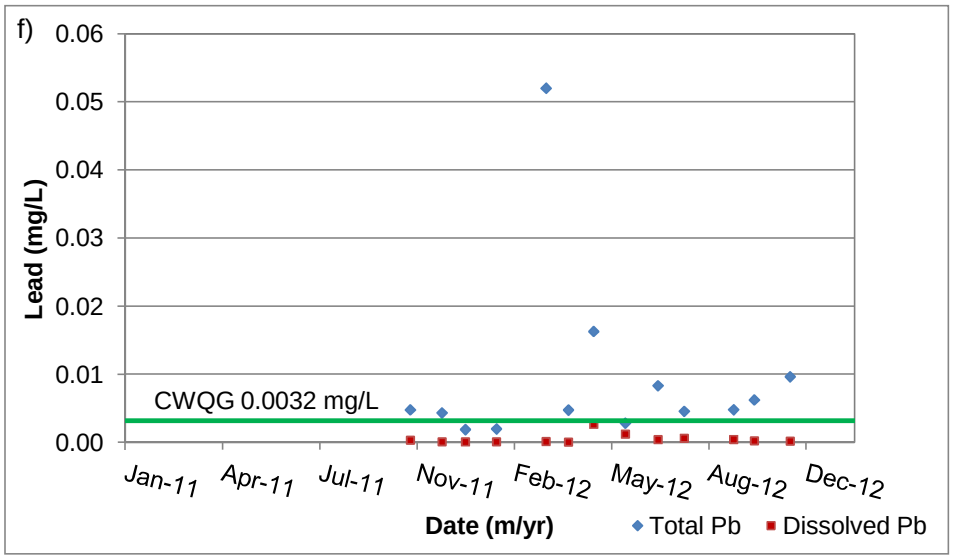
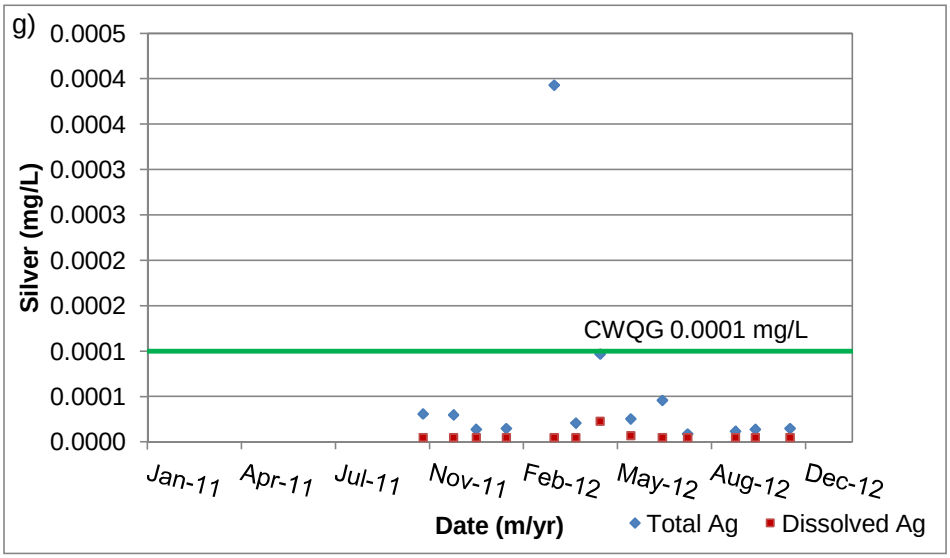


Figure 2: Selected total and dissolved analytes (2011-2012) at station KV-9A relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.



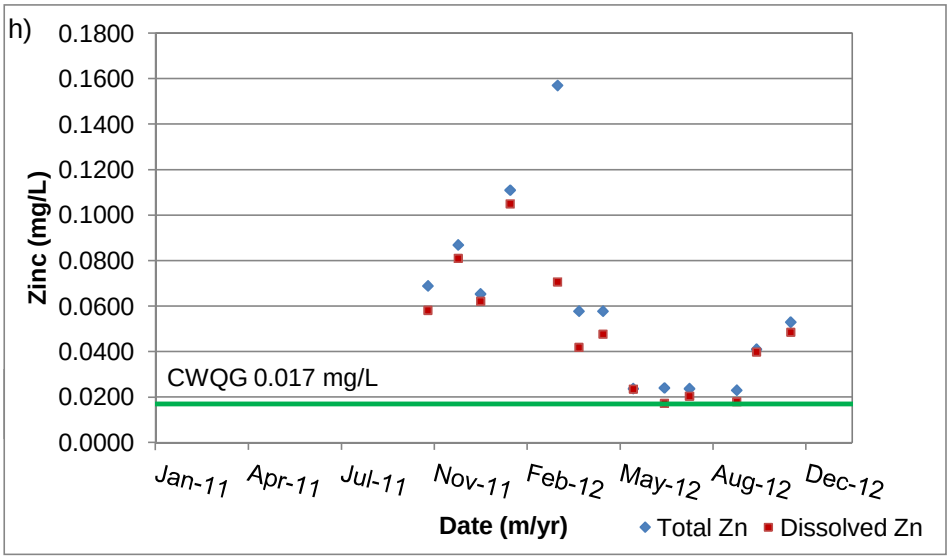


Figure 2: Selected total and dissolved analytes (2011-2012) at station KV-9A relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

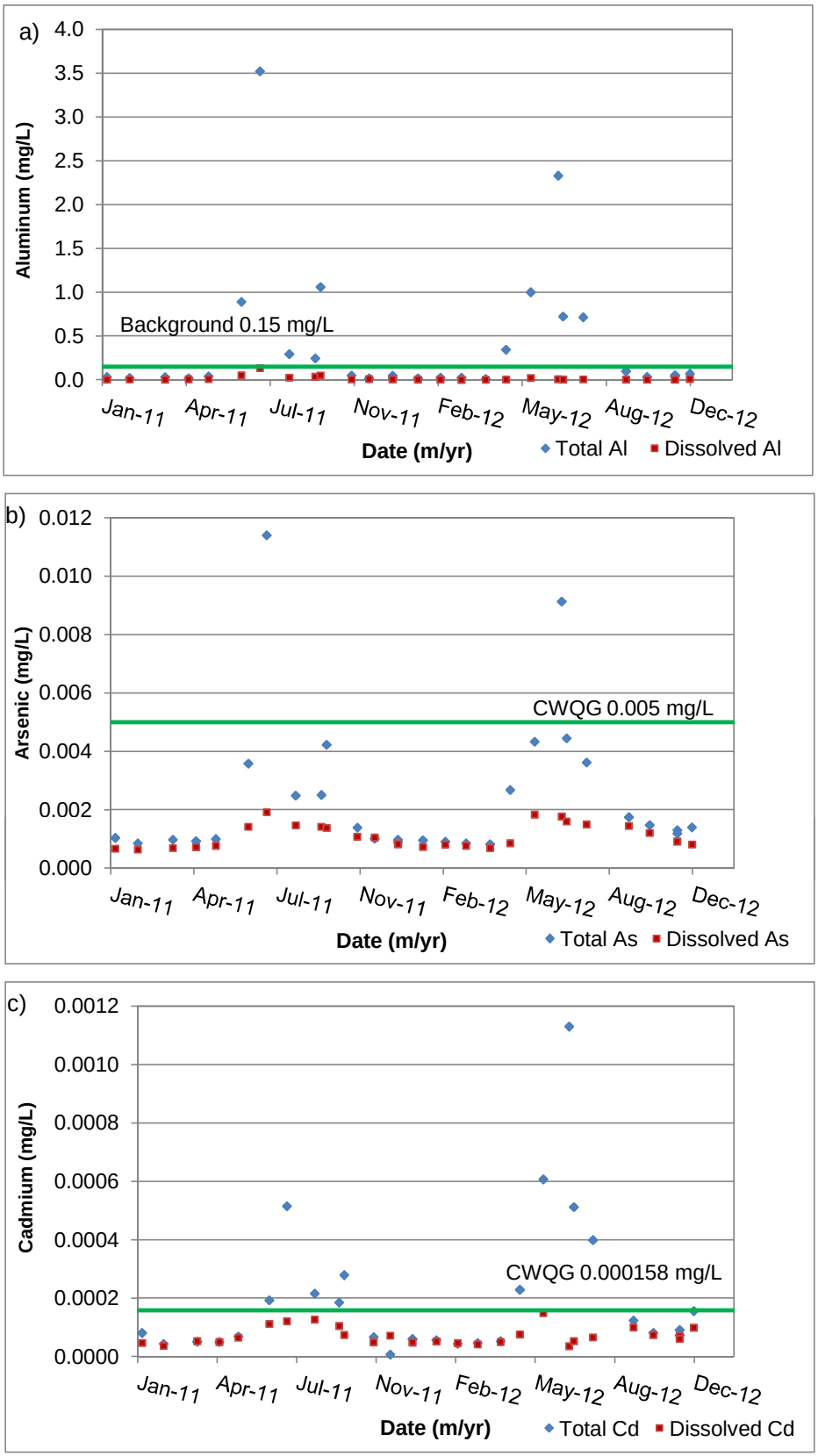
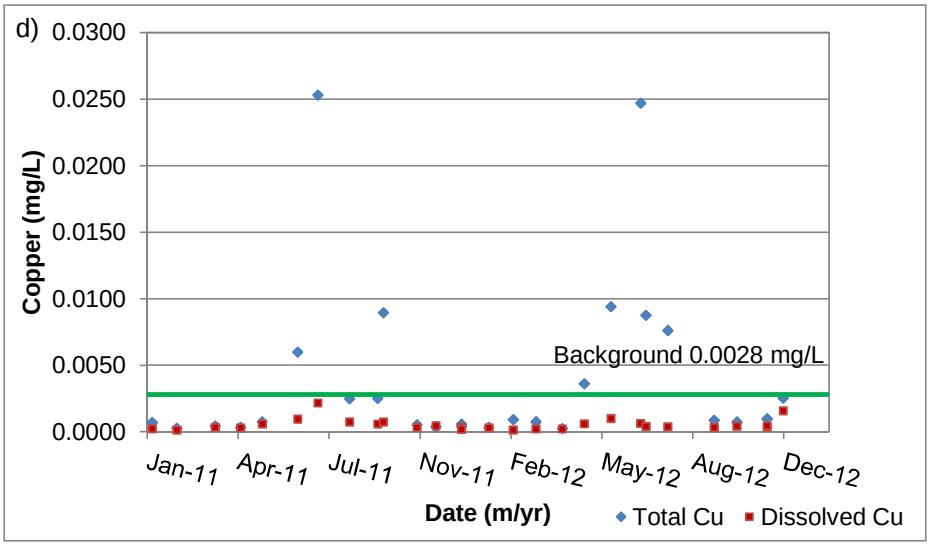
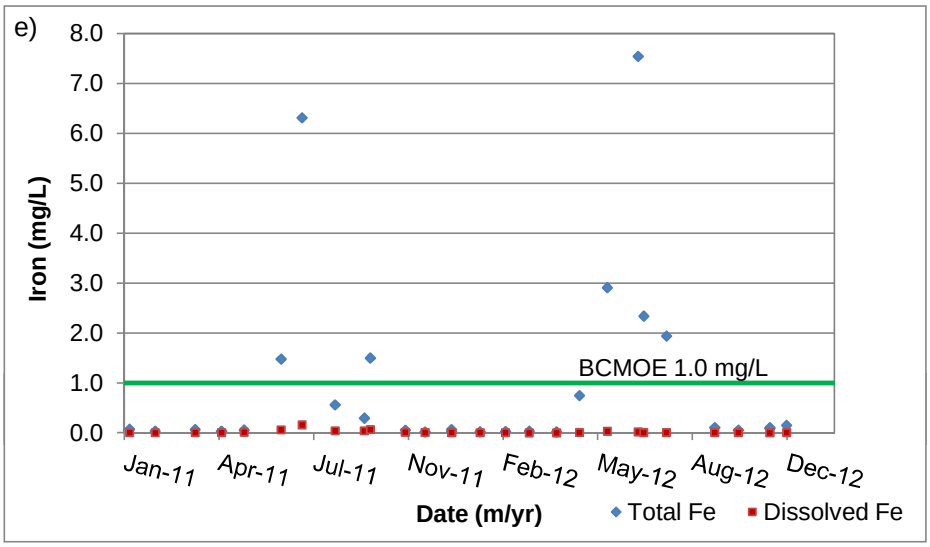


Figure 3: Selected total and dissolved analytes (2011-2012) at station KV-41 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.





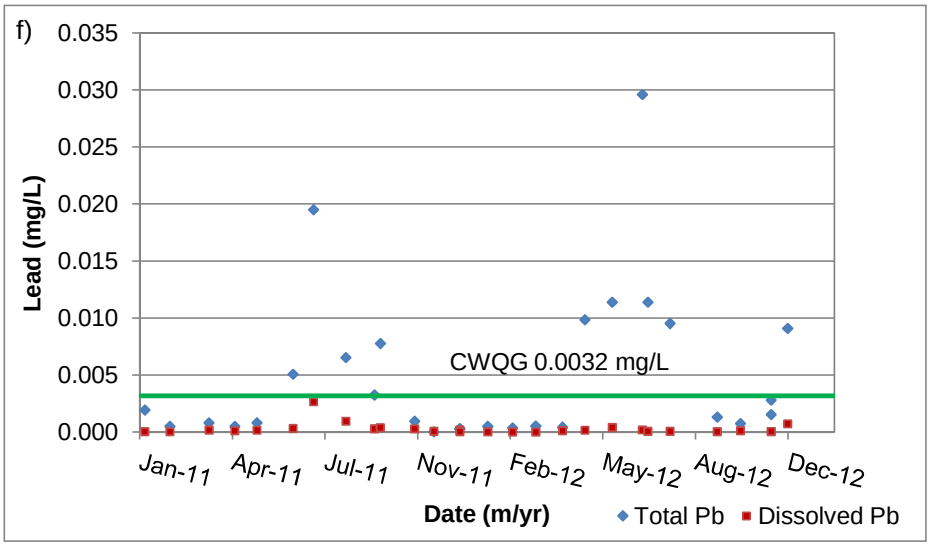


Figure 3: Selected total and dissolved analytes (2011-2012) at station KV-41 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

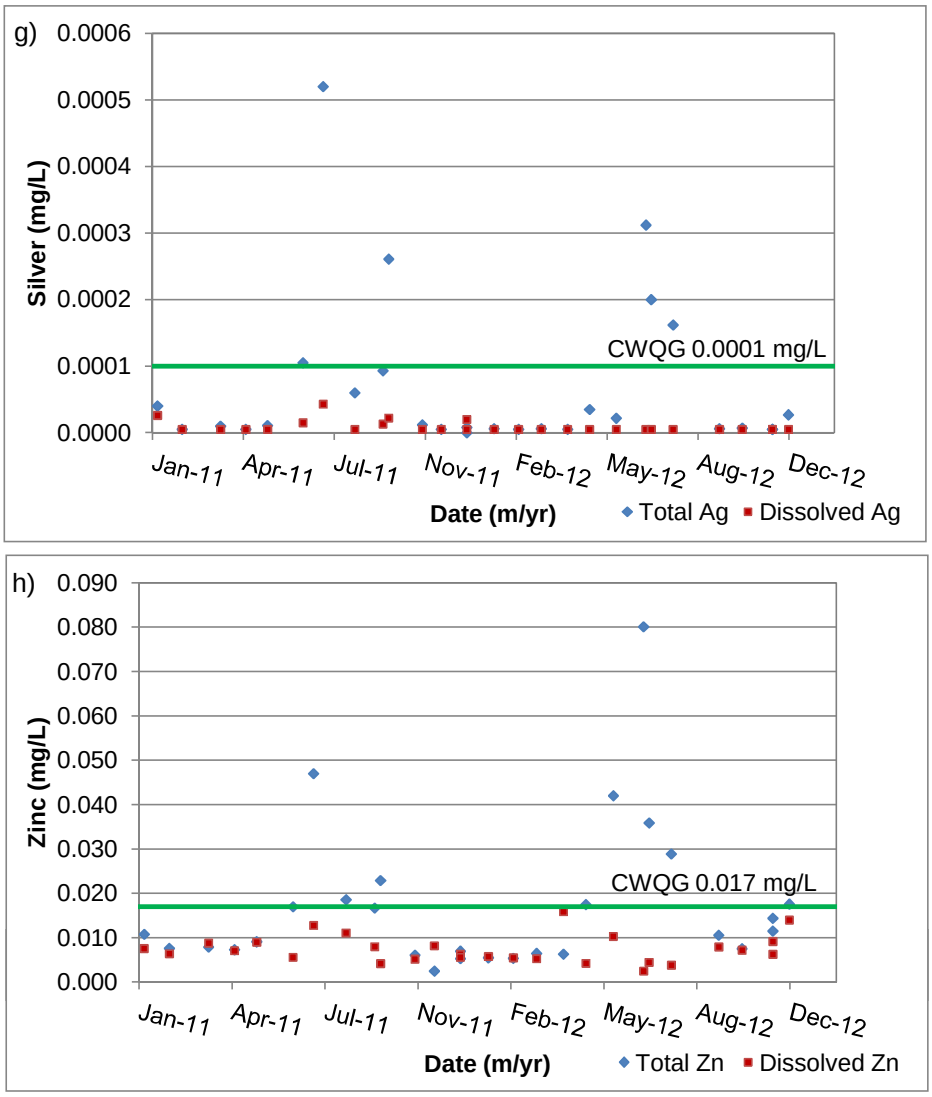


Figure 3: Selected total and dissolved analytes (2011-2012) at station KV-41 relative to the upper limit of background or the Canadian Water Quality Guideline (CWQG), whichever is higher.

APPENDIX A

Water Quality Tables and Figures

Table A.1: Water quality concentrations for KV-37, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011		7.98	7.52	124		132	0.0				2.0	58	55	38	46		29		
5/25/2011		7.75	**7.30**	36		61	3.1				11.0	28	28	11	14		18		
7/14/2011	1,021	7.71	7.55		112	118	**6.5**				1.0	54	53	26	31		30		
9/17/2011	348	7.88	7.76		171	148	2.0				<1	64	62	34	41		32	0.010	<0.005
10/30/2011	206	7.72	7.47		142	134	1.4	10.3	72	293	<1	63	57	33	41		28		<0.050
11/22/2011	162	8.06	7.73			132	0.0	12.6	86		<1	60	57				28		<0.005
12/18/2011			7.60			130					1.0	64	60	36	44		24	0.008	<0.005
12/18/2011	92	7.40	7.75			131	0.0	12.4	85		<1	58	58				30		
1/18/2012	120	7.51	7.73		115	135	0.0	11.1	76	**366**	<1	58	57				26		<0.005
2/9/2012	135	7.64	7.68		132	127	0.1	13.5	93	168	4.9	61	61	37	46		24		<0.005
3/9/2012		7.37	7.96			143	0.0	12.4	85	0	<1	64	60				27		**0.190**
4/7/2012	69	7.87	7.77		154	134	0.2	15.6	107	185	<1	59	62				26		<0.005
5/6/2012	62	8.21	7.74		116	127	0.5	14.3	99	88	<1	59	59	38	46	<0.5	22		<0.005
6/1/2012	781	7.65	7.66		71	90	2.0				2.5	36	38				20		<0.050
6/13/2012			**7.43**			104					1.7	48	47	21	25	<0.5	29	0.015	<0.050
7/1/2012	691	7.77	**7.43**		147	135	**6.5**	12.1	99	92	1.0	64	61			<0.5	34		<0.050
7/8/2012		7.64	7.71		154	143	4.9	12.5	98	93	<1	60	61	29	35		38	<0.0050	<0.050
8/1/2012	62	**7.00**	7.51		160	144	5.0	13.3	103	104	1.0	69	66				35		<0.050
9/20/2012	387	8.03	7.79			159	4.1	12.1	93	64	<1	75	73				43		<0.050
10/10/2012	262	7.60	7.71		175	147	0.0	12.3	85	176	<1	66	67	36	43	<0.5	37		<0.050
11/16/2012		7.83	**7.38**		149	141	0.1	13.0	89	344	<1	67	64				30		**0.077**
11/18/2012		**6.75**	7.70		128	141	0.1	**8.2**	**68**		<1	66	67	38	46	<0.5	30	0.008	<0.050
12/6/2012		**7.06**	7.86		150	135	0.1			137	<1	60	64				26		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	14	21	23	2	15	23	21	15	15	13	23	23	23	12	12	5	23	5	19
median	184	7.71	7.70	80	147	134	0.2	12.43	89	137	1	60	60	34.8	42	< 0.5	28.7	0.0082	0.050
mean	314	7.64	7.64	80	138	130	1.7	12.37	89	162	2	59	58	31.3	38	< 0.5	28.9	0.0092	0.040
standard deviation	305	0.36	0.17	62	27	21	2.3	1.69	11	111	2	10	10	8.4	10	< 0.0	5.9	0.0037	0.044
minimum	62	6.75	7.30	36	71	61	0.0	8.20	68	0	< 1	28	28	11.0	14	< 0.5	18.0	< 0.005	< 0.005
maximum	1021	8.21	7.96	124	175	159	6.5	15.59	107	366	11	75	73	38.0	46	< 0.5	43.0	0.0150	0.190
# < detection limit	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	5	0	1	17
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	61%	0%	0%	0%	0%	100%	0%	20%	89%
# > guideline		0	0					1			0					0		0	2
% > guideline		0%	0%					7%			0%					0%		0%	11%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.1: Water quality concentrations for KV-37, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011			0.006	1.00	0.01	0.00007	0.0027	0.059	<0.00001	<0.000005	<0.05	0.00001	18	0.00030	0.00002	0.0004	0.05	0.0003	0.0008	3	0.006
5/25/2011			0.009	4.60	0.07	0.00010	0.0034	0.031	<0.00001	<0.000005	<0.05	0.00007	8	0.00040	0.00012	0.0013	0.17	0.0023	<0.0005	2	0.019
7/14/2011			0.005	2.70	0.03	0.00012	0.0022	0.040	<0.00001	<0.000005	<0.05	0.00001	16	0.00030	0.00004	0.0009	0.06	0.0001	<0.0005	3	0.007
9/17/2011	0.07		0.005	<0.5	0.01	0.00009	0.0025	0.052	<0.00001	<0.000005	<0.05	0.00003	20	0.00010	0.00003	0.0004	0.06	0.0008	0.0006	4	0.009
10/30/2011	<0.20	0.30	0.005	1.10	0.01	0.00009	0.0024	0.056	<0.00001	<0.000005	<0.05	0.00001	19	0.00010	0.00002	0.0003	0.04	0.0000	0.0008	4	0.007
11/22/2011	0.14	0.19	0.004	0.62	0.01	0.00008	0.0025	0.056	<0.00001	<0.000005	<0.05	0.00001	18	<0.00010	0.00002	0.0001	0.04	0.0001	0.0008	4	0.007
12/18/2011	0.16		0.007	0.67	0.01	<0.00050	0.0027	0.062	<0.00010	<0.001000	<0.05	0.00002	19	**0.00100**	<0.0005	0.0003	0.07	<0.00020	<0.0050	4	0.008
12/18/2011					0.01	0.00007	0.0029	0.060	<0.00001	<0.000005	<0.05	0.00001	18	0.00020	0.00002	0.0003	0.05	0.0001	0.0008	4	0.007
1/18/2012	0.17	0.05	0.008	0.83	0.01	0.00007	0.0028	0.063	<0.00001	<0.000005	<0.05	0.00001	18	0.00030	0.00002	0.0004	0.05	0.0004	0.0008	3	0.007
2/9/2012	0.23	0.04	0.013	<0.5	0.02	0.00008	**0.0035**	0.063	<0.00001	<0.000005	<0.05	0.00001	19	0.00020	0.00004	0.0003	0.10	0.0005	0.0008	3	0.009
3/9/2012	**1.93**	<0.20	0.010	0.74	0.01	0.00011	0.0031	0.064	<0.00001	<0.000005	<0.05	0.00001	20	0.00060	0.00004	0.0006	0.04	0.0006	0.0009	3	0.005
4/7/2012	0.14	0.05	0.006	<0.5	0.01	0.00008	0.0029	0.064	<0.00001	<0.000005	<0.05	0.00001	18	0.00020	0.00002	0.0002	0.03	0.0001	0.0008	3	0.004
5/6/2012	0.10	0.17	0.010	1.56	0.01	0.00008	0.0031	0.062	<0.00001	<0.0000050	<0.05	0.00001	17	<0.00010	0.00003	0.0006	0.08	0.0002	0.0008	4	0.007
6/1/2012	<0.20	<0.20	0.010	<0.5	0.04	0.00008	0.0024	0.040	<0.00001	<0.0000050	<0.05	0.00010	10	0.00015	0.00005	0.0010	0.08	0.0004	<0.0005	2	0.008
6/13/2012	<0.20			1.36	0.02	0.00012	0.0019	0.039	<0.00001	<0.0000050	<0.05	0.00003	15	<0.00010	0.00004	0.0006	0.06	0.0002	<0.0005	3	0.005
7/1/2012	<0.20	<0.20	0.005	1.22	0.01	0.00012	0.0024	0.048	<0.00001	<0.0000050	<0.05	0.00002	20	0.00014	0.00003	0.0005	0.04	0.0001	<0.0005	3	0.006
7/8/2012	<0.20		0.004	0.72	0.01	0.00013	0.0022	0.047	<0.00001	<0.0000050	<0.05	0.00001	18	<0.00010	0.00003	0.0004	0.04	0.0001	0.0005	3	0.007
8/1/2012	<0.20	<0.20	0.004	1.12	0.01	0.00011	0.0025	0.054	<0.00001	<0.0000050	<0.05	0.00010	21	<0.00010	0.00005	0.0004	0.06	0.0001	0.0006	4	0.011
9/20/2012	<0.20	<0.20	0.005	0.69	0.01	0.00009	0.0025	0.058	<0.00001	<0.0000050	<0.05	0.00001	23	<0.00010	0.00003	0.0003	0.05	0.0001	0.0005	4	0.009
10/10/2012	<0.20	0.21		1.85	0.01	0.00009	0.0024	0.055	<0.00001	<0.0000050	<0.05	0.00001	20	0.00011	0.00003	0.0003	0.04	0.0001	0.0006	4	0.009
11/16/2012	<0.20	0.22	0.007	<0.5	0.01	0.00012	0.0026	0.059	<0.00001	<0.0000050	<0.05	0.00001	20	<0.00010	0.00003	0.0004	0.08	0.0000	0.0008	4	0.010
11/18/2012	<0.20		0.006	<0.5	0.01	0.00009	0.0025	0.062	<0.00001	<0.0000050	<0.05	0.00001	20	0.00040	0.00003	0.0004	0.05	0.0001	0.0008	4	0.009
12/6/2012	0.18	0.09	0.007	0.70	0.01	0.00009	0.0029	0.066	<0.00001	<0.0000050	<0.05	0.00001	18	<0.00010	0.00003	0.0002	0.06	0.0005	0.0007	4	0.010
guideline	3.00				0.10		0.0050				1.50	0.000158		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.000156	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	19	14	20	22	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
median	0.20	0.20	0.0062	0.7	0.009	0.00009	0.0025	0.058	< 0.00001	< 0.000005	< 0.05	0.000013	18.4	0.00014	0.00003	0.00036	0.053	0.00011	0.0008	3.50	0.0073
mean	0.27	0.17	0.0068	1.1	0.014	0.00011	0.0026	0.055	< 0.00001	< 0.00005	< 0.05	0.000023	18.0	0.00023	0.00005	0.00046	0.060	0.00031	0.0009	3.43	0.0080
standard deviation	0.40	0.08	0.0025	0.9	0.015	0.00009	0.0004	0.010	0.000019	0.000207	0.00	0.000027	3.2	0.00021	0.00010	0.00027	0.027	0.00048	0.0009	0.55	0.0030
minimum	0.07	0.04	0.0035	< 0.5	0.005	0.00007	0.0019	0.031	< 0.00001	< 0.000005	< 0.05	0.000007	8.3	< 0.0001	0.00002	0.00014	0.030	0.00004	< 0.0005	1.72	0.0040
maximum	1.93	0.30	0.0130	4.6	0.071	< 0.0005	0.0035	0.066	< 0.00010	< 0.001000	< 0.05	0.000102	22.8	0.00100	0.00050	0.00127	0.165	0.00228	0.0050	4.29	0.0193
# < detection limit	10	5	0	6	0	1	0	0	23	23	23	0	0	8	1	0	0	1	6	0	0
% < detection limit	53%	36%	0%	27%	0%	4%	0%	0%	100%	100%	100%	0%	0%	35%	4%	0%	0%	4%	26%	0%	0%
# > guideline	0				0		0				0	0		0		0	0	0			0
% > guideline	0%				0%		0%				0%	0%		0%		0%	0%	0%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.1: Water quality concentrations for KV-37, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011	<0.000010	0.0002	0.0007	0.007	0.18	0.00051	3.84	<0.000005	0.86	0.06	<10	0.000003	<0.00001	<0.00050	0.0001	<0.0002	0.001	<0.00010
5/25/2011	<0.000010	0.0001	0.0007	0.019	0.33	0.00026	1.34	0.000023	0.25	0.03	<10	<0.000002	<0.00001	0.0015	0.0000	<0.0002	0.005	<0.00010
7/14/2011	<0.000010	0.0001	0.0005	0.005	<0.050	0.00038	2.04	<0.000005	0.43	0.05	10	<0.000002	<0.00001	<0.00050	0.0000	<0.0002	0.001	<0.00010
9/17/2011	<0.000010	0.0001	0.0002	0.007	0.12	0.00053	2.80	0.000010	0.62	0.06	13	<0.000002	0.00004	<0.00050	0.0001	<0.0002	0.002	<0.00010
10/30/2011	<0.000010	0.0001	0.0002	0.004	0.16	0.00056	3.50	<0.000005	0.89	0.07	12	<0.000002	0.00006	<0.00050	0.0001	<0.0002	0.001	<0.00010
11/22/2011	<0.000010	0.0001	0.0001	0.005	0.17	0.00063	3.60	<0.000005	0.95	0.07	<10	<0.000002	0.00001	<0.00050	0.0001	<0.0002	0.001	<0.00010
12/18/2011	<0.000050	<0.00100	<0.00100	<0.0100	0.17	0.00060	3.91	<0.00002	1.02	0.07	8	<0.00005	<0.00500	<0.00500	<0.0001	<0.0050	<0.0050	<0.00050
12/18/2011	<0.000010	0.0002	0.0002	0.006	0.17	0.00062	3.50	<0.000005	0.96	0.07	<10	<0.000002	0.00003	<0.00050	0.0001	<0.0002	0.001	<0.00010
1/18/2012	<0.000010	0.0001	0.0002	0.010	0.20	0.00062	4.00	<0.000005	1.93	0.07	<10	<0.000002	<0.00020	<0.00050	0.0001	<0.0002	0.003	<0.00010
2/9/2012	<0.000010	0.0001	0.0002	0.012	0.19	0.00057	4.00	<0.000005	1.03	0.07	<10	<0.000002	<0.00020	<0.00050	0.0001	<0.0002	0.002	<0.00010
3/9/2012	<0.000010	0.0002	0.0002	0.010	0.24	0.00060	4.10	<0.000005	**2.96**	0.07	<10	<0.000002	<0.00020	<0.00050	0.0001	<0.0002	0.005	<0.00010
4/7/2012	<0.000010	0.0002	0.0002	0.006	0.17	0.00060	3.60	<0.000005	1.00	0.07	<10	<0.000002	<0.00020	<0.00050	0.0001	<0.0002	0.004	<0.00010
5/6/2012	<0.000010	0.0001	0.0003	0.008	0.32	0.00056	3.35	<0.0000050	0.97	0.07	<10	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
6/1/2012	<0.000010	0.0001	0.0006	0.010	0.21	0.00031	1.44	0.000006	0.40	0.04	<10	<0.0000020	<0.00020	<0.00050	0.0000	<0.0002	0.010	<0.00010
6/13/2012	<0.000010	0.0001	0.0004	0.005	0.09	0.00042	1.59	0.000005	0.34	0.04	<10	<0.0000020	<0.00020	0.0005	0.0000	0.0002	0.003	<0.00010
7/1/2012	<0.000010	0.0001	0.0003	<0.0020	0.06	0.00047	2.15	<0.000005	0.46	0.06	13	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
7/8/2012	<0.000010	0.0001	0.0003	0.004	0.07	0.00046	1.88	<0.000005	0.43	0.06	13	<0.0000020	<0.00020	<0.00050	0.0000	<0.0002	0.001	<0.00010
8/1/2012	<0.000010	0.0001	0.0003	<0.0020	0.07	0.00048	2.78	<0.000005	0.65	0.07	13	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
9/20/2012	<0.000010	0.0001	0.0002	0.004	0.13	0.00058	2.69	<0.000005	0.65	0.07	17	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
10/10/2012	<0.000010	0.0001	0.0002	0.005	0.15	0.00057	3.41	<0.000005	0.74	0.07	14	<0.0000020	0.00032	<0.00050	0.0001	<0.0002	0.002	<0.00010
11/16/2012	<0.000010	0.0002	0.0003	0.007	0.19	0.00064	3.48	<0.000005	0.98	0.07	12	0.000005	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
11/18/2012	<0.000010	0.0002	0.0002	0.008	0.17	0.00061	3.85	<0.000005	0.93	0.07	11	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
12/6/2012	<0.000010	0.0001	0.0004	0.008	0.23	0.00060	3.46	0.000006	1.00	0.07	10	<0.0000020	<0.00020	<0.00050	0.0001	<0.0002	0.001	<0.00010
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
median	< 0.00001	0.00013	0.00025	0.0067	0.170	0.00057	3.5	0.000005	0.89	0.0660	10	0.000002	0.00020	0.00050	0.00008	0.0002	0.0014	< 0.00010
mean	< 0.00001	0.00016	0.00034	0.0071	0.166	0.00053	3.1	0.000007	0.89	0.0613	11	0.000004	0.00036	0.00074	0.00007	0.0004	0.0023	< 0.0001
standard deviation	0.000008	0.00018	0.00022	0.0037	0.073	0.00010	0.9	0.000005	0.57	0.0112	2	0.000010	0.00102	0.00095	0.00003	0.0010	0.0023	0.00008
minimum	< 0.00001	0.00007	0.00014	< 0.0020	< 0.050	0.00026	1.3	< 0.000005	0.25	0.0273	8	< 0.000002	< 0.00001	< 0.00050	0.00002	< 0.0002	0.0006	< 0.00010
maximum	< 0.00005	0.00100	0.00100	0.0190	0.330	0.00064	4.1	0.000023	2.96	0.0710	17	0.000050	0.00500	0.00500	0.00011	0.0050	0.0102	< 0.00050
# < detection limit	23	1	1	3	1	0	0	18	0	0	11	21	18	21	1	22	1	23
% < detection limit	100%	4%	4%	13%	4%	0%	0%	78%	0%	0%	48%	91%	78%	91%	4%	96%	4%	100%
# > guideline	0	0	0			0		0				0			0		0	
% > guideline	0%	0%	0%			0%		0%				0%			0%		0%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.2: Water quality concentrations for KV-60, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011		7.52	8.01	120		534	0.0				<1	292	281						
5/27/2011		8.30	7.73	81		122	3.9				6.0	67	68						
7/14/2011		7.93	8.16		215	228	**9.4**				6.0	122	126						
10/27/2011	28	8.40	8.26		454	427	0.0	11.6	80	238	<1	247	221				45		<0.005
11/20/2011	22	7.92	8.22			489	0.1	12.4	82	73	1.2	299	255				53		<0.005
12/16/2011	15	7.76	8.09		491	491	-0.1	13.3	92		1.0	272	269				62		<0.005
1/24/2012	7	8.20	8.23		635	512	0.0	12.5	86	346	1.8	276	280				73		<0.005
2/16/2012		7.85	**8.33**		514	514	-0.1	14.3	98	-18	<1	275	304				68		<0.005
3/12/2012	4	7.95	**8.34**		530	519	-0.1	14.5	99	30	<1	284	268				72		<0.050
4/6/2012		8.21	**8.36**		578	496	0.0	13.5	93	25	<1	264	262				60		<0.005
5/1/2012		8.34	7.91		208	204	0.0	14.6	100	199	10.1	110	106	88	107	0.6	19	0.025	<0.050
5/7/2012		8.06	7.78		92	105	0.0	15.4	105	157	**98.7**	61	58				1		<0.050
5/9/2012	387																		
6/6/2012	76	8.08	8.10		241	216	**5.8**	13.6	109	300	**47.5**	117	118				21		<0.050
7/9/2012	41	8.23	**8.36**		356	323	**5.8**	12.8	102	143	1.1	172	181				31		<0.050
8/3/2012	56	8.44	8.28		341	340	**7.7**	12.4	104	300	8.5	188	193			0.7	29		<0.050
9/2/2012	101	7.76	**8.35**		346	295	4.8	13.2	103	125	8.5	149	156				20		<0.050
10/15/2012	25	8.09	**8.37**		507	451	0.0	13.0	89	117	3.3	240	244				51		<0.050
11/21/2012		**8.56**	8.20		417	493	0.0	14.2	97	**351**	**21.3**	266	268			1.1	70		<0.050
12/12/2012		7.36	8.21		509	508	0.0	**9.3**	**63**		1.9	275	272			0.7	70		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	11	19	19	2	16	19	19	16	16	14	19	19	19	1	1	4	16	1	16
median	28	8.08	8.22	100	435	451	0.0	13.25	97	150	2	247	244	87.5	107	0.7	51.9	0.025	< 0.050
mean	69	8.05	8.17	100	402	382	2.0	13.16	94	170	12	209	207	87.5	107	0.8	46.5	0.025	0.030
standard deviation	110	0.31	0.19	28	153	147	3.2	1.43	12	122	24	82	79	-	-	0.2	23.4	-	0.023
minimum	4	7.36	7.73	81	92	105	-0.1	9.26	63	-18	< 1	61	58	87.5	107	0.6	0.5	0.025	< 0.005
maximum	387	8.56	8.37	120	635	534	9.4	15.41	109	351	99	299	304	87.5	107	1.1	72.8	0.025	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	16
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	100%
# > guideline		0	0					1			2					0		1	0
% > guideline		0%	0%					6%			11%					0%		100%	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.2: Water quality concentrations for KV-60, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011					0.00	0.00039	0.0018	**0.099**	<0.00001	<0.000005	<0.05	**0.00036**	80	0.00030	0.00029	0.0003	0.02	0.0002	0.0029	**23**	0.025
5/27/2011					0.06	0.00042	0.0013	0.034	<0.00001	<0.000005	<0.05	0.00008	20	0.00040	0.00013	0.0018	0.23	0.0011	0.0006	4	0.013
7/14/2011					0.07	0.00048	0.0020	0.055	<0.00001	<0.000005	<0.05	0.00009	35	0.00040	0.00013	0.0023	0.24	0.0007	0.0013	8	0.015
10/27/2011	0.18	0.16	0.011	2.70	0.01	0.00031	0.0025	**0.091**	<0.00001	<0.000005	<0.05	**0.00021**	67	0.00010	**0.00030**	0.0005	0.09	0.0003	0.0024	**20**	0.024
11/20/2011	0.22	0.19	0.004	1.31	0.01	0.00035	0.0031	**0.101**	<0.00001	<0.000005	<0.05	**0.00031**	81	0.00020	**0.00048**	0.0004	0.10	0.0004	0.0028	**23**	0.035
12/16/2011	0.21	0.06	0.003	1.56	0.01	0.00037	0.0025	**0.095**	<0.00001	<0.000005	<0.05	**0.00040**	74	<0.00010	**0.00059**	0.0005	0.10	0.0003	0.0027	**21**	0.044
1/24/2012	0.19	0.14	0.005	1.13	0.01	0.00042	0.0033	**0.101**	<0.00001	<0.000005	<0.05	**0.00048**	73	0.00020	**0.00070**	0.0011	0.13	**0.0092**	0.0029	**23**	0.061
2/16/2012	0.17	0.12	0.003	0.82	0.01	0.00030	0.0029	**0.095**	<0.00001	<0.000005	<0.05	**0.00035**	74	0.00020	**0.00050**	0.0005	0.10	0.0006	0.0027	**22**	0.047
3/12/2012	<0.20	0.32	0.005	1.97	0.01	0.00027	**0.0036**	**0.104**	<0.00001	<0.000005	<0.05	**0.00026**	75	<0.00010	**0.00040**	0.0003	0.09	0.0003	0.0028	**23**	0.048
4/6/2012	0.15	0.11	0.004	0.62	0.01	0.00023	**0.0040**	**0.099**	<0.00001	<0.000005	<0.05	0.00013	71	<0.00010	0.00021	0.0003	0.08	0.0004	0.0028	**21**	0.017
5/1/2012	**0.57**	<0.20	**0.030**	**10.50**	**0.19**	0.00058	**0.0044**	0.058	0.000011	<0.0000050	<0.050	**0.00088**	30	0.00042	**0.00029**	**0.0050**	**0.50**	**0.0132**	0.0011	8	0.039
5/7/2012	<0.20	**0.79**		**18.10**	**0.52**	**0.00124**	**0.0089**	0.061	**0.000044**	**0.000010**	<0.050	**0.00082**	17	**0.00101**	**0.00086**	**0.0077**	**1.55**	**0.0605**	0.0008	4	0.148
5/9/2012																					
6/6/2012	<0.20	0.35	**0.070**	7.85	**0.26**	0.00060	0.0032	0.067	**0.000025**	0.000006	<0.050	**0.00022**	34	0.00043	**0.00050**	**0.0029**	**0.80**	**0.0070**	0.0014	8	0.082
7/9/2012	<0.20	0.33	0.005	7.15	0.02	0.00049	0.0021	0.073	<0.00001	<0.0000050	<0.050	0.00013	49	0.00011	0.00011	0.0013	0.11	0.0005	0.0019	12	0.009
8/3/2012	<0.20	**0.44**	0.014	7.07	0.08	0.00041	0.0025	**0.086**	<0.00001	<0.0000050	<0.050	0.00010	54	0.00019	0.00019	0.0012	0.37	0.0005	0.0017	13	0.028
9/2/2012	<0.20	**0.45**	0.015	8.77	0.07	0.00030	0.0021	0.073	<0.00001	0.000006	<0.050	0.00008	42	0.00028	0.00019	0.0011	0.34	0.0003	0.0015	11	0.048
10/15/2012	<0.20	0.30	0.007	2.10	0.03	0.00033	0.0026	**0.095**	<0.00001	<0.0000050	<0.050	0.00014	65	0.00013	0.00017	0.0008	0.10	0.0003	0.0024	**19**	0.020
11/21/2012	<0.20	0.38	0.010	2.30	0.06	0.00046	0.0030	**0.099**	<0.00001	<0.0000050	<0.050	**0.00044**	72	0.00015	**0.00033**	0.0010	0.21	0.0032	0.0026	**21**	0.030
12/12/2012	0.16	0.23	0.005	1.73	0.01	0.00036	0.0030	**0.105**	<0.00001	<0.0000050	<0.050	**0.00039**	73	0.00013	**0.00066**	0.0006	0.12	0.0017	0.0027	**22**	0.055
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	16	16	15	16	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	0.20	0.26	0.005	2.20	0.021	0.00039	0.0029	0.0946	0.00001	0.000005	< 0.05	0.00026	66.5	0.00020	0.00030	0.0010	0.122	0.00049	0.0024	19.7	0.035
mean	0.22	0.29	0.013	4.73	0.075	0.00044	0.0031	0.0837	0.00001	0.000005	< 0.05	0.00031	57.0	0.00026	0.00037	0.0016	0.277	0.00529	0.0021	16.2	0.041
standard deviation	0.10	0.18	0.017	4.83	0.128	0.00022	0.0016	0.0206	0.00001	0.000001	0.00	0.00023	21.1	0.00022	0.00022	0.0019	0.361	0.01385	0.0008	7.1	0.032
minimum	0.15	0.06	0.003	0.62	0.003	0.00023	0.0013	0.0337	< 0.00001	< 0.000005	< 0.05	0.00008	17.2	< 0.00010	0.00011	0.0003	0.017	0.00016	0.0006	4.1	0.009
maximum	0.57	0.79	0.070	18.10	0.523	0.00124	0.0089	0.1050	0.00004	0.000010	< 0.05	0.00088	81.1	0.00101	0.00086	0.0077	1.550	0.06050	0.0029	23.3	0.148
# < detection limit	8	1	0	0	0	0	0	0	16	16	19	0	0	3	0	0	0	0	0	0	0
% < detection limit	50%	6%	0%	0%	0%	0%	0%	0%	84%	84%	100%	0%	0%	16%	0%	0%	0%	0%	0%	0%	0%
# > guideline	0				3		1				0	12		0		3	1	4			0
% > guideline	0%				16%		5%				0%	63%		0%		16%	5%	21%			0%

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.2: Water quality concentrations for KV-60, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011	<0.000010	**0.0018**	**0.0022**	<0.002	0.55	0.00068	3.14	<0.000005	1.12	0.21	23	**0.000043**	0.00003	<0.0005	0.0018	<0.00020	**0.018**	<0.00010
5/27/2011	<0.000010	0.0003	0.0014	0.014	0.22	0.00020	1.73	0.000011	0.40	0.07	<10	0.000007	<0.00001	0.0019	0.0002	0.0003	0.005	0.0002
7/14/2011	<0.000010	**0.0005**	**0.0018**	0.009	0.14	0.00027	2.55	0.000006	0.61	0.13	<10	0.000007	<0.00001	0.0015	0.0006	0.0003	0.007	0.0002
10/27/2011	<0.000010	**0.0010**	**0.0022**	0.005	0.35	**0.00156**	3.60	<0.000005	1.09	0.19	17	0.000016	0.00008	<0.0005	0.0013	<0.00020	**0.015**	<0.00010
11/20/2011	<0.000020	**0.0014**	**0.0029**	0.005	0.47	**0.00146**	4.10	<0.000005	1.27	0.20	21	0.000026	0.00001	<0.0005	0.0016	<0.00020	**0.020**	<0.00010
12/16/2011	<0.000010	**0.0016**	**0.0029**	0.002	0.42	**0.00117**	3.40	<0.000005	1.09	0.20	20	0.000029	0.00001	<0.0005	0.0016	<0.00020	**0.020**	<0.00010
1/24/2012	<0.000010	**0.0016**	**0.0036**	0.007	0.56	0.00083	3.50	0.000043	1.20	0.18	23	**0.000035**	<0.00020	<0.0005	0.0018	<0.00020	**0.023**	<0.00010
2/16/2012	<0.000010	**0.0016**	**0.0028**	0.004	0.52	0.00085	3.40	<0.000005	1.16	0.19	24	**0.000037**	<0.00020	<0.0005	0.0018	<0.00020	**0.019**	<0.00010
3/12/2012	<0.000010	**0.0018**	**0.0025**	0.006	0.57	0.00085	3.50	<0.000005	1.15	0.20	24	**0.000036**	<0.00020	<0.0005	0.0014	<0.00020	0.013	<0.00010
4/6/2012	<0.000010	**0.0018**	0.0015	<0.002	0.48	0.00072	3.30	<0.000005	1.17	0.19	20	0.000022	<0.00020	<0.0005	0.0016	<0.00020	0.008	<0.00010
5/1/2012	<0.000010	**0.0005**	**0.0018**	0.018	**1.03**	0.00029	2.74	**0.000406**	0.83	0.09	<10	0.000026	<0.00020	**0.0102**	0.0004	**0.0006**	**0.063**	0.0002
5/7/2012	0.00001	0.0002	**0.0033**	**0.094**	**0.73**	0.00024	2.30	**0.001800**	0.47	0.06	<10	**0.000072**	<0.00020	**0.0277**	0.0002	**0.0018**	**0.051**	**0.0006**
5/9/2012																		
6/6/2012	<0.000010	**0.0004**	**0.0024**	**0.052**	0.26	0.00030	2.29	**0.000083**	0.66	0.12	<10	0.000014	<0.00020	**0.0065**	0.0007	**0.0008**	0.014	0.0002
7/9/2012	<0.000010	**0.0008**	**0.0016**	0.006	0.21	0.00080	2.90	0.000007	0.78	0.17	<10	0.000017	<0.00020	0.0007	0.0009	<0.00020	0.007	0.0001
8/3/2012	<0.000010	**0.0007**	0.0014	0.007	0.22	0.00083	2.97	0.000006	0.83	0.19	<10	0.000008	<0.00020	0.0021	0.0010	0.0004	0.005	**0.0007**
9/2/2012	<0.000010	**0.0006**	0.0013	0.012	0.26	0.00067	2.62	0.000005	0.82	0.15	<10	0.000003	<0.00020	0.0022	0.0007	0.0005	0.005	0.0002
10/15/2012	<0.000010	**0.0012**	**0.0015**	0.006	0.36	**0.00124**	3.32	<0.000005	0.97	0.19	17	0.000017	<0.00020	0.0011	0.0014	<0.00020	0.009	<0.00010
11/21/2012	<0.000010	**0.0013**	**0.0023**	0.015	0.42	**0.00110**	3.29	0.000010	1.10	0.19	19	0.000033	<0.00020	0.0016	0.0016	0.0003	**0.020**	<0.00010
12/12/2012	<0.000010	**0.0015**	**0.0029**	0.004	0.46	0.00097	3.55	<0.000005	1.13	0.20	23	**0.000036**	<0.00020	<0.0005	0.0015	<0.00020	**0.019**	<0.00010
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	0.000010	0.0012	0.0022	0.006	0.42	0.00083	3.29	0.000005	1.09	0.188	17	0.000026	0.00020	0.0007	0.00137	0.00020	0.0150	0.00010
mean	0.000011	0.0011	0.0022	0.014	0.43	0.00079	3.06	0.000127	0.94	0.164	16	0.000025	0.00014	0.0032	0.00116	0.00038	0.0178	0.00018
standard deviation	0.000002	0.0006	0.0007	0.022	0.21	0.00041	0.57	0.000415	0.26	0.047	6	0.000016	0.00008	0.0064	0.00054	0.00038	0.0152	0.00016
minimum	< 0.000010	0.0002	0.0013	< 0.002	0.14	0.00020	1.73	< 0.000005	0.40	0.060	< 10	0.000003	0.00001	< 0.0005	0.00021	< 0.00020	0.0048	0.00010
maximum	0.000020	0.0018	0.0036	0.094	1.03	0.00156	4.10	0.001800	1.27	0.206	24	0.000072	0.00020	0.0277	0.00183	0.00179	0.0627	0.00065
# < detection limit	18	0	0	2	0	0	0	9	0	0	8	0	15	9	0	11	0	11
% < detection limit	95%	0%	0%	11%	0%	0%	0%	47%	0%	0%	42%	0%	79%	47%	0%	58%	0%	58%
# > guideline	0	0	0			5		2				0			0		9	
% > guideline	0%	0%	0%			26%		11%				0%			0%		47%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.3: Water quality concentrations for KV-61, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011		7.29	8.02	96		**790**	0.1				2.0	**424**	**419**						
5/25/2011		7.75	**7.24**	21		70	1.6				**47.0**	33	35						
7/12/2011	20	8.14	8.11		289	298	3.4				<1	158	151						
10/27/2011		8.24	8.15		598	569	0.0	**10.3**	**71**	158	<1	304	285				176		<0.005
11/20/2011		7.85	8.10		614	632	0.6	13.9	97	127	<1	372	349				193		<0.005
12/14/2011		7.50	7.94		**702**	688	0.0	15.1	104		**21.1**	348	372				220		<0.005
1/15/2012		7.61	7.79		658	693	0.0	12.2	84	342	14.0	367	336				203		<0.005
2/11/2012		7.51	8.21		**728**	**715**	-0.1	14.1	96	100	<1	**384**	**406**				**232**		<0.005
3/12/2012		7.60	8.23		677	**740**	-0.1	10.5	72	79	<1	**408**	385				**245**		<0.050
4/5/2012		7.59	8.16		**897**	**772**	0.0			66	<1	**400**	**424**				**268**		<0.005
5/4/2012		8.00	8.26		**726**	**724**	0.0	15.6	107	168	<1	**397**	**392**				**238**		<0.005
5/7/2012		8.06	8.12		614	657	0.0	13.4	95	227	<1	350	361				216		<0.050
6/4/2012	325	7.66	7.89		200	180	1.6	15.2	108	314	**30.9**	84	78				41		<0.050
7/6/2012		8.13	8.15		471	429	2.5	13.5	99	112	6.3	238	201				130		<0.050
8/5/2012	10	8.05	8.08		495	449	2.1	13.5	98	287	<1	239	243				141		<0.050
9/2/2012	8	**7.10**	8.23		521	530	2.1	13.6	99	127	<1	256	265				160		<0.050
10/15/2012		7.72	8.18		639	568	0.2	12.7	88	121	<1	280	292				178		<0.050
11/20/2012		7.43	8.03			713	0.1	**9.8**	100	327	**28.4**	383	**392**				**221**		**0.075**
12/12/2012		7.64	8.21		**828**	**875**	0.0	14.6	101		<1	**477**	**479**				**277**		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	4	19	19	2	16	19	19	15	15	14	19	19	19	0	0	0	16	0	16
median	15	7.66	8.12	59	626	657	0.1	13.50	98	143	1	350	349	-	-	-	210	-	0.028
mean	91	7.73	8.06	59	604	584	0.7	13.19	95	183	9	311	309	-	-	-	196	-	0.029
standard deviation	156	0.31	0.23	53	180	214	1.1	1.79	11	97	14	118	121	-	-	-	59	-	0.026
minimum	8	7.10	7.24	21	200	70	-0.1	9.80	71	66	< 1	33	35	-	-	-	41	-	< 0.005
maximum	325	8.24	8.26	96	897	875	3.4	15.57	108	342	47	477	479	-	-	-	277	-	0.075
# < detection limit	0	0	0	0	0	0	0	0	0	0	12	0	0	-	-	-	0	-	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	63%	0%	0%	-	-	-	0%	-	94%
# > guideline		0	0					0			3								1
% > guideline		0%	0%					0%			16%								6%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.3: Water quality concentrations for KV-61, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011					0.01	0.00036	0.0005	0.079	<0.00001	<0.000005	<0.05	0.00012	**139**	0.00040	0.00003	0.0004	0.023	0.0018	0.0053	**19**	0.005
5/25/2011					0.12	0.00029	0.0015	0.014	<0.00001	<0.000020	<0.05	0.00004	11	<0.00050	0.00017	0.0016	0.118	0.0005	0.0010	2	0.036
7/12/2011					0.02	0.00043	0.0019	0.034	<0.00001	<0.000005	<0.05	0.00002	52	0.00030	0.00004	0.0008	0.029	0.0002	0.0030	7	0.005
10/27/2011	0.07	0.10	0.008	1.90	0.01	0.00035	0.0004	0.060	<0.00001	<0.000005	<0.05	0.00002	99	<0.00010	0.00001	0.0004	0.006	0.0000	0.0051	14	0.002
11/20/2011	<0.02	0.28	<0.002	1.04	0.00	0.00035	0.0005	0.063	<0.00001	<0.000005	<0.05	0.00010	122	0.00010	0.00001	0.0004	0.005	0.0002	**0.0056**	16	0.002
12/14/2011	0.12	0.07	**0.039**	1.44	**0.18**	0.00045	0.0021	0.071	<0.00001	<0.000005	<0.05	**0.00038**	114	0.00030	**0.00029**	0.0017	0.388	**0.0085**	0.0050	15	0.062
1/15/2012	0.13	0.07	0.004	1.13	0.01	0.00036	0.0004	0.068	<0.00001	<0.000005	<0.05	0.00004	120	<0.00010	0.00002	0.0005	0.015	0.0003	0.0046	16	0.002
2/11/2012	0.13	0.06	0.002	1.84	0.00	0.00032	0.0003	0.078	<0.00001	<0.000005	<0.05	0.00004	**126**	0.00010	0.00001	0.0005	0.006	0.0001	0.0047	17	0.001
3/12/2012	0.28	<0.20	0.003	1.77	0.00	0.00030	0.0004	0.082	<0.00001	<0.000005	<0.05	0.00005	**133**	<0.00010	0.00001	0.0004	0.009	0.0001	0.0047	18	0.002
4/5/2012	0.11	0.07	<0.002	0.61	0.00	0.00031	0.0006	0.076	<0.00001	<0.000005	<0.05	0.00005	**131**	<0.00010	0.00001	0.0004	0.004	0.0000	0.0050	18	0.001
5/4/2012	0.06	**0.49**	0.004	2.49	0.01	0.00042	0.0007	0.068	<0.00001	<0.000005	<0.05	0.00011	**131**	<0.00010	0.00004	0.0008	0.030	0.0021	**0.0060**	17	0.013
5/7/2012	<0.20	<0.20		3.93	0.01	0.00028	0.0008	0.061	<0.00001	<0.000005	<0.05	0.00003	115	<0.00010	0.00004	0.0005	0.025	0.0001	**0.0054**	15	0.014
6/4/2012	<0.20	0.42	**0.038**	5.93	**0.19**	0.00051	**0.0083**	0.030	<0.00001	**0.000009**	<0.05	**0.00025**	26	0.00029	**0.00034**	0.0020	0.324	**0.0078**	0.0021	5	0.042
7/6/2012	<0.20	<0.20	0.006	3.26	0.02	0.00038	0.0007	0.045	<0.00001	<0.000005	<0.05	0.00003	76	<0.00010	0.00004	0.0006	0.026	0.0003	0.0042	12	0.004
8/5/2012	<0.20	0.24	0.003	2.41	0.01	0.00039	0.0017	0.048	<0.00001	<0.000005	<0.05	0.00002	77	<0.00010	0.00002	0.0005	0.016	0.0001	0.0044	12	0.003
9/2/2012	<0.20	<0.20	0.005	2.47	0.01	0.00036	0.0007	0.051	<0.00001	<0.000005	<0.05	0.00004	81	0.00015	0.00002	0.0005	0.020	0.0010	0.0046	13	0.006
10/15/2012	<0.20	<0.20	0.003	1.64	0.01	0.00034	0.0008	0.053	<0.00001	<0.000005	<0.05	0.00003	89	<0.00010	0.00002	0.0005	0.019	0.0001	0.0049	14	0.004
11/20/2012	<0.20	0.37	0.006	1.06	0.03	0.00033	0.0007	0.067	<0.00001	<0.000005	<0.05	0.00007	125	<0.00010	0.00004	0.0006	0.056	0.0038	**0.0057**	18	0.010
12/12/2012	0.05	0.25	0.014	1.63	0.00	0.00038	0.0009	**0.103**	<0.00001	<0.000005	<0.05	**0.00018**	**152**	<0.00010	0.00002	0.0007	0.006	0.0004	**0.0056**	**24**	0.004
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	16	16	15	16	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	0.17	0.20	0.004	1.81	0.009	0.00036	0.0007	0.063	< 0.00001	0.000005	< 0.05	0.000042	115.0	0.00010	0.000024	0.00052	0.020	0.00026	0.0049	15.3	0.0043
mean	0.15	0.21	0.009	2.16	0.033	0.00036	0.0013	0.061	< 0.00001	0.000006	< 0.05	0.000087	101.0	0.00017	0.000062	0.00073	0.059	0.00143	0.0046	14.2	0.0114
standard deviation	0.07	0.13	0.012	1.32	0.058	0.00006	0.0018	0.021	0.00000	0.000004	0.00	0.000094	38.9	0.00012	0.000095	0.00049	0.108	0.00256	0.0013	5.2	0.0166
minimum	< 0.02	0.06	< 0.002	0.61	0.003	0.00028	0.0003	0.014	< 0.00001	< 0.000005	< 0.05	0.000023	10.7	< 0.00010	0.000008	0.00038	0.004	0.00002	0.0010	1.6	0.0010
maximum	0.28	0.49	0.039	5.93	0.187	0.00051	0.0083	0.103	< 0.00001	0.000020	< 0.05	0.000380	152.0	0.00050	0.000335	0.00201	0.388	0.00852	0.0060	23.6	0.0618
# < detection limit	8	5	2	0	0	0	0	0	19	18	19	0	0	12	0	0	0	0	0	0	0
% < detection limit	50%	31%	13%	0%	0%	0%	0%	0%	100%	95%	100%	0%	0%	63%	0%	0%	0%	0%	0%	0%	0%
# > guideline	0				3		1				0	3		0		0	0	3			0
% > guideline	0%				16%		5%				0%	16%		0%		0%	0%	16%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.3: Water quality concentrations for KV-61, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011	<0.000010	0.0002	0.0004	0.003	0.27	0.00049	3.73	<0.000005	1.04	0.23	88	<0.000002	<0.00001	<0.0005	0.0028	<0.00020	0.009	<0.00010
5/25/2011	<0.000010	0.0002	0.0009	0.014	<0.30	0.00016	1.28	0.000019	<0.30	0.03	<50	0.000004	<0.00020	<0.0050	0.0001	<0.00050	0.002	0.0002
7/12/2011	<0.000010	0.0002	0.0004	0.003	0.13	0.00071	3.99	<0.000005	0.75	0.09	27	<0.000002	<0.00001	<0.0005	0.0005	<0.00020	0.001	<0.00010
10/27/2011	<0.000010	0.0002	0.0002	0.004	0.20	0.00061	**4.20**	<0.000005	0.99	0.18	63	<0.000002	0.00004	<0.0005	0.0017	<0.00020	0.000	<0.00010
11/20/2011	<0.000020	0.0002	0.0003	<0.002	0.26	0.00052	**4.50**	<0.000005	1.15	0.19	82	<0.000002	<0.00001	<0.0005	0.0021	<0.00020	0.004	<0.00010
12/14/2011	<0.000010	0.0001	0.0010	**0.023**	0.22	0.00043	3.60	**0.000109**	0.90	0.20	72	0.000023	0.00003	0.0046	0.0023	0.0005	**0.021**	<0.00010
1/15/2012	<0.000010	0.0002	**0.0060**	0.005	0.23	0.00048	4.00	<0.000005	0.96	0.20	**102**	<0.000002	<0.00020	<0.0005	0.0024	<0.00020	0.001	<0.00010
2/11/2012	<0.000010	0.0002	0.0003	0.005	0.22	0.00044	3.70	<0.000005	1.00	0.21	82	<0.000002	<0.00020	<0.0005	0.0027	<0.00020	0.001	<0.00010
3/12/2012	<0.000010	0.0001	0.0003	0.008	0.27	0.00043	3.90	<0.000005	1.08	0.22	**97**	<0.000002	<0.00020	<0.0005	0.0021	<0.00020	0.002	<0.00010
4/5/2012	<0.000010	0.0002	0.0003	0.002	0.24	0.00042	3.70	<0.000005	1.10	0.23	**94**	<0.000002	<0.00020	<0.0005	0.0028	<0.00020	0.002	<0.00010
5/4/2012	<0.000010	0.0001	0.0005	0.008	0.37	0.00035	3.97	<0.000005	1.08	0.22	**94**	0.000004	<0.00020	<0.0005	0.0031	<0.00020	0.007	<0.00010
5/7/2012	<0.000010	0.0001	0.0004	0.005	0.37	0.00037	3.49	<0.000005	0.92	0.19	77	<0.000002	<0.00020	<0.0005	0.0026	<0.00020	0.002	<0.00010
6/4/2012	<0.000010	0.0001	0.0009	0.019	0.19	0.00059	2.62	**0.000128**	0.49	0.06	15	0.000009	<0.00020	0.0047	0.0002	0.0004	**0.019**	0.0001
7/6/2012	<0.000010	0.0002	0.0004	0.005	0.16	0.00050	**4.26**	<0.000005	0.90	0.12	48	<0.000002	<0.00020	<0.0005	0.0009	<0.00020	0.001	<0.00010
8/5/2012	<0.000010	0.0002	0.0003	<0.002	0.16	0.00064	3.75	<0.000005	0.87	0.14	48	<0.000002	<0.00020	<0.0005	0.0009	<0.00020	0.001	<0.00010
9/2/2012	<0.000010	0.0002	0.0003	0.005	0.22	0.00057	3.34	0.000007	0.97	0.15	63	<0.000002	<0.00020	<0.0005	0.0012	<0.00020	0.002	<0.00010
10/15/2012	<0.000010	0.0002	0.0003	0.002	0.19	0.00052	3.72	<0.000005	0.94	0.17	65	<0.000002	<0.00020	<0.0005	0.0015	<0.00020	0.002	<0.00010
11/20/2012	<0.000010	0.0002	0.0005	0.007	0.29	0.00038	3.57	<0.000005	1.02	0.22	**90**	0.000003	<0.00020	0.0012	0.0025	<0.00020	0.004	<0.00010
12/12/2012	<0.000010	0.0002	0.0004	0.003	0.45	0.00054	**4.69**	<0.000005	1.33	0.28	**109**	0.000002	<0.00020	<0.0005	0.0026	<0.00020	**0.017**	<0.00010
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	< 0.000010	0.00016	0.00041	0.005	0.23	0.00049	3.73	0.000005	0.97	0.193	77	0.000002	0.00020	0.0005	0.00213	0.00020	0.0020	0.00010
mean	< 0.000011	0.00016	0.00075	0.007	0.25	0.00048	3.68	0.000018	0.94	0.175	72	0.000004	0.00015	0.0012	0.00184	0.00024	0.0052	0.00011
standard deviation	0.000002	0.00001	0.00130	0.006	0.08	0.00012	0.73	0.000036	0.23	0.063	26	0.000005	0.00008	0.0016	0.00096	0.00010	0.0066	0.00002
minimum	< 0.000010	0.00012	0.00020	< 0.002	0.13	0.00016	1.28	< 0.000005	0.30	0.026	15	< 0.000002	< 0.00001	< 0.0005	0.00012	< 0.00020	0.0004	< 0.00010
maximum	< 0.000020	0.00017	0.00603	0.023	0.45	0.00071	4.69	0.000128	1.33	0.281	109	0.000023	0.00020	0.0050	0.00314	0.00050	0.0213	0.00020
# < detection limit	19	0	0	2	1	0	0	15	1	0	1	13	17	16	0	17	0	17
% < detection limit	100%	0%	0%	11%	5%	0%	0%	79%	5%	0%	5%	68%	89%	84%	0%	89%	0%	89%
# > guideline	0	0	0			0		2				0			0		2	
% > guideline	0%	0%	0%			0%		11%				0%			0%		11%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.4: Water quality concentrations for KV-64, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011		7.80	8.05	152		521	0.6				<1	259	263						
5/25/2011		8.40	7.72	62		114	0.9				6.0	63	61						
7/12/2011		8.35	8.26		332	342	3.7				2.0	194	186						
10/29/2011		**8.50**	8.12		445	421	2.0	10.3	75	268	<1	225	227				51		<0.050
11/21/2011	8	8.23	8.28			464	0.0	12.6	86		1.5	252	242				54		<0.005
12/19/2011		7.87	8.17		469	465	-0.1	11.7	80		18.3	246	248				59		<0.005
1/13/2012		7.63	8.00		454	465	0.0	11.0	76		1.1	236	251				56		<0.005
2/16/2012	5	7.99	8.30		484	484	-0.1	13.8	94	20	1.1	258	269				60		<0.005
3/14/2012		8.03	**8.39**		504	496	-0.1	13.2	90	48	<1	260	261				66		<0.050
4/9/2012		**8.52**	8.29			496	-0.1			122	<1	259	270				68		<0.005
5/3/2012	7	8.36	8.21		330	373	0.0	14.4	98	234	<1	229	204				46		<0.050
5/7/2012		8.43	8.12		259	276	0.0	15.6	106	179	4.4	148	154				33		<0.050
6/6/2012	148	8.35	8.13		282	250	2.9	14.7	109	304	5.6	138	139				22		<0.050
7/6/2012		8.30	**8.32**		379	342	2.7	14.2	106	97	1.2	192	170				33		<0.050
8/5/2012	40	8.31	8.24		409	382	3.5	13.6	104	290	1.5	205	206				38		<0.050
9/2/2012	30	7.79	**8.40**		446	379	2.9	13.6	101	131	<1	192	196				34		<0.050
10/15/2012	23	8.00	**8.35**		457	412	0.2	12.9	89	115	1.2	212	215				42		<0.050
11/21/2012		8.23	8.27			452	0.0	15.4	105	**362**	1.7	240	246				51		<0.050
12/14/2012		7.37	8.24		516	499	0.1	12.8	88		1.2	265	263				64		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	7	19	19	2	14	19	19	15	15	12	19	19	19	0	0	0	16	0	16
median	23	8.23	8.24	107	445	421	0.1	13.60	94	154.9	1	229	227	-	-	-	50.9	-	< 0.050
mean	37	8.13	8.20	107	412	402	1.0	13.32	94	180.9	3	214	214	-	-	-	48.5	-	< 0.033
standard deviation	51	0.32	0.16	63	82	104	1.4	1.51	11	109.4	4	52	55	-	-	-	13.6	-	0.023
minimum	5	7.37	7.72	62	259	114	-0.1	10.31	75	20.0	1	63	61	-	-	-	22.3	-	< 0.005
maximum	148	8.52	8.40	152	516	521	3.7	15.61	109	362.4	18	265	270	-	-	-	68.4	-	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	6	0	0	-	-	-	0	-	16
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	32%	0%	0%	-	-	-	0%	-	100%
# > guideline		0	0					0			0								0
% > guideline		0%	0%					0%			0%								0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.4: Water quality concentrations for KV-64, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011					0.00	0.00042	0.0005	0.076	<0.00001	<0.000005	<0.05	0.00002	78	0.00040	0.00001	0.0003	0.006	0.0002	0.0023	15	0.001
5/25/2011					0.06	0.00018	0.0006	0.026	<0.00001	<0.000005	<0.05	0.00003	21	0.00040	0.00010	0.0015	0.101	0.0004	0.0006	3	0.006
7/12/2011					0.01	0.00035	0.0005	0.059	<0.00001	<0.000005	<0.05	0.00002	61	0.00030	0.00003	0.0014	0.021	0.0004	0.0015	10	0.001
10/29/2011	0.20	0.30	<0.0020	2.00	0.01	0.00043	0.0006	0.072	<0.00001	<0.000005	<0.05	0.00003	68	0.00040	0.00002	0.0005	0.014	0.0005	0.0020	13	0.001
11/21/2011	0.24	0.35	<0.0020	1.88	0.01	0.00045	0.0006	0.072	<0.00001	<0.000005	<0.05	0.00003	77	0.00010	0.00002	0.0004	0.014	0.0030	0.0021	15	0.002
12/19/2011	0.28	0.11	0.019	2.88	0.10	0.00048	0.0012	**0.085**	<0.00001	0.000005	<0.05	0.00010	75	0.00030	0.00019	0.0017	0.300	0.0048	0.0022	14	0.028
1/13/2012	0.29	0.09	0.011	1.86	0.00	0.00040	0.0006	0.076	<0.00001	<0.000005	<0.05	0.00004	73	<0.00010	0.00001	0.0003	0.005	0.0001	0.0019	13	0.001
2/16/2012	0.31	0.14	0.002	0.82	0.00	0.00036	0.0005	0.079	<0.00001	<0.000005	<0.05	0.00002	79	0.00010	0.00001	0.0003	0.008	0.0001	0.0019	15	0.002
3/14/2012	**0.32**	<0.20	0.003	1.04	0.01	0.00041	0.0005	0.078	<0.00001	<0.000005	<0.05	0.00002	80	0.00050	0.00003	0.0004	0.021	0.0003	0.0022	14	0.004
4/9/2012	**0.33**	0.07	<0.0020	1.03	0.01	0.00041	0.0006	**0.091**	<0.00001	<0.000005	<0.05	0.00006	80	0.00050	0.00002	0.0014	0.014	0.0020	0.0022	14	0.004
5/3/2012	0.23	0.35	0.008	6.50	0.02	0.00036	0.0008	0.074	<0.00001	<0.000005	<0.05	0.00008	73	<0.00010	0.00004	0.0014	0.048	0.0004	0.0015	11	0.005
5/7/2012	<0.20	**0.56**		**11.10**	0.02	0.00030	0.0007	0.056	<0.00001	<0.000005	<0.05	0.00006	45	<0.00010	0.00006	0.0017	0.055	0.0043	0.0010	8	0.008
6/6/2012	0.22	<0.20	0.009	4.22	0.04	0.00035	0.0006	0.048	<0.00001	<0.000005	<0.05	0.00003	44	<0.00010	0.00008	0.0010	0.082	0.0008	0.0013	7	0.006
7/6/2012	<0.20	0.32	0.003	3.38	0.01	0.00037	0.0005	0.060	<0.00001	<0.000005	<0.05	0.00002	61	<0.00010	0.00002	0.0006	0.012	0.0001	0.0015	10	0.001
8/5/2012	0.25	<0.20	0.004	1.92	0.01	0.00036	0.0005	0.069	<0.00001	<0.000005	<0.05	0.00002	65	<0.00010	0.00002	0.0005	0.017	0.0002	0.0018	11	0.002
9/2/2012	<0.20	0.24	0.004	2.86	0.01	0.00035	0.0005	0.067	<0.00001	<0.000005	<0.05	0.00002	59	0.00013	0.00002	0.0005	0.015	0.0005	0.0017	11	0.002
10/15/2012	<0.20	0.28	0.004	0.82	0.01	0.00038	0.0005	0.072	<0.00001	<0.000005	<0.05	0.00002	66	0.00012	0.00002	0.0011	0.012	0.0002	0.0018	11	0.001
11/21/2012	<0.20	0.42	0.004	2.41	0.01	0.00039	0.0005	0.077	<0.00001	<0.000005	<0.05	0.00003	74	0.00011	0.00002	0.0011	0.023	0.0009	0.0017	14	0.003
12/14/2012	0.23	0.22	0.006	1.96	0.01	0.00052	0.0006	0.080	<0.00001	<0.000005	<0.05	0.00004	80	0.00012	0.00002	0.0012	0.014	0.0010	0.0021	16	0.003
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	16	16	15	16	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	0.23	0.23	0.0041	1.98	0.008	0.00038	0.0006	0.072	< 0.00001	< 0.000005	< 0.05	0.000028	72.7	0.00012	0.000022	0.00104	0.015	0.00045	0.0018	12.9	0.0021
mean	0.24	0.25	0.0055	2.92	0.017	0.00038	0.0006	0.069	< 0.00001	< 0.000005	< 0.05	0.000035	66.4	0.00021	0.000038	0.00091	0.041	0.00106	0.0018	11.8	0.0042
standard deviation	0.05	0.13	0.0047	2.62	0.024	0.00007	0.0002	0.015	0.00000	0.000000	0.00	0.000023	15.5	0.00015	0.000044	0.00051	0.068	0.00143	0.0004	3.3	0.0061
minimum	< 0.20	0.07	< 0.0020	0.82	0.002	0.00018	0.0005	0.026	< 0.00001	< 0.000005	< 0.05	0.000017	20.5	< 0.00010	0.000006	0.00026	0.005	0.00006	0.0006	2.9	0.0006
maximum	0.33	0.56	0.0190	11.10	0.098	0.00052	0.0012	0.091	< 0.00001	< 0.000005	< 0.05	0.000104	80.3	0.00050	0.000192	0.00171	0.300	0.00483	0.0023	15.9	0.0279
# < detection limit	5	3	3	0	0	0	0	0	19	18	19	0	0	6	0	0	0	0	0	0	0
% < detection limit	31%	19%	20%	0%	0%	0%	0%	0%	100%	95%	100%	0%	0%	32%	0%	0%	0%	0%	0%	0%	0%
# > guideline	0				0		0				0	0		0		0	0	2			0
% > guideline	0%				0%		0%				0%	0%		0%		0%	0%	11%			0%

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.4: Water quality concentrations for KV-64, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011	<0.00001	0.0004	0.0003	<0.002	0.56	**0.00128**	2.51	<0.000005	1.13	0.33	19	**0.000050**	<0.00001	<0.0005	0.0023	<0.0002	0.002	<0.0001
5/25/2011	<0.00001	0.0001	0.0007	0.016	0.44	0.00029	1.26	0.000006	0.25	0.09	<10	0.000002	<0.00001	0.0009	0.0003	<0.0002	0.002	0.0001
7/12/2011	<0.00001	0.0002	0.0004	0.004	0.30	0.00108	2.73	<0.000005	0.69	0.25	11	0.000004	<0.00001	<0.0005	0.0013	<0.0002	0.001	<0.0001
10/29/2011	<0.00001	0.0003	0.0002	0.002	0.47	0.00106	2.70	0.000006	1.03	0.31	19	0.000017	0.00008	<0.0005	0.0019	<0.0002	0.002	<0.0001
11/21/2011	<0.00001	0.0003	0.0002	0.002	0.45	**0.00119**	2.90	<0.000005	1.13	0.33	19	0.000022	0.00015	<0.0005	0.0023	<0.0002	0.003	<0.0001
12/19/2011	<0.00001	0.0003	0.0007	0.017	0.49	**0.00115**	2.70	**0.000059**	1.55	0.34	17	**0.000039**	<0.00001	0.0023	0.0020	0.0002	0.011	<0.0001
1/13/2012	<0.00001	0.0002	0.0002	<0.002	0.42	**0.00153**	3.20	<0.000005	1.01	0.32	25	0.000029	<0.00020	<0.0005	0.0018	<0.0002	0.001	<0.0001
2/16/2012	<0.00001	0.0002	0.0002	0.003	0.46	0.00107	2.90	<0.000005	1.19	0.34	22	0.000030	<0.00020	<0.0005	0.0022	<0.0002	0.001	<0.0001
3/14/2012	<0.00001	0.0003	0.0002	0.003	0.48	**0.00109**	2.90	<0.000005	1.20	**0.37**	20	0.000024	<0.00020	<0.0005	0.0022	<0.0002	0.004	<0.0001
4/9/2012	<0.00001	0.0003	0.0002	0.002	0.60	0.00108	3.00	<0.000005	1.27	**0.36**	21	0.000022	<0.00020	<0.0005	0.0021	<0.0002	0.004	<0.0001
5/3/2012	<0.00001	0.0002	0.0005	0.007	**0.77**	0.00075	3.12	0.000013	0.90	0.27	17	0.000009	<0.00020	<0.00050	0.0015	<0.00020	0.005	<0.0001
5/7/2012	<0.00001	0.0002	0.0005	0.008	**0.82**	0.00055	2.16	0.000020	0.60	0.20	10	0.000006	<0.00020	0.0007	0.0011	<0.00020	0.005	<0.0001
6/6/2012	<0.00001	0.0001	0.0005	0.008	0.32	0.00069	2.14	0.000014	0.56	0.19	<10	0.000004	<0.00020	0.0010	0.0009	<0.00020	0.003	<0.0001
7/6/2012	<0.00001	0.0001	0.0003	<0.002	0.29	0.00079	2.91	<0.0000050	0.76	0.25	<10	0.000005	**0.00034**	<0.0005	0.0014	<0.00020	0.001	<0.0001
8/5/2012	<0.00001	0.0002	0.0003	<0.002	0.33	0.00101	2.62	<0.0000050	0.81	0.29	12	0.000005	<0.00020	<0.0005	0.0015	<0.00020	0.002	<0.0001
9/2/2012	<0.00001	0.0002	0.0002	0.002	0.38	0.00083	2.49	0.000009	0.86	0.30	14	0.000006	<0.00020	<0.0005	0.0015	<0.00020	0.001	<0.0001
10/15/2012	0.00001	0.0002	0.0004	0.003	0.37	0.00091	2.78	<0.0000050	0.87	0.31	15	0.000009	0.00024	<0.0005	0.0017	<0.00020	0.002	<0.0001
11/21/2012	<0.00001	0.0003	0.0003	0.002	0.46	0.00107	2.71	0.000005	1.08	0.31	17	0.000014	<0.00020	<0.0005	0.0020	<0.00020	0.007	<0.0001
12/14/2012	<0.00001	0.0003	0.0003	0.004	0.61	**0.00135**	2.94	<0.0000050	1.22	0.34	21	0.000034	<0.00020	<0.0005	0.0021	<0.00020	0.003	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
median	0.00001	0.00023	0.00032	0.003	0.46	0.00107	2.73	0.000005	1.01	0.313	17	0.000014	0.00020	0.0005	0.0018	0.0002	0.0022	0.0001
mean	0.00001	0.00023	0.00035	0.005	0.47	0.00099	2.67	0.000010	0.95	0.289	16	0.000017	0.00016	0.0007	0.0017	0.0002	0.0030	0.0001
standard deviation	0.00000	0.00007	0.00016	0.005	0.15	0.00029	0.44	0.000013	0.30	0.069	5	0.000014	0.00009	0.0004	0.0005	0.0000	0.0025	0.0000
minimum	< 0.00001	0.00007	0.00016	< 0.002	0.29	0.00029	1.26	< 0.000005	0.25	0.086	< 10	0.000002	< 0.00001	< 0.0005	0.0003	< 0.0002	0.0008	< 0.0001
maximum	0.00001	0.00035	0.00073	0.017	0.82	0.00153	3.20	0.000059	1.55	0.366	25	0.000050	0.00034	0.0023	0.0023	0.0002	0.0107	0.0001
# < detection limit	18	0	0	4	0	0	0	11	0	0	3	0	15	15	0	18	0	18
% < detection limit	95%	0%	0%	21%	0%	0%	0%	58%	0%	0%	16%	0%	79%	79%	0%	95%	0%	95%
# > guideline	0	0	0			12		0				0			0		0	
% > guideline	0%	0%	0%			63%		0%				0%			0%		0%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.5: Water quality concentrations for KV-65, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	L/s	pH units	pH units	µS/cm	µS/cm	µS/cm	C	mg/L	%	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/12/2011		**8.66**	7.73	132		276	0.0				3.0	140	141	83	100		57		
2/10/2011		7.81	7.96	97		289	0.2				2.0	134	146	86	100		60		
3/23/2011		8.04	7.44	189		303	0.1				3.0	168	159	**98**	**120**		71		
4/20/2011			7.78	**380**		305	0.4				4.0	160	164	89	110		63	0.013	<0.005
5/28/2011		7.72	7.51	35		58	2.3				12.0	27	27	18	22		12	0.012	<0.005
6/21/2011	246	**8.57**	7.78	79		128	**5.3**				2.0	66	62	42	51		21	0.008	
7/19/2011		8.12	**7.36**		91	92	4.2				**33.0**	42	47	31	38		13	**0.033**	0.035
8/18/2011	272	**8.78**	7.69		123	127	4.2				3.0	62	56	43	52		19	0.028	<0.500
9/25/2011	228	8.38	7.85		178	178	2.6				2.0	86	81	59	72		24		
10/25/2011	115	8.45	8.02		252	219	0.8	11.3	79	263	1.0	109	106	70	86		41		<0.005
11/20/2011		8.05	7.90		234	244	0.0	14.1	97	122	1.7	127	132	76	93		46		<0.005
12/18/2011	53	7.89	7.77		260	257	0.0	13.6	94		1.5	127	126	75	92		52		<0.005
1/17/2012	46	7.87	7.87		260	273	0.0	11.9	81	**355**	2.5	137	123	81	98		52		<0.005
2/13/2012	27	7.90	8.09		288	286	0.0	14.0	96	87	<1	135	147	87	106		56		<0.005
3/12/2012	34	7.81	8.10			298	-0.1	15.0		88	1.6	150	144	88	107		63		<0.050
4/8/2012		8.35	8.07		331	306	0.1			107	2.0	141	151	91	111		67		<0.005
5/8/2012	83	8.34	7.98		202	233	0.6	14.0	98	71	14.2	120	109	67	81	**1.5**	46		0.007
6/4/2012	735	7.65	7.49		72	66	2.1	14.8	108	291	20.2	32	29			0.6	8		<0.050
7/4/2012	283	8.13	7.77		133	124	**5.5**	12.5	99	54	2.5	67	55	40	49	0.7	19		<0.050
8/1/2012	283	7.95	7.68		179	164	**5.5**	13.7	109	111	1.2	89	82	53	65	1.2	25		<0.050
9/2/2012	224	7.37	8.07		210	182	4.3	13.0	100	129	1.6	85	86	59	72	0.6	29		<0.050
10/16/2012	164	7.76	7.91		207	183	0.7	12.9	90	181	2.6	89	90	59	72	<0.5	31		<0.050
11/20/2012		8.00	7.51		227	235	0.0	13.0	102	**355**	3.8	117	121	75	91	<0.5	45		**0.075**
12/11/2012		7.68	8.04		295	274	0.1	15.7	108		1.6	136	129	85	103	1.2	57		0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	14	23	24	6	17	24	24	14	13	13	24	24	24	23	23	8	24	5	19
median	194	8.00	7.82	115	210	234	0.5	13.67	98	121.9	2	119	115	74.9	91	0.6	45	0.013	0.007
mean	199	8.06	7.81	152	208	213	1.6	13.53	97	170.2	5	106	105	67.6	82	0.8	41	0.019	0.051
standard deviation	183	0.36	0.22	123	73	80	2.1	1.21	9	108.2	8	41	42	21.5	26	0.4	20	0.011	0.111
minimum	27	7.37	7.36	35	72	58	-0.1	11.27	79	53.9	< 1	27	27	18.0	22	0.5	8	0.008	< 0.005
maximum	735	8.78	8.10	380	331	306	5.5	15.73	109	355.2	33	168	164	98.0	120	1.5	71.0	0.033	0.500
# < detection limit	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%	25%	0%	0%	79%
# > guideline		0	0					0			1					0		2	2
% > guideline		0%	0%					0%			4%					0%		40%	11%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.5: Water quality concentrations for KV-65, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011				0.50	0.02	0.00010	0.0004	0.043	<0.00001	<0.000005	<0.05	0.00002	45	0.00060	0.00002	0.0003	0.02	0.0004	0.0028	7	0.001
2/10/2011			0.007	0.80	0.01	0.00009	0.0004	0.042	<0.00001	<0.000005	<0.05	0.00002	43	0.00030	0.00002	0.0003	0.02	0.0004	0.0027	7	0.001
3/23/2011			0.008	0.60	0.05	0.00015	0.0006	0.051	<0.00001	<0.000005	<0.05	0.00006	55	0.00080	0.00010	0.0006	0.10	0.0016	0.0030	8	0.006
4/20/2011	0.15		0.008	1.00	0.02	0.00014	0.0005	0.045	<0.00001	<0.000005	<0.05	0.00005	53	**0.00090**	0.00004	0.0005	0.047	0.0033	0.0027	7	0.005
5/28/2011	0.06		0.021	5.10	**0.16**	0.00009	0.0005	0.024	<0.00001	<0.000005	<0.05	0.00004	9	0.00060	0.00014	0.0015	0.157	0.0024	0.0009	1	0.007
6/21/2011			0.005	2.10	0.04	0.00013	0.0004	0.032	<0.00001	<0.000005	<0.05	0.00002	21	0.00030	0.00004	0.0007	0.048	0.0018	0.0017	3	0.002
7/19/2011	0.11		0.004	4.60	**0.82**	**0.00098**	0.0031	0.042	**0.000020**	**0.000030**	<0.05	**0.00051**	13	**0.00190**	**0.00075**	**0.0045**	**1.300**	**0.1010**	0.0020	3	0.046
8/18/2011	<2.00		0.003	2.20	0.05	<0.0005	0.0005	0.032	<0.00020	<0.001000	<0.10	**0.00020**	19	<0.00200	<0.000500	0.0010	0.080	**0.0105**	<0.010	3	0.006
9/25/2011			0.004	1.20	0.02	0.00013	0.0005	0.038	<0.00001	<0.000005	<0.05	0.00004	27	0.00020	0.00003	0.0005	0.031	0.0027	0.0022	4	0.002
10/25/2011	0.15	0.35	0.006	0.90	0.01	0.00011	0.0004	0.041	<0.00001	<0.000005	<0.05	0.00003	35	<0.0001	0.00002	0.0003	0.016	0.0008	0.0024	6	0.001
11/20/2011	0.18	0.20	0.007	1.04	0.02	0.00012	0.0004	0.045	<0.00001	<0.000005	<0.05	0.00005	40	0.00010	0.00002	0.0007	0.019	0.0013	0.0026	6	0.002
12/18/2011	0.17	0.04	0.006	0.74	0.01	0.00012	0.0004	0.045	<0.00001	<0.000005	<0.05	0.00004	41	<0.00010	0.00002	0.0004	0.014	0.0007	0.0026	6	0.001
1/17/2012	0.19	0.07	0.008	1.21	0.01	0.00013	0.0005	0.049	<0.00001	<0.000005	<0.05	0.00004	45	**0.00110**	0.00010	0.0003	0.017	0.0011	0.0028	6	0.002
2/13/2012	0.17	0.08	0.007	1.26	0.01	0.00012	0.0004	0.049	<0.00001	<0.000005	<0.05	0.00004	44	<0.00010	0.00001	0.0002	0.008	0.0004	0.0029	6	0.000
3/12/2012	0.29	<0.20	0.008	0.95	0.01	0.00014	0.0005	0.047	<0.00001	<0.000005	<0.05	0.00004	48	0.00010	0.00002	0.0004	0.017	0.0010	0.0029	7	0.002
4/8/2012	0.17	0.04	0.012	<0.50	0.01	0.00012	0.0005	0.048	<0.00001	<0.000005	<0.05	0.00005	46	<0.00010	0.00001	0.0003	0.008	0.0008	0.0028	7	0.001
5/8/2012	0.25		**0.029**	4.22	**0.22**	**0.00142**	**0.0042**	0.052	**0.000016**	**0.000029**	<0.050	**0.00070**	39	0.00077	0.00027	**0.0033**	**0.443**	**0.1900**	0.0024	6	0.058
6/4/2012	<0.20	0.28	**0.027**	4.02	0.12	0.00011	0.0006	0.022	<0.00001	<0.000005	<0.050	0.00005	10	0.00024	0.00012	0.0014	0.158	**0.0068**	0.0011	2	0.008
7/4/2012	<0.20	0.21	0.006	1.70	0.03	0.00016	0.0005	0.030	<0.00001	<0.000005	<0.050	0.00005	22	0.00011	0.00004	0.0006	0.038	0.0036	0.0016	3	0.003
8/1/2012	<0.20	<0.20	0.006	1.67	0.02	0.00014	0.0004	0.040	<0.00001	<0.000005	<0.050	0.00006	29	<0.00010	0.00003	0.0004	0.038	0.0034	0.0021	4	0.002
9/2/2012	<0.20	<0.20	0.009	1.27	0.02	0.00014	0.0004	0.037	<0.00001	<0.000005	<0.050	0.00007	27	<0.00010	0.00003	0.0004	0.027	0.0036	0.0021	4	0.002
10/16/2012	<0.20	0.22	0.007	<0.50	0.02	0.00011	0.0004	0.036	<0.00001	<0.000005	<0.050	0.00005	28	0.00010	0.00003	0.0004	0.023	0.0021	0.0020	5	0.002
11/20/2012	0.24	<0.20	0.009	0.50	0.02	0.00013	0.0004	0.044	<0.00001	<0.000005	<0.050	0.00007	38	<0.00010	0.00003	0.0004	0.035	0.0021	0.0025	6	0.002
12/11/2012	0.24	0.04	0.009	0.91	0.02	0.00014	0.0004	0.050	<0.00001	<0.000005	<0.050	0.00007	43	<0.00010	0.00003	0.0003	0.028	0.0045	0.0028	7	0.002
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	19	14	23	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
median	0.20	0.20	0.0070	1.12	0.020	0.00013	0.0004	0.042	0.00001	0.000005	< 0.05	0.000046	38.2	0.00016	0.00003	0.00044	0.029	0.00206	0.0025	5.7	0.0021
mean	0.28	0.17	0.0094	1.65	0.073	0.00023	0.0007	0.041	0.00002	0.000049	< 0.05	0.000098	34.1	0.00046	0.00010	0.00082	0.112	0.01442	0.0026	5.1	0.0068
standard deviation	0.42	0.10	0.0069	1.39	0.168	0.00032	0.0009	0.008	0.00004	0.000203	0.01	0.000162	13.4	0.00055	0.00018	0.00102	0.269	0.04251	0.0017	1.8	0.0141
minimum	0.06	0.04	0.0030	0.50	0.008	0.00009	0.0004	0.022	< 0.00001	< 0.000005	< 0.05	0.000021	8.6	< 0.00010	0.00001	0.00023	0.008	0.00037	0.0009	1.4	0.0005
maximum	2.00	0.35	0.0290	5.10	0.823	0.00142	0.0042	0.052	0.00020	0.001000	< 0.10	0.000695	54.8	0.00200	0.00075	0.00450	1.300	0.19000	0.0100	7.6	0.0576
# < detection limit	6	4	0	2	0	1	0	0	22	22	24	0	0	9	1	0	0	0	1	0	0
% < detection limit	32%	29%	0%	8%	0%	4%	0%	0%	92%	92%	100%	0%	0%	38%	4%	0%	0%	0%	4%	0%	0%
# > guideline	0				4		0				0	3		0		2	1	9			0
% > guideline	0%				17%		0%				0%	13%		0%		8%	4%	38%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.5: Water quality concentrations for KV-65, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011	<0.00001	0.0003	0.0002	0.010	0.14	0.00085	3.02	0.000012	0.80	0.11	19	<0.000002	<0.00001	<0.0005	0.0012	<0.0002	0.002	0.0002
2/10/2011	<0.00001	0.0003	0.0002	0.006	0.14	0.00082	2.39	<0.000005	0.74	0.11	19	<0.000002	<0.00001	<0.0005	0.0012	<0.0002	0.001	<0.0001
3/23/2011	<0.00001	0.0003	0.0005	0.020	0.19	0.00087	3.55	0.000014	0.91	0.13	23	0.000002	<0.00001	0.0010	0.0015	0.0003	0.004	<0.0001
4/20/2011	<0.00001	0.0004	0.0003	0.009	0.16	0.00088	3.31	0.000010	0.80	0.12	19	<0.000002	0.00001	<0.0005	0.0014	<0.0002	0.005	<0.0001
5/28/2011	<0.00001	0.0001	0.0009	0.018	0.19	0.00029	1.69	0.000026	0.27	0.03	<10	0.000002	0.00006	**0.0048**	0.0001	0.0004	0.003	0.0001
6/21/2011	<0.00001	0.0002	0.0003	0.007	0.15	0.00056	2.62	0.000013	0.54	0.06	<10	0.000004	<0.00001	0.0006	0.0003	<0.0002	0.002	<0.0001
7/19/2011	<0.00001	0.0002	**0.0025**	**0.040**	<0.30	0.00033	3.20	**0.000878**	0.50	0.05	<50	0.000034	<0.00020	**0.0260**	0.0002	**0.0020**	**0.041**	**0.0005**
8/18/2011	<0.00020	<0.00100	0.0010	<0.040	<1.00	<0.00080	3.00	<0.000100	<1.00	0.06	<60	<0.00005	<0.00500	<0.0100	0.0003	<0.0050	<0.0100	<0.0020
9/25/2011	<0.00001	0.0002	0.0003	0.006	0.11	0.00073	2.90	0.000020	0.64	0.08	10	<0.000002	0.00014	0.0006	0.0005	<0.0002	0.003	<0.0001
10/25/2011	<0.00001	0.0003	0.0002	0.008	0.12	0.00091	3.10	<0.000005	0.76	0.09	14	<0.000002	0.00004	0.0005	0.0007	<0.0002	0.002	<0.0001
11/20/2011	<0.00002	0.0002	0.0003	0.004	0.14	0.00099	3.30	<0.000005	0.81	0.10	16	<0.000002	0.00010	<0.0005	0.0008	<0.0002	0.003	<0.0001
12/18/2011	<0.00001	0.0003	0.0002	0.007	0.13	0.00094	3.00	<0.000005	0.76	0.10	17	<0.000002	0.00005	<0.0005	0.0009	<0.0002	0.003	<0.0001
1/17/2012	<0.00001	0.0003	0.0002	0.009	0.15	0.00093	3.30	<0.000005	0.78	0.11	22	<0.000002	<0.00020	<0.0005	0.0010	<0.0002	0.004	<0.0001
2/13/2012	<0.00001	0.0003	0.0002	0.007	0.14	0.00095	2.90	<0.000005	0.73	0.11	18	<0.000002	<0.00020	<0.0005	0.0012	<0.0002	0.002	<0.0001
3/12/2012	<0.00001	0.0003	0.0002	0.013	0.20	0.00100	3.20	<0.000005	0.85	0.11	23	<0.000002	<0.00020	<0.0005	0.0010	<0.0002	0.003	<0.0001
4/8/2012	<0.00001	0.0003	0.0002	0.006	0.16	0.00100	3.00	<0.000005	0.87	0.12	20	<0.000002	<0.00020	<0.0005	0.0013	<0.0002	0.003	<0.0001
5/8/2012	<0.00001	0.0003	0.0012	**0.020**	0.28	0.00065	3.30	**0.000217**	0.93	0.09	16	**0.000168**	<0.00020	**0.0052**	0.0008	**0.0006**	**0.055**	**0.0003**
6/4/2012	<0.00001	0.0001	0.0008	0.019	0.14	0.00031	1.90	0.000035	0.36	0.03	<10	0.000003	<0.00020	0.0028	0.0001	0.0004	0.004	<0.0001
7/4/2012	<0.00001	**0.0012**	0.0003	0.008	0.12	0.00062	3.30	0.000011	0.61	0.05	<10	0.000002	<0.00020	0.0006	0.0002	<0.0002	0.004	<0.0001
8/1/2012	<0.00001	0.0002	0.0003	0.003	0.11	0.00086	3.27	<0.000005	0.65	0.08	<10	<0.0000020	<0.00020	<0.0005	0.0004	<0.0002	0.003	<0.0001
9/2/2012	<0.00001	0.0002	0.0002	0.007	0.10	0.00078	2.63	0.000013	0.68	0.08	<10	<0.0000020	<0.00020	0.0006	0.0004	0.0002	0.004	<0.0001
10/16/2012	<0.00001	0.0002	0.0002	0.009	0.11	0.00078	3.07	0.000006	0.67	0.08	11	0.000002	<0.00020	0.0005	0.0005	<0.0002	0.004	<0.0001
11/20/2012	<0.00001	0.0002	0.0002	0.016	0.13	0.00100	3.00	0.000005	0.75	0.10	18	0.000002	<0.00020	<0.0005	0.0008	<0.0002	0.004	<0.0001
12/11/2012	<0.00001	0.0002	0.0003	0.008	0.17	0.00107	3.13	0.000010	0.83	0.11	20	<0.0000020	<0.00020	0.0006	0.0011	<0.0002	0.005	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
median	< 0.00001	0.00026	0.00025	0.009	0.14	0.00085	3.05	0.00001	0.75	0.095	17	0.000002	0.00020	0.0005	0.0008	0.0002	0.003	0.0001
mean	< 0.00002	0.00031	0.00046	0.013	0.19	0.00079	2.96	0.00006	0.72	0.087	19	0.000012	0.00034	0.0025	0.0007	0.0005	0.007	0.0002
standard deviation	0.00004	0.00025	0.00052	0.010	0.18	0.00022	0.44	0.00018	0.17	0.029	12	0.000035	0.00100	0.0055	0.0004	0.0010	0.013	0.0004
minimum	< 0.00001	0.00009	0.00016	0.003	0.10	0.00029	1.69	0.00001	0.27	0.027	< 10	< 0.000002	< 0.00001	< 0.0005	0.0001	< 0.0002	0.001	< 0.0001
maximum	< 0.00020	0.00119	0.00250	0.040	1.00	0.00107	3.55	0.00088	1.00	0.127	60	0.000168	0.00500	0.0260	0.0015	0.0050	0.055	0.0020
# < detection limit	24	1	0	1	2	1	0	10	1	0	8	15	18	12	0	18	1	20
% < detection limit	100%	4%	0%	4%	8%	4%	0%	42%	4%	0%	33%	63%	75%	50%	0%	75%	4%	83%
# > guideline	0	0	0			1		2				0			0		2	
% > guideline	0%	0%	0%			4%		8%				0%			0%		8%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.6: Water quality concentrations for WILC, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	21	8.15	8.22			455	-0.1	**6.1**	**42**		<1	245	239				55		<0.005
12/21/2011	20	7.59	8.17		478	476	-0.1	12.5	85		1.3	250	242				61		<0.005
1/25/2012		8.46	**8.33**		660	534	0.0	11.8	81	330	<1	285	297				78		<0.005
2/17/2012		7.66	8.24		523	526	-0.1	13.3	91	57	<1	281	296				78		<0.005
3/14/2012		7.70	8.27		555	540	0.1	13.4	94	33	1.5	287	286				78		<0.050
4/9/2012		7.92	8.08			534	-0.1			169	<1	274	296				77		<0.005
5/4/2012		7.82	7.58		119	119	0.0	15.9	109	216	<1	68	68				<0.50		<0.050
6/3/2012	264	8.12	8.12		201	184	4.2	16.0	123	346	15.6	86	86				15		<0.050
7/3/2012	221	8.14	8.05		279	255	4.6	12.9	100	101	10.7	139	133				20		<0.050
8/5/2012	98	8.28	8.22		352	332	4.9	13.5	106	293	<1	178	183				25		<0.050
9/3/2012	117	7.79	8.18		348	296	2.7	13.9	102	122	<1	147	153	**133**	**162**		28		<0.050
10/18/2012		8.04	8.23		437	393	-0.1	14.4	99	192	<1	211	211				45		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	6	12	12	0	10	12	12	11	11	10	12	12	12	1	1	0	12	0	12
median	108	7.98	8.20	-	394	424	0.0	13.41	99	180.4	1	228	225	133.0	162	-	50	-	< 0.028
mean	123	7.97	8.14	-	395	387	1.3	13.06	94	185.7	3	204	207	133.0	162	-	47	-	< 0.028
standard deviation	101	0.27	0.19	-	167	148	2.1	2.65	21	110.6	5	79	83	-	-	-	28	-	0.024
minimum	20	7.59	7.58	-	119	119	-0.1	6.11	42	33.4	< 1	68	68	133.0	162	-	< 0.5	-	< 0.005
maximum	264	8.46	8.33	-	660	540	4.9	16.00	123	345.6	16	287	297	133.0	162	-	78	-	< 0.050
# < detection limit	0	0	0	-	0	0	0	0	0	0	8	0	0	0	0	-	1	-	12
% < detection limit	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	67%	0%	0%	0%	0%	-	8%	-	100%
# > guideline		0	0					1			0					-		-	0
% > guideline		0%	0%					9%			0%					-		-	0%

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.6: Water quality concentrations for WILC, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	0.06	0.26	<0.0020	4.29	0.01	0.00093	0.0020	0.057	<0.000010	<0.000005	<0.05	0.00001	69	<0.00010	0.00003	0.0006	0.05	0.0001	0.0017	18	0.024
12/21/2011	0.03	0.27	0.002	4.99	0.01	0.00094	0.0019	0.059	<0.000010	<0.000005	<0.05	0.00002	73	<0.00010	0.00004	0.0007	0.05	0.0005	0.0017	17	0.022
1/25/2012	0.06	0.15	0.005	4.21	0.00	**0.00101**	0.0019	0.066	<0.000010	<0.000005	<0.05	0.00002	80	0.00010	0.00002	0.0007	0.03	0.0002	0.0021	**21**	0.012
2/17/2012	0.03	0.20	0.003	3.89	0.01	**0.00110**	0.0018	0.063	<0.000010	<0.000005	<0.05	0.00002	80	<0.00010	0.00002	0.0005	0.02	0.0002	0.0019	**20**	0.009
3/14/2012	<0.20	0.23	0.006	2.61	0.01	**0.00128**	0.0017	0.059	<0.000010	<0.000005	<0.05	0.00003	82	0.00020	0.00006	0.0008	0.04	0.0004	0.0021	**20**	0.012
4/9/2012	0.06	0.14	0.002	2.89	0.00	**0.00119**	0.0021	0.067	<0.000010	<0.000005	<0.05	0.00001	79	<0.00010	0.00004	0.0005	0.03	0.0001	0.0020	**19**	0.071
5/4/2012	<0.20	**0.82**	0.023	**24.50**	0.07	0.00037	0.0024	0.025	<0.000010	<0.000005	<0.05	0.00004	20	0.00020	0.00011	0.0020	0.30	0.0001	0.0006	5	0.043
6/3/2012	<0.20	0.31	**0.497**	7.67	0.09	0.00064	0.0032	0.034	0.000013	<0.000005	<0.05	0.00003	24	0.00019	0.00016	0.0017	0.31	0.0008	0.0009	7	0.037
7/3/2012	<0.20	0.34	0.019	9.17	0.10	0.00077	**0.0047**	0.042	<0.000010	<0.000005	<0.05	0.00002	41	0.00023	0.00017	0.0015	**0.44**	0.0003	0.0011	9	0.044
8/5/2012	<0.20	0.32	0.006	7.36	0.02	0.00081	**0.0047**	0.046	<0.000010	<0.000005	<0.05	0.00001	52	<0.00010	0.00007	0.0008	0.26	0.0001	0.0013	12	0.028
9/3/2012	<0.20	0.31	0.008	**9.27**	0.02	0.00072	**0.0039**	0.041	<0.000010	<0.000005	<0.05	0.00001	42	0.00019	0.00009	0.0010	0.25	0.0003	0.0011	10	0.042
10/18/2012	0.03	0.20	0.004	5.04	0.01	0.00085	0.0032	0.049	<0.000010	<0.000005	<0.05	0.00001	61	<0.00010	0.00005	0.0008	0.14	0.0002	0.0016	14	0.036
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
median	0.13	0.27	0.0053	5.02	0.011	0.00089	0.0023	0.053	0.000010	< 0.000005	< 0.05	0.000017	65.0	0.00010	0.000054	0.00078	0.095	0.00024	0.0016	15.4	0.0324
mean	0.12	0.30	0.0480	7.16	0.029	0.00088	0.0028	0.051	0.000010	< 0.000005	< 0.05	0.000017	58.4	0.00014	0.000071	0.00097	0.159	0.00029	0.0015	14.2	0.0317
standard deviation	0.08	0.18	0.1416	5.92	0.036	0.00025	0.0011	0.013	0.000001	0.000000	0.00	0.000010	22.6	0.00005	0.000051	0.00051	0.145	0.00021	0.0005	5.6	0.0177
minimum	0.03	0.14	0.0020	2.61	0.004	0.00037	0.0017	0.025	< 0.000010	< 0.000005	< 0.05	0.000007	19.5	< 0.00010	0.000020	0.00049	0.016	0.00008	0.0006	4.7	0.0092
maximum	0.20	0.82	0.4970	24.50	0.095	0.00128	0.0047	0.067	0.000013	< 0.000005	< 0.05	0.000036	81.9	0.00023	0.000168	0.00203	0.439	0.00083	0.0021	20.9	0.0711
# < detection limit	6	0	1	0	0	0	0	0	11	12	12	0	0	6	0	0	0	0	0	0	0
% < detection limit	50%	0%	8%	0%	0%	0%	0%	0%	92%	100%	100%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%
# > guideline	0				0		0				0	0		0		0	0	0			0
% > guideline	0%				0%		0%				0%	0%		0%		0%	0%	0%			0%

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.6: Water quality concentrations for WILC, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	<0.00001	0.0003	0.0005	<0.002	0.43	0.00014	3.80	<0.000005	1.86	0.34	20	<0.000002	0.00003	<0.0005	**0.0034**	<0.0002	0.000	0.0001
12/21/2011	<0.00001	0.0003	0.0005	0.003	0.49	0.00011	3.90	<0.000005	1.76	0.35	22	<0.000002	<0.00001	<0.0005	**0.0034**	<0.0002	0.002	<0.0001
1/25/2012	<0.00001	0.0003	0.0006	0.005	**0.71**	0.00008	**4.30**	<0.000005	**2.29**	**0.36**	25	<0.000002	<0.00020	<0.0005	**0.0042**	<0.0002	0.002	<0.0001
2/17/2012	<0.00001	0.0002	0.0005	0.004	0.60	0.00007	3.90	<0.000005	**2.04**	**0.37**	28	<0.000002	<0.00020	<0.0005	**0.0039**	<0.0002	0.001	<0.0001
3/14/2012	<0.00001	0.0003	0.0006	0.006	0.57	0.00009	4.10	<0.000005	**2.12**	**0.39**	25	0.000003	0.00030	0.0005	**0.0038**	<0.0002	0.003	<0.0001
4/9/2012	<0.00001	0.0003	0.0005	<0.002	0.55	0.00009	3.90	<0.000005	1.91	**0.38**	26	<0.000002	<0.00020	<0.0005	**0.0039**	<0.0002	0.001	<0.0001
5/4/2012	<0.00001	0.0001	0.0012	0.019	**0.77**	0.00017	1.73	0.000005	0.56	0.09	<10	<0.0000020	<0.00020	0.0008	0.0005	<0.0002	0.003	0.0003
6/3/2012	<0.00001	0.0002	0.0012	0.012	0.36	0.00016	1.90	<0.0000050	0.71	0.13	<10	<0.0000020	<0.00020	0.0028	0.0009	0.0003	0.003	0.0002
7/3/2012	<0.00001	0.0002	0.0012	0.011	0.20	0.00014	3.32	<0.0000050	1.02	0.19	<10	<0.0000020	<0.00020	0.0031	0.0012	0.0004	0.001	0.0003
8/5/2012	<0.00001	0.0002	0.0007	0.003	0.27	0.00013	3.41	<0.0000050	1.26	0.25	<10	<0.0000020	<0.00020	<0.00050	0.0017	<0.0002	0.000	0.0002
9/3/2012	<0.00001	0.0002	0.0008	0.005	0.28	0.00008	2.98	<0.0000050	1.25	0.22	<10	<0.0000020	<0.00020	0.0006	0.0014	0.0003	0.001	0.0002
10/18/2012	<0.00001	0.0003	0.0006	<0.002	0.33	0.00010	3.65	<0.0000050	1.49	0.29	14	<0.0000020	0.00024	<0.00050	0.0025	<0.0002	0.001	0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
median	0.00001	0.00025	0.00062	0.004	0.46	0.00011	3.73	0.000005	1.63	0.316	17	0.000002	0.00020	0.0005	0.0029	0.0002	0.0013	0.0001
mean	0.00001	0.00023	0.00075	0.006	0.46	0.00011	3.41	0.000005	1.52	0.280	18	0.000002	0.00018	0.0009	0.0026	0.0002	0.0015	0.0002
standard deviation	0.00000	0.00006	0.00028	0.005	0.18	0.00003	0.83	0.000000	0.57	0.103	7	0.000000	0.00008	0.0009	0.0014	0.0001	0.0010	0.0001
minimum	0.00001	0.00009	0.00050	0.002	0.20	0.00007	1.73	< 0.000005	0.56	0.091	< 10	< 0.000002	< 0.00001	< 0.0005	0.0005	< 0.0002	0.0004	< 0.0001
maximum	0.00001	0.00030	0.00119	0.019	0.77	0.00017	4.30	0.000005	2.29	0.389	28	0.000003	0.00030	0.0031	0.0042	0.0004	0.0032	0.0003
# < detection limit	12	0	0	3	0	0	0	11	0	0	5	11	9	7	0	9	0	5
% < detection limit	100%	0%	0%	25%	0%	0%	0%	92%	0%	0%	42%	92%	75%	58%	0%	75%	0%	42%
# > guideline	0	0	0			0		0				0			0		0	
% > guideline	0%	0%	0%			0%		0%				0%			0%		0%	

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.7: Water quality concentrations for FIELC, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	34	8.06	8.19			353	-0.1	13.3	91		<1	193	187				24		<0.005
12/21/2011	26	7.73	8.21		370	370	0.0	12.9	88		1.1	192	189				24		<0.005
1/25/2012		7.92	8.25		466	397	0.0	12.2	84	339	1.1	210	202				25		<0.005
2/17/2012		7.52	8.24			396	-0.1	14.6	99	80	1.1	205	219				23		<0.005
3/14/2012	12	7.59	8.26		339	406	-0.1	12.7	87	89	<1	205	211				23		<0.050
4/9/2012		7.88	8.13			407	0.0			259	1.1	205	219				24		<0.005
5/4/2012		7.48	7.76		108	105	0.0	16.0	109	205	1.5	65	63						<0.050
6/3/2012	346	**8.55**	8.04		187	172	5.0	15.8	124	271	4.7	98	82				9		<0.050
7/3/2012	399	8.05	8.01		214	196	4.8	13.1	103	114	**24.9**	109	104				13		<0.050
8/5/2012	14	8.37	8.21		304	285	**5.8**	13.7	109	288	1.2	153	159				14		<0.050
9/3/2012	170	7.77	8.29		296	255	3.9	13.4	102	129	7.5	127	133				13		<0.050
10/18/2012		**7.00**	8.21		355	321	-0.1	15.1	103	170	1.0	176	171				19		<0.005
11/24/2012		7.42	8.22		412	377	0.0			46	1.4	203	205				23		<0.050
12/13/2012		**6.77**	8.22		426	417	0.0	12.6	86		1.0	219	222				23		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	7	14	14	0	11	14	14	12	12	11	14	14	14	0	0	0	13	0	14
median	34	7.75	8.21	-	339	362	0.0	13.4	101	169.6	1	193	188	-	-	-	23	-	< 0.028
mean	143	7.72	8.16	-	316	318	1.4	13.8	99	181.0	4	169	169	-	-	-	20	-	< 0.028
standard deviation	167	0.48	0.14	-	109	101	2.3	1.3	12	97.7	6	50	53	-	-	-	6	-	0.023
minimum	12	6.77	7.76	-	108	105	-0.1	12.2	84	45.8	< 1	65	63	-	-	-	9	-	< 0.005
maximum	399	8.55	8.29	-	466	417	5.8	16.0	124	339.3	25	219	222	-	-	-	25	-	< 0.050
# < detection limit	0	0	0	-	0	0	0	0	0	0	2	0	0	-	-	-	0	-	14
% < detection limit	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	14%	0%	0%	-	-	-	0%	-	100%
# > guideline		0	0					0			0					-		-	0
% > guideline		0%	0%					0%			0%					-		-	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.7: Water quality concentrations for FIELC, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	0.11	0.27	<0.0020	4.33	0.01	0.00011	0.0015	0.065	<0.000010	<0.000005	<0.05	0.00001	51	<0.00010	0.00013	0.0006	0.25	0.0000	0.0017	16	0.236
12/21/2011	0.05	0.31	0.004	3.89	0.01	0.00013	0.0015	0.069	<0.000010	<0.000005	<0.05	0.00002	52	<0.00010	0.00014	**0.0149**	0.28	0.0013	0.0018	15	**0.249**
1/25/2012	0.13	0.15	0.004	3.34	0.01	0.00009	0.0015	0.080	<0.000010	<0.000005	<0.05	0.00002	54	<0.00010	0.00019	0.0006	0.24	0.0000	0.0017	18	**0.342**
2/17/2012	0.12	0.20	0.003	3.26	0.01	0.00009	0.0012	0.076	<0.000010	<0.000005	<0.05	0.00001	54	<0.00010	0.00014	0.0006	0.16	0.0003	0.0016	17	**0.298**
3/14/2012	0.23	<0.20	0.003	3.31	0.00	0.00009	0.0011	0.073	<0.000010	<0.000005	<0.05	0.00001	54	0.00050	0.00015	0.0004	0.18	0.0002	0.0017	17	**0.316**
4/9/2012	0.13	0.18	<0.0020	2.64	0.00	0.00009	0.0011	**0.090**	<0.000010	<0.000005	<0.05	0.00003	56	<0.00010	0.00014	0.0004	0.18	0.0002	0.0016	16	**0.328**
5/4/2012	**0.39**	**0.49**	0.020	**30.60**	0.14	0.00008	0.0009	0.037	**0.000017**	<0.000005	<0.05	0.00004	18	0.00035	0.00023	0.0021	0.40	0.0001	0.0006	5	0.090
6/3/2012	<0.20	0.38	0.013	8.11	0.11	0.00046	0.0020	0.038	<0.000010	<0.000005	<0.05	0.00013	27	**0.00937**	0.00029	**0.0095**	0.37	0.0046	0.0016	7	0.062
7/3/2012	<0.20	**0.44**	0.027	**11.20**	**0.21**	0.00022	0.0029	0.052	**0.000024**	<0.000005	<0.05	0.00004	31	0.00041	**0.00042**	0.0023	**0.85**	0.0006	0.0011	8	0.095
8/5/2012	<0.20	0.35	0.006	7.34	0.02	0.00015	0.0022	0.055	<0.000010	<0.000005	<0.05	0.00001	42	<0.00010	0.00012	0.0009	**0.42**	0.0002	0.0014	12	0.075
9/3/2012	<0.20	0.37	0.017	**9.63**	0.07	0.00018	0.0025	0.054	<0.000010	<0.000005	<0.05	0.00003	35	0.00043	0.00025	0.0016	**0.64**	0.0009	0.0011	10	0.116
10/18/2012	0.06	0.23	0.003	5.60	0.01	0.00011	0.0017	0.058	<0.000010	<0.000005	<0.05	0.00001	48	0.00011	0.00011	0.0008	0.30	0.0003	0.0016	14	0.158
11/24/2012	<0.20	0.39	0.004	4.32	0.01	0.00010	0.0013	**0.083**	<0.000010	<0.000005	<0.05	0.00001	53	0.00085	0.00015	**0.0050**	0.28	0.0003	0.0014	17	**0.257**
12/13/2012	0.11	0.37	0.003	4.90	0.01	0.00019	0.0009	**0.083**	<0.000010	<0.000005	<0.05	0.00004	58	0.00022	0.00010	**0.0039**	0.14	0.0021	0.0015	18	0.156
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
median	0.17	0.33	0.0038	4.62	0.010	0.00011	0.0015	0.067	0.000010	< 0.000005	< 0.05	0.000021	51.5	0.00017	0.00015	0.00125	0.279	0.00027	0.0016	15.4	0.1970
mean	0.17	0.31	0.0080	7.32	0.044	0.00015	0.0016	0.065	0.000012	< 0.000005	< 0.05	0.000029	45.2	0.00092	0.00018	0.00312	0.335	0.00080	0.0015	13.5	0.1984
standard deviation	0.09	0.11	0.0081	7.19	0.065	0.00010	0.0006	0.017	0.000004	0.000000	0.00	0.000031	12.7	0.00244	0.00009	0.00422	0.199	0.00124	0.0003	4.4	0.1019
minimum	0.05	0.15	< 0.0020	2.64	0.004	0.00008	0.0009	0.037	< 0.000010	< 0.000005	< 0.05	0.000007	17.8	0.00010	0.00010	0.00042	0.140	0.00003	0.0006	5.0	0.0623
maximum	0.39	0.49	0.0271	30.60	0.212	0.00046	0.0029	0.090	0.000024	< 0.000005	< 0.05	0.000128	57.7	0.00937	0.00042	0.01490	0.853	0.00462	0.0018	18.1	0.3420
# < detection limit	5	1	2	0	0	0	0	0	12	14	14	0	0	6	0	0	0	0	0	0	0
% < detection limit	36%	7%	14%	0%	0%	0%	0%	0%	86%	100%	100%	0%	0%	43%	0%	0%	0%	0%	0%	0%	0%
# > guideline	0				3		0				0	0		1		4	0	1			0
% > guideline	0%				21%		0%				0%	0%		7%		29%	0%	7%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.7: Water quality concentrations for FIELC, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
11/22/2011	<0.00001	**0.0004**	0.0009	0.003	0.47	0.00037	3.50	<0.000005	1.69	0.28	<10	<0.000002	0.00003	<0.0005	0.0025	<0.0002	0.000	0.0001
12/21/2011	<0.00001	0.0002	**0.0030**	0.005	0.54	0.00037	3.50	<0.000005	1.59	0.29	<10	<0.000002	<0.00001	0.0006	0.0027	<0.0002	0.003	0.0001
1/25/2012	<0.00001	0.0002	0.0011	0.004	0.50	0.00026	3.50	<0.000005	1.80	0.30	<10	<0.000002	<0.0002	<0.0005	0.0031	<0.0002	0.001	0.0001
2/17/2012	<0.00001	0.0002	0.0010	<0.002	0.55	0.00029	3.40	<0.000005	1.75	0.30	<10	<0.000002	<0.0002	<0.0005	0.0030	<0.0002	0.001	<0.0001
3/14/2012	<0.00001	0.0002	0.0009	0.003	0.50	0.00032	3.30	<0.000005	1.72	0.31	<10	<0.000002	<0.0002	<0.0005	0.0032	<0.0002	0.001	<0.0001
4/9/2012	<0.00001	0.0002	0.0009	0.002	0.51	0.00036	3.50	<0.000005	1.57	0.31	<10	<0.000002	<0.0002	<0.0005	0.0030	<0.0002	0.003	<0.0001
5/4/2012	<0.00001	0.0001	**0.0017**	**0.020**	0.57	0.00025	1.82	0.000006	0.58	0.10	<10	<0.000002	<0.00020	0.0015	0.0005	<0.0002	0.005	**0.0003**
6/3/2012	<0.00001	**0.0036**	**0.0030**	**0.067**	**2.05**	0.00022	2.40	0.000034	**2.75**	0.15	<10	0.000004	**0.00059**	0.0039	0.0006	0.0004	**0.030**	0.0002
7/3/2012	<0.00001	0.0001	**0.0017**	0.020	0.20	0.00019	3.22	0.000007	1.00	0.17	<10	0.000002	<0.00020	0.0047	0.0009	**0.0007**	0.002	**0.0005**
8/5/2012	<0.00001	0.0002	0.0010	0.004	0.33	0.00027	3.17	<0.000005	1.26	0.25	<10	<0.000002	<0.00020	<0.0005	0.0015	<0.0002	0.002	0.0002
9/3/2012	<0.00001	0.0002	0.0013	0.009	0.34	0.00027	2.88	0.000011	1.22	0.21	<10	<0.000002	<0.00020	0.0025	0.0012	**0.0005**	0.002	0.0003
10/18/2012	<0.00001	0.0002	0.0009	<0.002	0.38	0.00023	3.53	<0.000005	1.40	0.26	<10	<0.000002	<0.00020	<0.0005	0.0019	<0.0002	0.001	0.0001
11/24/2012	<0.00001	0.0003	0.0010	0.005	0.47	0.00034	3.34	<0.000005	1.71	0.31	8	<0.000002	**0.00037**	0.0006	0.0027	0.0003	0.001	0.0001
12/13/2012	<0.00001	0.0002	0.0011	0.002	0.52	0.00021	3.67	<0.000005	**1.97**	0.34	8	0.000003	**0.00056**	<0.0005	0.0028	<0.0002	0.009	0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
median	< 0.00001	0.00021	0.00107	0.004	0.50	0.00027	3.37	0.000005	1.64	0.286	10	0.000002	0.00020	0.00050	0.0026	0.0002	0.0019	0.0001
mean	< 0.00001	0.00046	0.00139	0.011	0.57	0.00028	3.20	0.000008	1.57	0.254	10	0.000002	0.00024	0.00127	0.0021	0.0003	0.0044	0.0002
standard deviation	0.00000	0.00092	0.00074	0.017	0.44	0.00006	0.51	0.000008	0.50	0.072	1	0.000001	0.00016	0.00142	0.0010	0.0002	0.0078	0.0001
minimum	< 0.00001	0.00007	0.00085	< 0.002	0.20	0.00019	1.82	< 0.000005	0.58	0.098	8	< 0.000002	< 0.00001	0.00050	0.0005	0.0002	0.0004	0.0001
maximum	< 0.00001	0.00364	0.00303	0.067	2.05	0.00037	3.67	0.000034	2.75	0.337	10	0.000004	0.00059	0.00473	0.0032	0.0007	0.0303	0.0005
# < detection limit	14	0	0	2	0	0	0	10	0	0	12	11	10	8	0	10	0	3
% < detection limit	100%	0%	0%	14%	0%	0%	0%	71%	0%	0%	86%	79%	71%	57%	0%	71%	0%	21%
# > guideline	0	0	0			0		0				0			0		1	
% > guideline	0%	0%	0%			0%		0%				0%			0%		7%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.8: Water quality concentrations for KV-1, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011		7.72	7.89	**519**		492	0.0				**90.0**	238	223	**140**	**170**		120		
3/22/2011		7.69	8.00	**460**		**796**	0.4				2.0	**450**	**453**				170		
5/25/2011		8.24	7.77	113		169	**6.3**				**160.0**	80	85	53	64		35		
6/22/2011		8.23	8.04	260		328	**15.0**				6.0	172	167				74		
7/20/2011		8.06	7.81		301	310	**13.1**				**31.0**	153	158	81	98		72		
8/19/2011		8.31	8.18			294	**10.7**				<1	159	151				32		
9/24/2011		7.39	8.10		351	356	**7.0**				7.0	174	165				84		
10/24/2011	3,505	**7.01**	8.05			391	0.3	10.9	76	273	3.0	186	200	**110**	**140**		83		<0.005
11/24/2011		8.00	8.05			425	-0.1	**10.2**	**70**		**65.7**	226	237				102		<0.005
12/15/2011		7.58	7.82		446	436	-0.1	**10.2**	**70**		1.8	224	224	**126**	**154**		98	**0.055**	<0.005
1/13/2012		7.65	8.12		411	473	0.0	**9.3**	**63**		1.7	236	245				102		<0.005
2/10/2012		7.47	8.21		484	513	-0.1	**10.1**	**69**	86	1.4	273	275	**154**	**188**		121		0.012
3/10/2012		7.61	8.09		486	479	-0.1	12.1	82	69	3.6	250	239				113		<0.05
4/6/2012		7.56	8.19		550	482	-0.1	**9.9**	**68**	56	11.0	237	253				109		<0.005
5/5/2012	6,155	7.85	7.65		287	273	2.2	13.2	96	44	**34.4**	141	138	77	94	0.9	53		<0.050
6/1/2012	8,779	7.91	8.06		245	288	**11.7**				**42.2**	139	128				57		<0.050
7/5/2012		7.97	8.08		359	327	**14.6**	**9.5**	94	114	**57.9**	179	149	88	107	0.7	79		<0.050
8/2/2012	6,315	7.98	8.17		358	335	**15.5**	**9.4**	94	120	3.3	174	173				77		<0.050
9/21/2012	2,681	8.00	8.10		424	380	**7.0**	11.5	95	116	2.7	174	191				96		<0.050
10/11/2012	2,267	**7.08**	8.15		464	403	0.0			161	4.0	184	196	**109**	**133**	1.1	103		<0.050
11/19/2012		7.99	8.21		390	462	0.0	**5.1**	77	**413**	1.9	246	254				115		**0.061**
12/7/2012		**7.09**	8.14		600	531	0.0				1.7	270	261				130		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	6	22	22	4	15	22	22	12	12	10	22	22	22	9	9	3	22	1	15
median	4830	7.79	8.09	360	411	397	0.4	10.17	77	114.7	4	185	198	109.0	133	0.9	97	0.055	0.05
mean	4950	7.75	8.04	338	410	407	4.7	10.12	80	145.1	24	207	208	104.2	128	0.9	92	0.055	0.03
standard deviation	2546	0.37	0.16	187	98	127	6.0	1.97	12	114.5	39	73	74	32.6	40	0.2	32	0	0.02
minimum	2267	7.01	7.65	113	245	169	-0.1	5.10	63	44.0	< 1	80	85	53.0	64	0.7	32	0.0550	0.01
maximum	8779	8.31	8.21	519	600	796	15.5	13.21	96	412.6	160	450	453	154.0	188	1.1	170	0.0550	0.06
# < detection limit	0	0.00	0.00	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	13
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	87%
95th Percentile	8163	8	8	510	565	530	15	13	95	350	89	273	274	148	181	1	130	0	0

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.8: Water quality concentrations for KV-1, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011			0.009	3.30	**2.91**	0.00014	**0.0075**	**0.092**	**0.000120**	<0.000005	<0.05	**0.00196**	61	**0.00160**	**0.01080**	**0.0115**	**2.37**	**0.0117**	**0.0077**	**21**	**0.706**
3/22/2011				3.30	0.02	0.00008	0.0031	**0.114**	<0.000010	<0.000005	<0.05	**0.00031**	117	0.00040	**0.00121**	0.0010	0.35	0.0011	**0.0076**	**38**	**0.313**
5/25/2011			**0.031**	**11.50**	**0.27**	0.00015	0.0008	0.034	**0.000020**	<0.000020	<0.05	**0.00027**	22	<0.00050	**0.00273**	**0.0042**	0.31	0.0005	0.0026	6	0.185
6/22/2011					**0.77**	0.00010	0.0009	0.051	**0.000040**	<0.000005	<0.05	**0.00094**	45	0.00020	**0.00457**	**0.0059**	0.29	0.0003	**0.0063**	15	0.220
7/20/2011			0.002	5.70	**1.91**	0.00031	0.0022	0.060	**0.000080**	<0.00002	<0.05	**0.00131**	40	**0.00180**	**0.00698**	**0.0120**	**1.90**	0.0018	**0.0069**	13	**0.278**
8/19/2011					0.00	0.00029	**0.0076**	0.061	<0.000010	<0.000005	<0.05	<0.000005	40	0.00020	0.00004	0.0003	0.04	0.0002	0.0029	14	0.021
9/24/2011					**0.60**	0.00010	0.0010	0.046	**0.000040**	<0.000005	<0.05	**0.00082**	45	0.00030	**0.00392**	**0.0049**	0.35	0.0005	**0.0060**	15	0.178
10/24/2011	0.03	0.07	0.005	3.90	**0.35**	0.00007	0.0010	0.052	**0.000020**	<0.000005	<0.05	**0.00063**	49	0.00010	**0.00284**	**0.0030**	0.27	0.0002	**0.0060**	15	0.166
11/24/2011	0.04	0.34	0.011	3.81	**0.35**	0.00035	0.0016	0.059	**0.000020**	**0.000007**	<0.05	**0.00082**	58	0.00050	**0.00366**	**0.0043**	**0.46**	**0.0063**	**0.0069**	**20**	0.241
12/15/2011	0.05	0.17	0.005	3.52	**0.23**	0.00008	0.0013	0.063	0.000010	<0.000005	<0.05	**0.00066**	58	<0.00010	**0.00244**	0.0027	0.25	0.0002	**0.0063**	**19**	0.180
1/13/2012	0.06	0.19	0.006	3.49	**0.16**	0.00007	0.0016	0.069	**0.000020**	<0.000005	<0.05	**0.00074**	63	<0.00010	**0.00199**	0.0022	0.26	0.0003	**0.0063**	**20**	0.183
2/10/2012	0.21	0.14	0.005	4.23	0.11	0.00012	0.0015	0.078	<0.000010	<0.000005	<0.05	**0.00081**	72	<0.00010	**0.00240**	0.0023	0.24	0.0004	**0.0071**	**23**	0.226
3/10/2012	<0.20	**0.53**	0.007	3.90	0.14	0.00011	0.0016	0.069	0.000010	<0.000005	<0.05	**0.00060**	65	0.00030	**0.00154**	0.0025	0.24	0.0009	**0.0066**	**21**	0.162
4/6/2012	0.10	0.22	0.007	2.98	**0.25**	0.00011	0.0018	0.069	0.000010	<0.000005	<0.05	**0.00076**	62	0.00020	**0.00234**	0.0026	0.32	0.0019	**0.0065**	**20**	0.202
5/5/2012	**0.33**	<0.20	**0.046**	**11.80**	**0.64**	0.00011	0.0019	0.057	**0.000038**	**0.000008**	<0.05	**0.00041**	37	0.00047	**0.00191**	**0.0042**	**0.96**	0.0015	0.0033	12	0.201
6/1/2012	<0.20	0.28	**0.051**	4.84	**0.77**	0.00013	0.0017	0.056	**0.000051**	<0.000005	<0.05	**0.00079**	35	0.00051	**0.00402**	**0.0064**	**0.81**	0.0014	0.0048	13	0.222
7/5/2012	<0.20	0.24	0.013	4.49	**0.87**	0.00012	0.0009	0.048	**0.000048**	<0.000005	<0.05	**0.00097**	48	0.00022	**0.00463**	**0.0064**	0.39	0.0004	**0.0063**	14	0.181
8/2/2012	<0.20	0.22	0.005	5.15	**0.49**	0.00009	0.0008	0.048	**0.000025**	<0.000005	<0.05	**0.00073**	45	0.00015	**0.00306**	**0.0044**	0.23	0.0002	**0.0064**	15	0.144
9/21/2012	<0.20	0.23	0.005	4.04	**0.49**	0.00012	0.0021	0.048	**0.000028**	**0.000039**	<0.05	**0.00115**	44	<0.00010	**0.00517**	**0.0039**	0.22	0.0010	**0.0075**	16	0.222
10/11/2012	<0.20	0.26	0.006	5.33	**0.32**	0.00008	0.0011	0.048	0.000014	<0.000005	<0.05	**0.00070**	48	<0.00010	**0.00395**	**0.0031**	0.22	0.0001	**0.0061**	15	0.202
11/19/2012	<0.20	**1.01**	0.007	3.46	**0.25**	0.00008	0.0014	0.066	0.000010	<0.000005	<0.05	**0.00085**	64	0.00010	**0.00355**	**0.0030**	0.30	0.0005	**0.0071**	**21**	**0.252**
12/7/2012	0.06	0.29	0.006	3.11	0.11	0.00006	0.0021	0.080	<0.000010	<0.000005	<0.05	**0.00068**	69	0.00028	**0.00206**	0.0019	0.36	0.0006	**0.0068**	**24**	**0.244**
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	18	19	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
median	0.20	0.23	0.0067	3.90	0.335	0.00011	0.0016	0.059	0.000020	0.000005	< 0.05	0.000748	48.8	0.00021	0.002950	0.00347	0.305	0.00052	0.0064	15.6	0.2020
mean	0.15	0.29	0.0126	4.83	0.546	0.00013	0.0021	0.062	0.000029	0.000008	< 0.05	0.000769	53.9	0.00038	0.003446	0.00421	0.505	0.00145	0.0061	17.7	0.2240
standard deviation	0.09	0.22	0.0145	2.52	0.669	0.00008	0.0019	0.018	0.000027	0.000008	0.00	0.000390	18.8	0.00045	0.002226	0.00291	0.567	0.00263	0.0014	6.2	0.1215
minimum	0.03	0.07	0.0020	2.98	0.003	0.00006	0.0008	0.034	< 0.000010	< 0.000005	< 0.05	< 0.000005	22.1	< 0.00010	0.000038	0.00025	0.036	0.00011	0.0026	5.9	0.0206
maximum	0.33	1.01	0.0509	11.80	2.910	0.00035	0.0076	0.114	0.000120	0.000039	< 0.05	0.001960	117.0	0.00180	0.010800	0.01200	2.370	0.01170	0.0077	38.2	0.7060
# < detection limit	7	1	0	0	0	0	0	0	4	19	22	1	0	6	0	0	0	0	0	0	0
% < detection limit	47%	7%	0%	0%	0%	0%	0%	0%	18%	86%	100%	5%	0%	27%	0%	0%	0%	0%	0%	0%	0%
95th Percentile	0	1	0	12	2	0	0	0	0	0	0	0	72	0	0	0	2	0	0	23	0

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.8: Water quality concentrations for KV-1, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011	<0.00001	**0.0008**	**0.0513**	**0.052**	**0.79**	0.00058	3.13	<0.000005	**2.93**	0.28	35	0.000007	0.00002	**0.0090**	0.0019	**0.0008**	**0.377**	0.0002
3/22/2011	<0.00002	**0.0024**	**0.0166**	0.010	**2.20**	0.00022	**6.26**	0.000006	**9.09**	**0.41**	63	0.000003	0.00001	<0.0005	0.0015	<0.0002	**0.065**	<0.0001
5/25/2011	<0.00001	**0.0005**	**0.0156**	0.011	0.50	0.00028	1.36	0.000007	0.60	0.08	<50	0.000004	<0.0002	<0.0050	0.0004	0.0005	**0.039**	**0.0003**
6/22/2011	<0.00001	**0.0004**	**0.0317**	0.007	0.44	0.00048	1.91	<0.000005	1.25	0.20	30	0.000004	0.00002	0.0009	0.0007	0.0002	**0.147**	<0.0001
7/20/2011	<0.00001	**0.0005**	**0.0417**	**0.062**	0.50	0.00057	2.99	0.000041	1.20	0.16	<50	0.000014	<0.00020	**0.0220**	0.0009	**0.0021**	**0.213**	**0.0007**
8/19/2011	<0.00001	**0.0009**	0.0009	0.012	**0.66**	0.00006	1.30	<0.000005	**3.69**	0.21	13	<0.000002	0.00002	<0.0005	0.0001	<0.0002	0.001	<0.0001
9/24/2011	<0.00001	**0.0004**	**0.0265**	0.011	0.43	0.00048	1.90	0.000009	1.33	0.19	29	0.000003	0.00013	0.0016	0.0009	0.0003	**0.137**	<0.0001
10/24/2011	<0.00001	**0.0004**	**0.0220**	0.008	0.49	0.00051	2.00	<0.000005	1.58	0.22	32	<0.000002	0.00015	0.0015	0.0010	<0.0002	**0.106**	<0.0001
11/24/2011	<0.00002	**0.0005**	**0.0292**	0.016	**0.73**	0.00056	2.60	0.000023	**2.46**	0.23	35	0.000004	**0.00093**	0.0024	0.0009	0.0004	**0.148**	<0.0001
12/15/2011	<0.00001	**0.0006**	**0.0261**	0.002	0.60	0.00056	2.50	<0.000005	**2.39**	0.25	35	<0.000002	0.00003	<0.0005	0.0008	<0.0002	**0.122**	<0.0001
1/13/2012	<0.00001	**0.0007**	**0.0237**	0.004	**0.75**	0.00058	3.10	<0.000005	**2.64**	0.25	42	<0.000002	<0.00020	<0.0005	0.0008	<0.0002	**0.113**	<0.0001
2/10/2012	<0.00001	**0.0007**	**0.0313**	0.005	**0.92**	0.00061	3.30	<0.000005	**3.17**	0.28	41	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.149**	<0.0001
3/10/2012	<0.00001	**0.0007**	**0.0231**	0.009	**0.93**	0.00056	3.00	<0.000005	**2.99**	0.25	40	<0.000002	<0.00020	0.0007	0.0007	<0.0002	**0.112**	<0.0001
4/6/2012	<0.00001	**0.0006**	**0.0286**	0.007	**0.77**	0.00058	2.90	0.000009	**2.87**	0.26	38	<0.000002	<0.00020	0.0009	0.0008	<0.0002	**0.138**	<0.0001
5/5/2012	<0.00001	**0.0004**	**0.0120**	**0.033**	**0.80**	0.00028	2.57	0.000017	1.25	0.14	19	0.000007	0.00025	**0.0146**	0.0008	**0.0010**	**0.069**	**0.0004**
6/1/2012	<0.00001	0.0003	**0.0233**	**0.040**	0.55	0.00050	1.90	0.000006	1.15	0.16	22	0.000007	<0.00020	**0.0056**	0.0008	**0.0008**	**0.130**	**0.0004**
7/5/2012	<0.00001	**0.0004**	**0.0307**	0.008	0.36	0.00057	2.38	0.000006	1.32	0.17	26	0.000003	<0.00020	0.0028	0.0008	0.0003	**0.169**	<0.0001
8/2/2012	<0.00001	**0.0005**	**0.0231**	0.003	0.37	0.00055	1.73	<0.000005	1.33	0.20	29	0.000002	<0.00020	<0.0005	0.0007	<0.0002	**0.113**	<0.0001
9/21/2012	<0.00001	**0.0005**	**0.0313**	0.002	0.42	0.00060	1.55	**0.000070**	1.49	0.21	32	0.000002	<0.00020	0.0005	0.0010	<0.0002	**0.147**	**0.0004**
10/11/2012	<0.00001	**0.0004**	**0.0252**	0.007	0.48	0.00057	2.10	<0.000005	1.55	0.20	41	<0.0000020	<0.00020	<0.0005	0.0008	<0.0002	**0.117**	0.0002
11/19/2012	<0.00001	**0.0005**	**0.0313**	0.005	**0.69**	0.00066	2.70	<0.000005	**2.52**	0.26	43	0.000002	<0.00020	0.0007	0.0008	<0.0002	**0.161**	<0.0001
12/7/2012	<0.00001	**0.0008**	**0.0268**	0.004	**0.88**	0.00059	3.21	<0.000005	**3.62**	0.29	44	0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.133**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
median	< 0.00001	0.00053	0.02630	0.008	0.63	0.00056	2.54	0.000005	1.99	0.215	35	0.000002	0.00020	0.0008	0.0008	0.0002	0.1315	0.0001
mean	< 0.00001	0.00063	0.02600	0.014	0.69	0.00050	2.56	0.000012	2.38	0.222	36	0.000004	0.00019	0.0033	0.0009	0.0004	0.1321	0.0002
standard deviation	0.00000	0.00042	0.01003	0.017	0.38	0.00015	1.03	0.000016	1.75	0.065	11	0.000003	0.00018	0.0054	0.0003	0.0004	0.0711	0.0002
minimum	< 0.00001	0.00033	0.00086	0.002	0.36	0.00006	1.30	< 0.000005	0.60	0.084	13	< 0.000002	0.00001	< 0.0005	0.0001	< 0.0002	0.0013	< 0.0001
maximum	< 0.00002	0.00240	0.05130	0.062	2.20	0.00066	6.26	0.000070	9.09	0.407	63	0.000014	0.00093	0.0220	0.0019	0.0021	0.3770	0.0007
# < detection limit	22	0	0	0	0	0	0	12	0	0	2	8	13	9	0	13	0	15
% < detection limit	100%	0%	0%	0%	0%	0%	0%	55%	0%	0%	9%	36%	59%	41%	0%	59%	0%	68%
95th Percentile	0	0	0	0	1	0	3	0	4	0	50	0	0	0	0	0	0	0

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.9: Water quality concentrations for KV-2, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011		8.05	8.02	138		**775**	0.5				16.0	377	382	**230**	**290**		170		
5/27/2011		8.00	8.09	210		259	**8.4**				2.0	131	131	**98**	**120**		39		
7/12/2011		**8.61**	8.20		300	279	**16.2**				<1	144	142	**110**	**130**		32		
10/29/2011		8.27	7.87		442	419	0.1	10.7	74	284	2.0	220	221	**120**	**150**		90		<0.050
11/23/2011		7.95	8.15			473	-0.1	**9.9**	**68**		1.9	245	246				109		<0.005
12/15/2011		7.59	7.82		468	453	-0.1	**9.5**	**65**		1.7	237	235	**133**	**163**		101	**0.045**	<0.005
1/14/2012		7.57	8.11		464	496	0.0	**9.1**	**63**	315	12.1	241	254				112		<0.005
2/10/2012		7.52	8.24		505	501	-0.1	**10.2**	**70**	57	14.4	259	270	**154**	**188**		117		<0.005
3/19/2012		7.52	8.24		506	506	-0.1	**9.9**	**67**	-3	4.7	252	253				98		<0.050
4/5/2012		7.43	8.12		595	509	0.0			105	1.1	249	262				112		<0.005
5/3/2012		8.00	7.87		247	245	0.6	13.4	93	231	**42.1**	130	122	72	87	0.6	50		<0.050
6/4/2012		7.82	8.09		336	308	**11.9**	10.6	99	315	**22.7**	153	143				65		<0.050
7/6/2012		8.06	8.06		376	343	**15.2**	**9.4**	94	120	7.3	177	152	92	113	1.0	85		<0.050
8/5/2012	6,486	8.21	8.20		386	357	**13.2**	10.5	100	265	2.5	189	186				85		<0.050
9/23/2012	3,554	8.02	8.20			405	**7.3**	11.1	92		2.1	207	201				102		<0.050
10/13/2012	3,061	7.37	8.07		469	427	-0.1	13.7	94	-41	3.2	224	223	**125**	**153**	0.8	104		<0.050
11/17/2012			8.04		516	480	0.0				1.3	247	257				115		**0.059**
12/8/2012		**7.09**	7.98		597	520	0.0	10.7	73		1.5	270	259				124		<0.005
guideline		6.5 - 9.0						9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	3	17	18	2	14	18	18	13	13	10	18	18	18	9	9	3	18	1	15
median	3554	7.95	8.09	174	466	440	0.1	10.50	74	175.9	2	231	229	120.0	150.0	0.8	102	0.045	0.050
mean	4367	7.83	8.08	174	443	431	4.1	10.66	81	164.9	8	220	219	126.0	154.9	0.8	95	0.045	0.033
standard deviation	1852	0.39	0.13	51	104	126	6.1	1.40	14	134.1	11	60	65	45.8	58.7	0.2	33	0	0.023
minimum	3061	7.09	7.82	138	247	245	-0.1	9.10	63	-41.2	< 1	130	122	71.6	87.3	0.6	32	0.045	< 0.005
maximum	6486	8.61	8.24	210	597	775	16.2	13.70	100	315.1	42	377	382	230.0	290.0	1.0	170	0.045	0.059
# < detection limit	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	14
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	93%
# > background		2	0	0	0	1	6	6	5	0	2	0	0	7	7	0	0	1	1
% > background		12%	0%	0%	0%	6%	33%	46%	38%	0%	11%	0%	0%	78%	78%	0%	0%	100%	7%
# > guideline		0	0					2			1					0		1	0
% > guideline		0%	0%					15%			6%					0%		100%	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.9: Water quality concentrations for KV-2, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011			0.007	4.30	0.11	0.00018	**0.0050**	**0.122**	0.000010	<0.000005	<0.05	**0.00112**	100	0.00060	**0.00238**	0.0026	**0.47**	0.0016	**0.0089**	**31**	**0.308**
5/27/2011			0.015	9.00	0.02	0.00028	**0.0080**	0.054	<0.000010	<0.000005	<0.05	0.00005	34	0.00030	0.00011	0.0005	0.17	0.0007	0.0022	11	0.053
7/12/2011			0.010	**9.40**	0.01	0.00033	**0.0075**	0.056	<0.000010	<0.000005	<0.05	0.00001	34	0.00020	0.00007	0.0003	0.07	0.0004	0.0029	14	0.026
10/29/2011	<0.20	0.30	0.004	3.80	**0.26**	0.00014	0.0014	0.061	<0.000010	<0.000005	<0.05	**0.00061**	57	0.00020	**0.00249**	**0.0033**	0.24	0.0029	**0.0061**	**19**	0.173
11/23/2011	0.08	0.38	0.003	4.15	0.13	0.00014	0.0017	0.072	<0.000010	<0.000005	<0.05	**0.00054**	64	0.00020	**0.00175**	0.0023	0.22	0.0021	**0.0065**	**21**	0.175
12/15/2011	0.09	0.17	0.004	3.32	0.15	0.00010	0.0015	0.073	<0.000010	<0.000005	<0.05	**0.00056**	63	<0.00010	**0.00160**	0.0023	0.20	0.0004	**0.0058**	**20**	0.159
1/14/2012	0.10	**0.44**	0.011	2.91	0.13	0.00013	0.0022	0.074	0.000010	<0.000005	<0.05	**0.00070**	66	<0.00010	**0.00143**	0.0019	0.27	0.0019	**0.0056**	**19**	0.166
2/10/2012	0.14	0.22	0.019	3.00	**0.31**	0.00016	**0.0039**	**0.085**	**0.000020**	<0.000005	<0.05	**0.00094**	70	0.00020	**0.00259**	**0.0030**	**0.54**	**0.0084**	**0.0060**	**21**	**0.287**
3/19/2012	<0.20	**0.56**	0.005	3.05	0.11	0.00014	0.0018	0.072	0.000010	<0.000005	<0.05	**0.00052**	67	0.00030	**0.00092**	0.0017	0.25	0.0014	**0.0060**	**21**	0.133
4/5/2012	0.14	**0.88**	0.006	4.31	0.06	0.00020	0.0016	0.076	<0.000010	<0.000005	<0.05	**0.00058**	67	0.00010	**0.00086**	0.0023	0.17	0.0014	**0.0060**	**20**	0.127
5/3/2012	**0.32**	0.27	**0.060**	**12.20**	**0.85**	0.00017	**0.0047**	0.050	**0.000038**	0.000006	<0.05	**0.00099**	35	0.00037	**0.00339**	**0.0057**	**1.21**	**0.0103**	0.0030	10	**0.306**
6/4/2012	<0.20	0.41	**0.032**	4.61	**0.72**	0.00016	0.0020	0.050	**0.000042**	0.000006	<0.05	**0.00089**	41	0.00036	**0.00340**	**0.0053**	**0.71**	**0.0093**	0.0048	13	0.212
7/6/2012	<0.20	0.24	0.010	4.73	**0.81**	0.00012	0.0011	0.051	**0.000049**	<0.0000050	<0.05	**0.00089**	47	0.00019	**0.00415**	**0.0060**	0.33	0.0006	**0.0064**	15	0.171
8/5/2012	<0.20	0.39	0.005	4.11	**0.41**	0.00009	0.0011	0.051	**0.000021**	<0.0000050	<0.05	**0.00064**	49	0.00010	**0.00265**	**0.0036**	0.21	0.0003	**0.0059**	16	0.138
9/23/2012	<0.20	0.22	0.005	3.58	**0.37**	0.00010	0.0014	0.057	**0.000020**	<0.0000050	<0.05	**0.00083**	54	<0.00010	**0.00368**	**0.0031**	0.21	0.0004	**0.0068**	17	0.201
10/13/2012	<0.20	0.26	0.006	4.24	0.14	0.00010	0.0014	0.062	<0.000010	<0.0000050	<0.05	**0.00044**	61	<0.00010	**0.00152**	0.0018	0.23	0.0007	**0.0054**	17	0.125
11/17/2012	<0.20	0.43	0.006	3.36	**0.17**	0.00013	0.0017	0.076	<0.000010	<0.0000050	<0.05	**0.00083**	67	<0.00010	**0.00230**	0.0025	0.25	0.0014	**0.0061**	**20**	0.204
12/8/2012	0.11	0.24	0.004	2.70	0.05	0.00014	0.0021	**0.091**	<0.000010	<0.0000050	<0.05	**0.00057**	71	<0.00010	**0.00112**	0.0012	0.25	0.0008	**0.0056**	**22**	0.202
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	0.20	0.30	0.006	4.13	0.146	0.00014	0.0018	0.067	0.000010	0.000005	< 0.05	0.000623	61.9	0.00020	0.002025	0.00238	0.243	0.00140	0.0060	18.7	0.1720
mean	0.17	0.36	0.012	4.82	0.268	0.00016	0.0028	0.068	0.000017	0.000005	< 0.05	0.000650	58.1	0.00021	0.002022	0.00275	0.333	0.00249	0.0056	18.1	0.1759
standard deviation	0.06	0.18	0.014	2.62	0.265	0.00006	0.0021	0.018	0.000013	0.000000	0.00	0.000293	16.5	0.00014	0.001186	0.00161	0.265	0.00323	0.0016	4.7	0.0754
minimum	0.08	0.17	0.003	2.70	0.015	0.00009	0.0011	0.050	< 0.000010	< 0.000005	< 0.05	0.000014	33.8	< 0.00010	0.000066	0.00032	0.068	0.00029	0.0022	10.1	0.0255
maximum	0.32	0.88	0.060	12.20	0.845	0.00033	0.0080	0.122	0.000049	0.000006	< 0.05	0.001120	100.0	0.00060	0.004150	0.00602	1.210	0.01030	0.0089	30.6	0.3080
# < detection limit	8	0	0	0	0	0	0	0	9	16	18	0	0	6	0	0	0	0	0	0	0
% < detection limit	53%	0%	0%	0%	0%	0%	0%	0%	50%	89%	100%	0%	0%	33%	0%	0%	0%	0%	0%	0%	0%
# > background	1	3	2	2	8	0	5	3	6	0	0	16	0	0	16	7	4	3	14	10	3
% > background	7%	20%	11%	11%	44%	0%	28%	17%	33%	0%	0%	89%	0%	0%	89%	39%	22%	17%	78%	56%	17%
# > guideline	0				14		2				0	16		0		9	1	3			0
% > guideline	0%				78%		11%				0%	89%		0%		50%	6%	17%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.9: Water quality concentrations for KV-2, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/9/2011	<0.00001	**0.0013**	**0.0326**	0.007	**1.19**	0.00090	**4.33**	<0.000005	**4.03**	0.35	57	<0.000002	0.00002	<0.0005	0.0012	<0.0002	**0.175**	<0.0001
5/27/2011	<0.00001	**0.0015**	**0.0018**	0.014	**0.95**	0.00007	0.96	0.000006	**2.72**	0.17	13	<0.000002	<0.00001	<0.0005	0.0002	<0.0002	0.004	<0.0001
7/12/2011	<0.00001	**0.0013**	0.0010	0.015	**0.72**	0.00006	0.59	<0.000005	**3.83**	0.20	13	<0.000002	<0.00001	<0.0005	0.0001	<0.0002	0.001	<0.0001
10/29/2011	<0.00001	**0.0006**	**0.0201**	0.006	0.57	0.00056	2.30	0.000017	1.90	0.22	37	<0.000002	**0.00045**	<0.0005	0.0009	<0.0002	**0.100**	<0.0001
11/23/2011	<0.00001	**0.0007**	**0.0197**	0.006	**0.70**	0.00058	2.90	0.000009	**2.29**	0.23	38	0.000003	0.00004	<0.0005	0.0010	<0.0002	**0.098**	<0.0001
12/15/2011	<0.00001	**0.0006**	**0.0200**	0.003	0.61	0.00061	2.70	<0.000005	**2.22**	0.23	34	<0.000002	0.00004	<0.0005	0.0009	<0.0002	**0.100**	<0.0001
1/14/2012	<0.00001	**0.0007**	**0.0168**	0.010	**0.69**	0.00068	3.30	<0.000005	**2.32**	0.22	43	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.094**	<0.0001
2/10/2012	<0.00001	**0.0006**	**0.0233**	0.017	**0.77**	0.00060	3.10	0.000007	**2.63**	0.24	39	<0.000002	<0.0002	0.0014	0.0010	<0.0002	**0.151**	<0.0001
3/19/2012	<0.00001	**0.0008**	**0.0169**	0.006	**0.86**	0.00060	2.90	0.000008	**2.70**	0.24	35	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.096**	<0.0001
4/5/2012	<0.00001	**0.0008**	**0.0179**	0.005	**1.19**	0.00058	3.00	<0.000005	**2.83**	0.23	40	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.093**	<0.0001
5/3/2012	<0.00001	**0.0004**	**0.0156**	**0.053**	**0.77**	0.00035	2.24	**0.000057**	1.09	0.12	17	0.000006	<0.00020	**0.0086**	0.0007	**0.0008**	**0.149**	**0.0003**
6/4/2012	<0.00001	**0.0004**	**0.0212**	**0.024**	0.49	0.00047	2.08	0.000040	1.15	0.16	23	0.000007	<0.00020	0.0044	0.0007	0.0005	**0.127**	0.0001
7/6/2012	<0.00001	**0.0004**	**0.0287**	0.007	0.37	0.00060	2.26	0.000006	1.32	0.18	28	0.000004	<0.00020	0.0026	0.0008	0.0003	**0.152**	<0.0001
8/5/2012	<0.00001	**0.0005**	**0.0203**	0.002	0.38	0.00057	1.89	<0.000005	1.38	0.19	30	<0.0000020	<0.00020	<0.0005	0.0007	<0.0002	**0.096**	<0.0001
9/23/2012	<0.00001	**0.0005**	**0.0242**	0.003	0.52	0.00051	2.04	<0.000005	1.65	0.21	37	<0.0000020	<0.00020	<0.0005	0.0009	<0.0002	**0.119**	<0.0001
10/13/2012	<0.00001	**0.0005**	**0.0135**	0.004	0.61	0.00060	2.30	<0.000005	1.70	0.23	35	<0.0000020	<0.00020	<0.0005	0.0010	<0.0002	**0.070**	<0.0001
11/17/2012	<0.00001	**0.0006**	**0.0229**	0.006	**0.71**	0.00065	2.78	<0.000005	**2.27**	0.24	39	0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.130**	<0.0001
12/8/2012	<0.00001	**0.0008**	**0.0173**	0.003	**0.79**	0.00066	3.26	<0.000005	**2.99**	0.25	41	0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.103**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	< 0.00001	0.00062	0.01985	0.006	0.71	0.00059	2.50	0.000005	2.28	0.224	36	0.000002	0.00020	0.0005	0.0009	0.0002	0.0997	0.0001
mean	< 0.00001	0.00071	0.01854	0.011	0.72	0.00054	2.50	0.000011	2.28	0.216	33	0.000003	0.00017	0.0013	0.0008	0.0003	0.1032	0.0001
standard deviation	0	0.00033	0.00775	0.012	0.23	0.00020	0.86	0.000014	0.84	0.048	11	0.000002	0.00011	0.0021	0.0003	0.0001	0.0454	0.0001
minimum	< 0.00001	0.00036	0.00103	0.002	0.37	0.00006	0.59	< 0.000005	1.09	0.115	13	< 0.000002	< 0.00001	< 0.0005	0.0001	< 0.0002	0.0014	< 0.0001
maximum	< 0.00001	0.00153	0.03260	0.053	1.19	0.00090	4.33	0.000057	4.03	0.347	57	0.000007	0.00045	0.0086	0.0012	0.0008	0.1750	0.0003
# < detection limit	18	0	0	0	0	0	0	10	0	0	0	12	14	14	0	15	0	16
% < detection limit	100%	0%	0%	0%	0%	0%	0%	56%	0%	0%	0%	67%	78%	78%	0%	83%	0%	89%
# > background	0	18	17	2	11	0	1	1	11	0	0	0	1	1	0	1	16	1
% > background	0%	100%	94%	11%	61%	0%	6%	6%	61%	0%	0%	0%	6%	6%	0%	6%	89%	6%
# > guideline	0	0	0			0		0				0			0		16	
% > guideline	0%	0%	0%			0%		0%				0%			0%		89%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.10: Water quality concentrations for KV-3, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	L/s	pH units	pH units	µS/cm	µS/cm	µS/cm	C	mg/L	%	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
5/12/2011		7.72	7.80	145		283	1				17	148	151				60		
7/14/2011		8.09	7.98		331	335	**16**				5	171	175				78		
10/23/2011	4,291	8.14	8.04		423	410	1	11.27	81	268	4	199	210				85		<0.005
11/25/2011		8.23	8.17			476	0	**9.09**	**62**		<1	250	260				104		<0.005
12/16/2011		7.47	7.96		466	463	0	**9.39**	**64**		3	237	256				99		<0.005
1/14/2012		7.30	7.91		461	482	0	**9.00**	**62**	299	<1	253	250				102		<0.005
2/15/2012		7.50	8.16		506	506	0	**9.77**	**67**	41	<1	256	294				110		<0.005
3/15/2012		7.51	8.24		509	499	0	**9.75**	**67**	41	<1	246	255				109		<0.050
4/8/2012		7.88	8.15		544	504	0	**10.01**	**69**	102	<1	250	261				119		<0.005
5/4/2012		7.80	8.15		511	258	0				**40**	133	126				52		<0.050
6/7/2012	9,281	7.92	8.08		336	299	**11**	10.40	90	299	**24**	156	159				74		<0.050
7/7/2012		8.10	8.16		377	344	**15**	**8.18**	81	113	8	180	163				81		<0.050
8/3/2012	7,539	8.18	8.16		354	351	**14**	**9.70**	96	281	2	190	186				80		<0.050
9/22/2012	3,584	7.90	8.12			405	**5**	11.70	93	93	4	209	205				100		<0.050
10/12/2012	2,576	7.28	8.28		485	431	0	12.28	84	137	4	209	215				103		<0.050
11/24/2012		7.53	8.22		540	482	0	11.60	78	56	2	261	259				119		<0.050
12/8/2012		**6.97**	8.21		595	527	0	10.36	**71**		2	271	262				119		<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	5	17	17	1	14	17	17	14	14	11	17	17	17	0	0	0	17	0	15
median	4291	7.80	8.15	145	476	431	0.0	9.89	75	113.2	3	209	215	-	-	-	100	-	< 0.050
mean	5454	7.74	8.11	145	460	415	3.8	10.18	76	157.2	7	213	217	-	-	-	94	-	< 0.029
standard deviation	2834	0.37	0.13	-	84	87	6.1	1.17	12	107.2	11	44	50	-	-	-	20	-	0.023
minimum	2576	6.97	7.80	145	331	258	-0.1	8.18	62	40.5	< 1	133	126	-	-	-	52	-	< 0.005
maximum	9281	8.23	8.28	145	595	527	16.0	12.28	96	299.3	40	271	294	-	-	-	119	-	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	5	0	0	-	-	-	0	-	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	29%	0%	0%	-	-	-	0%	-	100%
# > background		1	0	0	0	0	5	8	7	0	2	0	0	-	-	-	0	-	0
% > background		6%	0%	0%	0%	0%	29%	57%	50%	0%	12%	0%	0%	-	-	-	0%	-	0%
# > guideline		0	0					4			1					-		-	0
% > guideline		0%	0%					29%			6%					-		-	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.10: Water quality concentrations for KV-3, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/12/2011					**0.52**	0.00017	0.0028	0.046	**0.000020**	0.000005	<0.05	**0.00066**	40	0.00050	**0.00190**	**0.0038**	**0.68**	**0.0081**	0.0033	12	0.215
7/14/2011					**0.65**	0.00014	0.0015	0.050	**0.000030**	<0.000005	<0.05	**0.00070**	44	0.00030	**0.00274**	**0.0048**	0.24	0.0018	**0.0059**	15	0.151
10/23/2011	0.05	0.15	0.007	4.20	**0.24**	0.00013	0.0017	0.064	<0.000010	<0.000005	<0.05	**0.00054**	54	0.00010	**0.00221**	0.0025	0.29	0.0023	0.0044	16	0.182
11/25/2011	0.077	0.29	<0.0020	4.29	0.09	0.00011	0.0014	0.074	<0.000010	<0.000005	<0.05	**0.00051**	66	0.00020	**0.00144**	0.0019	0.19	0.0007	**0.0063**	**21**	0.170
12/16/2011	0.08	0.16	0.004	3.34	0.15	0.00011	0.0017	0.075	<0.000010	<0.000005	<0.05	**0.00055**	63	<0.00010	**0.00137**	0.0022	0.26	0.0009	**0.0056**	**20**	0.158
1/14/2012	0.10	0.30	0.004	3.19	0.08	0.00010	0.0018	0.081	0.000010	<0.000005	<0.05	**0.00064**	69	<0.00010	**0.00107**	0.0015	0.22	0.0007	**0.0059**	**20**	0.164
2/15/2012	0.12	0.27	**0.028**	3.86	0.06	0.00011	0.0016	0.079	<0.000010	<0.000005	<0.05	**0.00047**	68	0.00020	**0.00094**	0.0019	0.20	0.0011	**0.0055**	**21**	0.152
3/15/2012	<0.20	0.37	0.004	3.60	0.05	0.00011	0.0016	0.072	<0.000010	<0.000005	<0.05	**0.00045**	65	<0.00010	**0.00067**	0.0010	0.19	0.0005	**0.0058**	**20**	0.124
4/8/2012	0.13	0.14	0.002	2.21	0.04	0.00009	0.0017	0.082	<0.000010	<0.000005	<0.05	**0.00053**	66	<0.00010	**0.00064**	0.0013	0.18	0.0005	**0.0057**	**20**	0.117
5/4/2012	<0.20	**0.56**	**0.055**	**11.90**	**0.71**	0.00021	**0.0043**	0.057	**0.000027**	**0.000007**	<0.05	**0.00082**	36	0.00046	**0.00264**	**0.0049**	**1.22**	**0.0107**	0.0029	10	**0.264**
6/7/2012	<0.20	0.40	**0.035**	5.70	**1.05**	0.00019	0.0025	0.053	**0.000060**	0.0000051	<0.05	**0.00102**	41	0.00036	**0.00448**	**0.0076**	**0.80**	**0.0065**	**0.0062**	13	**0.253**
7/7/2012	<0.20	0.26	0.008	4.41	**0.63**	0.00029	0.0013	0.054	**0.000034**	<0.000005	<0.05	**0.00076**	49	0.00017	**0.00293**	**0.0049**	0.28	0.0019	**0.0062**	14	0.150
8/3/2012	<0.20	0.36	0.004	4.29	**0.36**	0.00011	0.0014	0.053	**0.000021**	<0.000005	<0.05	**0.00056**	51	<0.00010	**0.00189**	**0.0034**	0.22	0.0005	**0.0058**	15	0.123
9/22/2012	<0.20	0.20	0.008	3.85	**0.33**	0.00012	0.0019	0.061	**0.000017**	<0.000005	<0.05	**0.00083**	55	<0.00010	**0.00347**	**0.0030**	0.27	0.0019	**0.0065**	17	0.208
10/12/2012	<0.20	0.26	0.006	2.45	**0.25**	0.00013	0.0018	0.068	**0.000016**	<0.000005	<0.05	**0.00066**	55	0.00016	**0.00317**	**0.0030**	0.28	0.0017	**0.0059**	17	0.208
11/24/2012	<0.20	0.31	0.006	3.07	0.11	0.00017	0.0016	0.082	<0.000010	<0.000005	<0.05	**0.00068**	69	0.00022	**0.00195**	0.0024	0.28	**0.0065**	**0.0062**	**21**	0.205
12/8/2012	0.11	0.22	0.005	3.08	0.05	0.00015	0.0021	**0.094**	<0.000010	<0.000005	<0.05	**0.00059**	71	<0.00010	**0.00106**	0.0015	0.28	0.0023	**0.0055**	**23**	0.224
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	15	15	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
median	0.20	0.27	0.0059	3.85	0.239	0.00013	0.0017	0.068	0.000010	0.000005	< 0.05	0.000639	55.1	0.00016	0.001900	0.00248	0.268	0.00176	0.0058	17.4	0.170
mean	0.15	0.28	0.0118	4.23	0.315	0.00014	0.0019	0.067	0.000019	0.000005	< 0.05	0.000646	56.6	0.00020	0.002034	0.00302	0.356	0.00286	0.0055	17.4	0.180
standard deviation	0.06	0.11	0.0153	2.29	0.298	0.00005	0.0007	0.014	0.000013	0.000000	0.00	0.000148	11.6	0.00013	0.001083	0.00173	0.280	0.00310	0.0010	3.7	0.044
minimum	0.05	0.14	< 0.0020	2.21	0.044	0.00009	0.0013	0.046	< 0.000010	< 0.000005	< 0.05	0.000451	36.1	0.00010	0.000638	0.00099	0.179	0.00048	0.0029	10.3	0.117
maximum	0.20	0.56	0.0553	11.90	1.050	0.00029	0.0043	0.094	0.000060	0.000007	< 0.05	0.001020	71.4	0.00050	0.004480	0.00761	1.220	0.01070	0.0065	22.6	0.264
# < detection limit	8	0	1	0	0	0	0	0	8	14	17	0	0	7	0	0	0	0	0	0	0
% < detection limit	53%	0%	7%	0%	0%	0%	0%	0%	47%	82%	100%	0%	0%	41%	0%	0%	0%	0%	0%	0%	0%
# > background	0	1	3	1	9	0	1	1	8	1	0	17	0	0	17	8	3	4	14	8	2
% > background	0%	7%	20%	7%	53%	0%	6%	6%	47%	6%	0%	100%	0%	0%	100%	47%	18%	24%	82%	47%	12%
# > guideline	0				11		0				0	17		0		9	1	4			0
% > guideline	0%				65%		0%				0%	100%		0%		53%	6%	24%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.10: Water quality concentrations for KV-3, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/12/2011	<0.00001	**0.0004**	**0.0135**	**0.026**	**0.73**	0.00031	2.24	0.000029	1.14	0.14	20	0.000005	0.00002	0.0022	0.0007	0.0004	**0.095**	<0.0001
7/14/2011	<0.00001	**0.0004**	**0.0222**	0.006	0.38	0.00042	1.85	<0.000005	1.26	0.18	28	0.000003	<0.00001	0.0039	0.0007	0.0002	**0.098**	<0.0001
10/23/2011	<0.00001	**0.0005**	**0.0167**	0.007	0.52	0.00051	2.20	0.000021	1.57	0.22	31	<0.000002	<0.00001	0.0009	0.0009	<0.0002	**0.084**	<0.0001
11/25/2011	<0.00001	**0.0007**	**0.0190**	0.006	**0.67**	0.00053	2.90	0.000008	**2.32**	0.23	36	<0.000002	0.00013	<0.0005	0.0009	<0.0002	**0.090**	<0.0001
12/16/2011	<0.00001	**0.0007**	**0.0188**	<0.002	0.61	0.00054	2.70	0.000005	**2.27**	0.23	34	0.000002	0.00003	<0.0005	0.0009	<0.0002	**0.094**	<0.0001
1/14/2012	<0.00001	**0.0008**	**0.0165**	0.005	**0.73**	0.00061	3.30	<0.000005	**2.51**	0.24	44	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.084**	<0.0001
2/15/2012	<0.00001	**0.0008**	**0.0175**	0.004	**0.80**	0.00053	3.10	<0.000005	**2.72**	0.23	39	<0.000002	<0.0002	0.0005	0.0009	<0.0002	**0.089**	<0.0001
3/15/2012	<0.00001	**0.0008**	**0.0152**	0.003	**0.69**	0.00056	2.80	<0.000005	**2.59**	0.23	35	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.076**	<0.0001
4/8/2012	<0.00001	**0.0008**	**0.0166**	0.003	**0.75**	0.00053	3.00	<0.000005	**2.68**	0.23	39	<0.000002	<0.0002	<0.0005	0.0009	<0.0002	**0.077**	<0.0001
5/4/2012	<0.00001	**0.0004**	**0.0133**	**0.043**	**0.78**	0.00030	2.35	**0.000076**	1.10	0.12	16	0.000005	<0.00020	**0.0085**	0.0008	**0.0007**	**0.120**	0.0002
6/7/2012	<0.00001	**0.0004**	**0.0281**	**0.024**	0.47	0.00056	2.28	**0.000056**	1.14	0.16	26	0.0000053	<0.00020	0.0040	0.0007	**0.0007**	**0.161**	0.0001
7/7/2012	<0.00001	**0.0004**	**0.0235**	0.002	0.37	0.00062	2.22	0.000013	1.27	0.18	26	0.000004	<0.00020	0.0009	0.0007	0.0002	**0.113**	<0.0001
8/3/2012	<0.00001	**0.0005**	**0.0174**	<0.002	0.38	0.00054	1.89	<0.000005	1.36	0.19	29	<0.000002	<0.00020	<0.0005	0.0008	<0.0002	**0.077**	<0.0001
9/22/2012	<0.00001	**0.0005**	**0.0238**	0.004	0.52	0.00048	2.05	<0.000005	1.65	0.21	37	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.117**	<0.0001
10/12/2012	<0.00001	**0.0006**	**0.0227**	0.006	0.59	0.00044	2.13	<0.000005	1.70	0.22	38	0.0000020	**0.00045**	0.0007	0.0009	<0.0002	**0.104**	<0.0001
11/24/2012	<0.00001	**0.0007**	**0.0240**	0.004	**0.70**	0.00055	2.91	0.000007	**2.50**	0.25	40	0.0000030	<0.00020	<0.0005	0.0010	<0.0002	**0.123**	<0.0001
12/8/2012	<0.00001	**0.0008**	**0.0168**	0.003	**0.79**	0.00054	3.25	0.000006	**3.00**	0.25	41	0.000003	<0.00020	<0.0005	0.0009	<0.0002	**0.100**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
median	< 0.00001	0.00056	0.01750	0.004	0.67	0.00053	2.35	0.000005	1.70	0.223	35	0.000002	0.00020	0.0005	0.0009	0.0002	0.0947	0.0001
mean	< 0.00001	0.00059	0.01915	0.009	0.62	0.00050	2.54	0.000015	1.93	0.206	33	0.000003	0.00017	0.0015	0.0008	0.0003	0.1001	0.0001
standard deviation	0.00000	0.00016	0.00417	0.011	0.15	0.00009	0.48	0.000020	0.67	0.038	8	0.000001	0.00011	0.0021	0.0001	0.0002	0.0217	0.0000
minimum	< 0.00001	0.00039	0.01330	0.002	0.37	0.00030	1.85	< 0.000005	1.10	0.121	16	< 0.000002	< 0.00001	< 0.0005	0.0007	< 0.0002	0.0761	< 0.0001
maximum	< 0.00001	0.00084	0.02810	0.043	0.80	0.00062	3.30	0.000076	3.00	0.249	44	0.000005	0.00045	0.0085	0.0010	0.0007	0.1610	0.0002
# < detection limit	17	0	0	2	0	0	0	8	0	0	0	8	13	9	0	12	0	15
% < detection limit	100%	0%	0%	12%	0%	0%	0%	47%	0%	0%	0%	47%	76%	53%	0%	71%	0%	88%
# > background	0	17	17	3	9	0	0	2	8	0	0	0	1	1	0	2	17	0
% > background	0%	100%	100%	18%	53%	0%	0%	12%	47%	0%	0%	0%	6%	6%	0%	12%	100%	0%
# > guideline	0	0	0			0		0				0			0		17	
% > guideline	0%	0%	0%			0%		0%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.11: Water quality concentrations for KV-4, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011		8.32	7.92	**310**		533	0				<1	263	278				120		
5/12/2011		7.89	7.84	135		243	1				5	120	115				60		
7/14/2011		8.03	8.15		352	362	**16**				4	184	187				83		
10/23/2011	5,507	8.04	8.06		603	583	0	10.70	83	283	1	316	301				127		<0.005
11/25/2011		7.96	8.18			505	0	**9.08**	**63**		<1	263	277				111		<0.005
12/16/2011		7.45	7.89		475	470	0	**9.45**	**65**		1	239	240				100		<0.005
1/14/2012		7.29	8.13		431	490	0	**9.20**	**63**	312	2	242	235				112		<0.005
2/15/2012		7.54	8.21		517	517	0	**9.78**	**67**	30	3	264	304				113		<0.005
3/15/2012		7.59	8.25		511	505	0	**9.79**	**67**	54	<1	248	254				112		<0.050
4/8/2012		7.85	8.15		547	507	0			101	1	251	257				119		<0.005
5/4/2012		7.63	8.06		597	248	0				**24**	131	123				51		<0.005
6/7/2012		7.97	8.08		350	313	**11**	11.00	100	301	18	162	163				75		<0.050
7/7/2012		8.05	8.23		402	366	**15**	**9.62**	95	113	5	194	197				88		<0.050
8/3/2012	7,852	8.14	8.08		379	372	**14**	**10.00**	97	289	3	204	193				84		<0.050
9/22/2012	4,504	7.85	8.17			447	**5**	11.28	89	94	2	235	233				109		<0.050
10/12/2012	2,908	7.30	8.22		511	458	0	12.53	86	133	2	231	232				104		<0.050
11/24/2012		7.68	8.15		517	491	0	11.40	79	64	1	258	260				114		<0.050
12/8/2012		**7.02**	8.13		601	531	0	**9.91**	**68**		2	272	265				125		<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	4	18	18	2	14	18	18	13	13	11	18	18	18	0	0	0	18	0	15
median	5006	7.85	8.14	223	511	480	0.1	9.91	79	113.0	2	241	238	-	-	-	110	-	< 0.005
mean	5193	7.76	8.11	223	485	441	3.5	10.29	79	161.3	4	227	229	-	-	-	100	-	< 0.026
standard deviation	2071	0.34	0.12	124	90	100	5.9	1.02	14	110.9	6	51	55	-	-	-	22	-	0.023
minimum	2908	7.02	7.84	135	350	243	-0.1	9.08	63	30.1	1	120	115	-	-	-	51	-	< 0.005
maximum	7852	8.32	8.25	310	603	583	15.7	12.53	100	312.1	24	316	304	-	-	-	127	-	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	3	0	0	-	-	-	0	-	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	0%	-	-	-	0%	-	100%
# > background		1	0	1	0	0	5	8	6	0	1	0	0	-	-	-	0	-	0
% > background		6%	0%	50%	0%	0%	28%	62%	46%	0%	6%	0%	0%	-	-	-	0%	-	0%
# > guideline		0	0					3			0					-		-	0
% > guideline		0%	0%					23%			0%					-		-	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.11: Water quality concentrations for KV-4, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011					0.042	0.00015	0.0015	**0.094**	<0.000010	<0.000005	<0.05	**0.00061**	71	0.00030	**0.00115**	0.0012	0.19	0.0008	**0.0061**	**21**	0.192
5/12/2011					0.036	**0.00178**	**0.0038**	0.020	<0.000010	<0.000005	<0.05	**0.00122**	34	0.00050	0.00017	**0.0047**	0.34	**0.0716**	0.0017	9	0.199
7/14/2011					**0.491**	0.00042	0.0017	0.047	**0.000020**	<0.000005	<0.05	**0.00064**	49	0.00030	**0.00217**	**0.0042**	0.20	0.0028	0.0052	15	0.124
10/23/2011	0.08	0.09	<0.0050	4.60	0.022	0.00075	0.0019	0.063	<0.000010	<0.000005	<0.05	**0.00042**	91	<0.00010	0.00019	0.0011	0.14	**0.0068**	0.0045	**22**	0.084
11/25/2011	0.10	0.30	<0.0020	3.64	0.084	0.00025	0.0013	0.076	<0.000010	<0.000005	<0.05	**0.00044**	70	0.00020	**0.00110**	0.0017	0.16	0.0016	0.0053	**22**	0.142
12/16/2011	0.09	0.15	0.003	3.53	0.097	0.00012	0.0015	0.076	<0.000010	<0.000005	<0.05	**0.00053**	64	<0.00010	**0.00122**	0.0018	0.19	0.0006	**0.0054**	**20**	0.148
1/14/2012	0.10	0.21	0.004	3.01	0.075	0.00013	0.0018	0.076	<0.000010	<0.000005	<0.05	**0.00061**	66	<0.00010	**0.00093**	0.0016	0.21	0.0011	0.0053	**19**	0.153
2/15/2012	0.12	0.16	0.005	2.44	0.051	0.00014	0.0016	0.080	<0.000010	<0.000005	<0.05	**0.00047**	71	<0.00010	**0.00079**	0.0016	0.20	0.0016	0.0049	**21**	0.149
3/15/2012	<0.20	0.29	0.003	3.05	0.044	0.00012	0.0016	0.072	<0.000010	<0.000005	<0.05	**0.00045**	65	<0.00010	**0.00065**	0.0010	0.18	0.0006	**0.0057**	**21**	0.125
4/8/2012	0.12	0.17	0.003	2.52	0.044	0.00011	0.0016	**0.084**	<0.000010	<0.000005	<0.05	**0.00057**	66	<0.00010	**0.00066**	0.0014	0.18	0.0006	**0.0056**	**21**	0.120
5/4/2012	0.03	**0.61**	**0.041**	**14.80**	**0.393**	0.00078	**0.0047**	0.042	**0.000024**	0.000005	<0.05	**0.00125**	36	0.00030	**0.00149**	**0.0052**	**0.87**	**0.0457**	0.0022	10	**0.283**
6/7/2012	<0.20	0.27	0.023	4.97	**0.891**	0.00029	0.0021	0.050	**0.000046**	<0.000005	<0.05	**0.00088**	43	0.00024	**0.00383**	**0.0055**	**0.61**	0.0046	**0.0058**	13	0.205
7/7/2012	<0.20	0.24	0.008	4.34	**0.558**	0.00028	0.0016	0.053	**0.000034**	<0.000005	<0.05	**0.00075**	52	0.00015	**0.00261**	**0.0053**	0.27	0.0018	**0.0065**	16	0.146
8/3/2012	<0.20	0.35	0.005	4.85	**0.319**	0.00021	0.0015	0.054	**0.000016**	<0.000005	<0.05	**0.00056**	55	0.00011	**0.00173**	**0.0033**	0.20	0.0016	**0.0055**	16	0.115
9/22/2012	<0.20	<0.20	0.005	4.52	**0.231**	0.00030	0.0019	0.059	0.000012	<0.000005	<0.05	**0.00067**	63	<0.00010	**0.00250**	0.0023	0.21	0.0022	**0.0059**	**19**	0.160
10/12/2012	<0.20	0.26	0.006	3.23	**0.210**	0.00018	0.0016	0.064	0.000011	<0.000005	<0.05	**0.00060**	61	<0.00010	**0.00278**	0.0026	0.23	0.0014	**0.0057**	**19**	0.183
11/24/2012	<0.20	0.30	0.006	3.21	0.094	0.00014	0.0015	**0.084**	<0.000010	<0.000005	<0.05	**0.00062**	69	<0.00010	**0.00182**	0.0019	0.24	0.0013	**0.0058**	**21**	0.191
12/8/2012	0.10	0.17	0.004	2.57	0.045	0.00019	0.0020	**0.094**	<0.000010	<0.000005	<0.05	**0.00058**	72	<0.00010	**0.00102**	0.0014	0.26	0.0032	0.0052	**23**	0.213
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	15	15	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	0.12	0.24	0.005	3.53	0.089	0.00020	0.0016	0.068	0.000010	0.000005	< 0.05	0.000604	64.3	0.00010	0.001185	0.00188	0.205	0.00158	0.0055	19.5	0.1510
mean	0.14	0.25	0.008	4.35	0.207	0.00035	0.0019	0.066	0.000015	0.000005	< 0.05	0.000659	60.9	0.00017	0.001490	0.00266	0.270	0.00832	0.0051	18.1	0.1629
standard deviation	0.06	0.12	0.010	3.02	0.239	0.00041	0.0009	0.019	0.000010	0.000000	0.00	0.000238	14.1	0.00011	0.000977	0.00159	0.182	0.01891	0.0012	4.1	0.0464
minimum	0.03	0.09	0.002	2.44	0.022	0.00011	0.0013	0.020	< 0.000010	< 0.000005	< 0.05	0.000415	33.8	< 0.00010	0.000168	0.00098	0.142	0.00056	0.0017	8.7	0.0844
maximum	0.20	0.61	0.041	14.80	0.891	0.00178	0.0047	0.094	0.000046	0.000005	< 0.05	0.001250	90.9	0.00050	0.003830	0.00554	0.867	0.07160	0.0065	22.6	0.2830
# < detection limit	7	1	2	0	0	0	0	0	11	17	18	0	0	10	0	0	0	0	0	0	0
% < detection limit	47%	7%	13%	0%	0%	0%	0%	0%	61%	94%	100%	0%	0%	56%	0%	0%	0%	0%	0%	0%	0%
# > background	0	1	1	1	7	1	2	4	5	0	0	18	0	0	16	6	2	3	10	12	1
% > background	0%	7%	7%	7%	39%	6%	11%	22%	28%	0%	0%	100%	0%	0%	89%	33%	11%	17%	56%	67%	6%
# > guideline	0				7		0				0	18		0		7	0	5			0
% > guideline	0%				39%		0%				0%	100%		0%		39%	0%	28%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.11: Water quality concentrations for KV-4, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011	<0.00001	**0.0009**	**0.0182**	<0.002	**0.74**	0.00044	2.70	0.000007	**2.56**	0.26	38	<0.000002	<0.00001	<0.0005	0.0009	<0.0002	**0.089**	<0.0001
5/12/2011	<0.00001	0.0002	**0.0412**	0.019	**0.79**	0.00007	1.79	**0.000420**	0.71	0.08	18	0.000026	0.00005	0.0006	0.0002	<0.0002	**0.105**	<0.0001
7/14/2011	<0.00001	**0.0004**	**0.0177**	0.006	0.36	0.00036	1.98	0.000016	1.30	0.17	29	0.000005	<0.00001	0.0016	0.0006	<0.0002	**0.085**	<0.0001
10/23/2011	<0.00001	0.0003	**0.0017**	0.004	0.55	0.00025	3.00	**0.000061**	1.73	0.22	52	0.000009	<0.00001	<0.0005	0.0011	<0.0002	**0.033**	<0.0001
11/25/2011	<0.00001	**0.0006**	**0.0140**	0.005	0.64	0.00045	2.80	0.000008	**3.13**	0.22	40	0.000003	0.0001	<0.0005	0.0010	<0.0002	**0.073**	<0.0001
12/16/2011	<0.00001	**0.0006**	**0.0172**	<0.002	0.60	0.00054	2.70	<0.000005	**2.69**	0.23	34	<0.000002	0.00004	<0.0005	0.0008	<0.0002	**0.085**	<0.0001
1/14/2012	<0.00001	**0.0008**	**0.0150**	0.005	**0.69**	0.00060	3.20	<0.000005	**2.62**	0.21	44	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.078**	<0.0001
2/15/2012	<0.00001	**0.0007**	**0.0153**	0.002	**0.73**	0.00046	2.90	0.000014	**2.57**	0.22	40	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.079**	<0.0001
3/15/2012	<0.00001	**0.0008**	**0.0145**	0.003	**0.69**	0.00057	2.90	0.000005	**2.62**	0.23	35	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.076**	<0.0001
4/8/2012	<0.00001	**0.0008**	**0.0161**	<0.002	**0.75**	0.00051	2.90	<0.000005	**2.65**	0.24	39	<0.000002	<0.00020	0.0014	0.0009	<0.0002	**0.084**	<0.0001
5/4/2012	<0.00001	0.0002	**0.0081**	**0.034**	**0.76**	0.00030	2.12	**0.000238**	0.98	0.11	18	0.000018	<0.00020	0.0030	0.0005	0.0004	**0.117**	0.0001
6/7/2012	<0.00001	**0.0004**	**0.0245**	0.017	0.48	0.00045	2.20	0.000040	1.16	0.16	27	0.0000064	<0.00020	**0.0053**	0.0007	0.0004	**0.137**	0.0001
7/7/2012	<0.00001	**0.0004**	**0.0215**	0.008	0.37	0.00050	2.23	0.000017	1.39	0.19	32	0.0000041	0.00031	0.0020	0.0007	<0.0002	**0.110**	<0.0001
8/3/2012	<0.00001	**0.0005**	**0.0156**	0.003	0.36	0.00044	2.22	<0.000005	1.44	0.20	29	0.0000040	<0.00020	<0.0005	0.0008	<0.0002	**0.075**	<0.0001
9/22/2012	<0.00001	**0.0004**	**0.0169**	0.003	0.53	0.00035	2.29	0.000009	1.70	0.21	40	0.0000030	<0.00020	<0.0005	0.0009	<0.0002	**0.089**	<0.0001
10/12/2012	<0.00001	**0.0005**	**0.0199**	0.004	0.57	0.00046	2.32	0.000005	1.92	0.22	39	0.0000030	<0.00020	0.0005	0.0010	<0.0002	**0.094**	<0.0001
11/24/2012	<0.00001	**0.0007**	**0.0211**	0.004	0.66	0.00049	2.77	0.000005	**2.44**	0.24	38	0.000003	<0.00020	<0.0005	0.0009	0.00023	**0.111**	<0.0001
12/8/2012	<0.00001	**0.0009**	**0.0157**	0.003	**0.76**	0.00054	3.21	0.000005	**2.93**	0.24	40	0.000004	<0.00020	<0.0005	0.0009	<0.0002	**0.092**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	< 0.00001	0.00055	0.01650	0.004	0.65	0.00046	2.70	0.000008	2.18	0.219	38	0.000003	0.00020	0.0005	0.000891	0.0002	0.0869	0.0001
mean	< 0.00001	0.00056	0.01746	0.007	0.61	0.00043	2.57	0.000048	2.03	0.203	35	0.000006	0.00015	0.0011	0.000814	0.0002	0.0895	0.0001
standard deviation	0.00000	0.00022	0.00776	0.008	0.15	0.00013	0.43	0.000108	0.74	0.048	9	0.000006	0.00009	0.0012	0.000207	0.0001	0.0221	0.0000
minimum	< 0.00001	0.00017	0.00173	< 0.002	0.36	0.00007	1.79	< 0.000005	0.71	0.078	18	< 0.000002	< 0.00001	< 0.0005	0.000182	< 0.0002	0.0331	< 0.0001
maximum	< 0.00001	0.00093	0.04120	0.034	0.79	0.00060	3.21	0.000420	3.13	0.262	52	0.000026	0.00031	0.0053	0.001080	0.0004	0.1370	0.0001
# < detection limit	18	0	0	3	0	0	0	4	0	0	0	6	14	11	0	15	0	16
% < detection limit	100%	0%	0%	17%	0%	0%	0%	22%	0%	0%	0%	33%	78%	61%	0%	83%	0%	89%
# > background	0	15	18	1	8	0	0	3	9	0	0	0	0	1	0	0	18	0
% > background	0%	83%	100%	6%	44%	0%	0%	17%	50%	0%	0%	0%	0%	6%	0%	0%	100%	0%
# > guideline	0	0	0			0		2				0			0		18	
% > guideline	0%	0%	0%			0%		11%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.12: Water quality concentrations for KV-5, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011		8.31	7.89	**495**		510	0.5				<1	236	254				110		
5/25/2011		7.79	7.72	138		180	**6.3**				**24**	89	90				33		
7/14/2011		8.09	7.92		324	325	**15.1**				15	173	168				71		
10/23/2011		**8.60**	8.09		422	410	1.0	11.40	87	124	4	200	212				76		<0.005
11/25/2011		8.00	8.13			468	-0.1	**9.14**	**63**		2	247	260				101		<0.005
12/16/2011		7.40	7.78		472	463	-0.1	**10.00**	**69**		2	241	245	**145**	**177**		93	**0.060**	<0.005
1/14/2012		7.47	8.14		459	488	0.0	**8.80**	**60**	271	2	243	266				95		<0.005
2/15/2012		7.48	8.19		500	501	-0.1	**10.03**	**69**	6	1	251	291				108		<0.005
3/15/2012		7.69	8.27		508	501	-0.1	**10.23**	**70**	17	1	250	253				103		<0.050
4/8/2012		7.75	8.10		536	504	0.0	10.89	74	62	1	249	263				103		<0.005
5/6/2012		7.92	7.89		214	214	1.9	13.36	97	89	**42**	123	111			0.8	44		<0.050
6/7/2012		7.93	8.06		338	299	**11.4**	10.80	99	296	**25**	152	162				65		<0.050
7/7/2012		8.09	8.22		384	348	**14.0**	**9.60**	93	124	9	191	162				76		<0.050
8/3/2012	8,170	8.01	8.20		364	361	**13.5**	10.40	100	246	7	193	191				77		<0.050
9/22/2012	4,656	7.93	8.18			414	**5.8**	11.82	95	99	4	217	204				88		<0.050
10/12/2012	4,088	7.34	8.28		501	444	-0.1	12.91	88	133	18	227	220				98		<0.050
11/24/2012		7.86	8.20		551	483	0.0	15.00	107	85	1	264	252				110		<0.050
12/8/2012		**6.89**	8.21		586	518	0.0	**9.99**	**69**		1	267	264				115		<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	3	18	18	2	14	18	18	15	15	12	18	18	18	1	1	1	18	1	15
median	4656	7.89	8.14	317	465	454	0.3	10.40	87	111.8	3	232	233	145	177	0.81	94	0.06	< 0.050
mean	5638	7.81	8.08	317	440	413	3.8	10.96	83	129.4	9	212	215	145	177	1	87	0	< 0.029
standard deviation	2211	0.39	0.17	252	104	104	5.7	1.70	16	94.8	12	50	57	-	-	-	23	-	< 0.023
minimum	4088	6.89	7.72	138	214	180	-0.1	8.80	60	5.5	< 1	89	90	145	177	1	33	0	< 0.005
maximum	8170	8.60	8.28	495	586	518	15.1	15.00	107	296.2	42	267	291	145	177	0.81	115	0.06	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	100%
# > background		2	0	1	0	0	6	7	6	0	3	0	0	1	1	0	0	1	0
% > background		11%	0%	50%	0%	0%	33%	47%	40%	0%	17%	0%	0%	100%	100%	0%	0%	100%	0%
# > guideline		0	0					2			1					0		1	0
% > guideline		0%	0%					13%			6%					0%		100%	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.12: Water quality concentrations for KV-5, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011					0.03	0.00011	0.0023	**0.088**	<0.000010	<0.000005	<0.05	**0.00053**	61	0.00030	**0.00083**	0.0011	0.23	0.0008	0.0052	**20**	0.170
5/25/2011					**0.75**	0.00064	**0.0041**	0.054	**0.000030**	<0.000020	<0.05	**0.00029**	25	**0.00120**	**0.00100**	**0.0047**	**1.38**	**0.0075**	0.0025	6	0.088
7/14/2011					**0.54**	0.00030	**0.0036**	0.055	**0.000030**	<0.000005	<0.05	**0.00054**	47	0.00040	**0.00198**	**0.0044**	**0.44**	0.0019	0.0050	14	0.130
10/23/2011	0.05	0.09	0.008	4.50	**0.21**	0.00020	**0.0038**	0.067	0.000010	<0.000005	<0.05	**0.00042**	54	0.00010	**0.00164**	0.0021	0.32	0.0025	0.0047	16	0.164
11/25/2011	0.09	0.30	0.002	4.00	0.08	0.00016	**0.0036**	0.079	<0.000010	<0.000005	<0.05	**0.00041**	66	0.00020	**0.00100**	0.0017	0.28	0.0012	**0.0056**	**20**	0.151
12/16/2011	0.11	0.16	0.007	3.56	0.08	0.00013	**0.0039**	0.081	<0.000010	<0.000005	<0.05	**0.00042**	65	<0.00010	**0.00098**	0.0017	0.27	0.0007	0.0050	**20**	0.145
1/14/2012	0.13	0.19	0.007	3.27	0.06	0.00013	**0.0041**	**0.086**	<0.000010	<0.000005	<0.05	**0.00050**	67	<0.00010	**0.00069**	0.0012	0.27	0.0006	0.0048	**19**	0.143
2/15/2012	0.15	0.18	0.006	2.67	0.04	0.00013	**0.0038**	**0.084**	<0.000010	<0.000005	<0.05	**0.00045**	68	<0.00010	**0.00061**	0.0011	0.28	0.0013	0.0049	**20**	0.137
3/15/2012	<0.20	0.35	0.005	3.40	0.03	0.00013	**0.0037**	0.078	0.000010	<0.000005	<0.05	**0.00040**	66	0.00010	**0.00046**	0.0009	0.26	0.0009	0.0053	**21**	0.115
4/8/2012	0.16	0.17	0.004	1.92	0.03	0.00011	**0.0035**	**0.090**	<0.000010	<0.000005	<0.05	**0.00047**	68	0.00020	**0.00042**	0.0011	0.26	0.0006	0.0050	**20**	0.108
5/6/2012	**0.48**	<0.20	**0.064**	**14.00**	**0.42**	0.00034	**0.0084**	0.054	**0.000029**	**0.000007**	<0.05	**0.00060**	34	0.00053	**0.00179**	**0.0039**	**1.08**	**0.0139**	0.0025	9	0.239
6/7/2012	<0.20	0.34	**0.033**	5.12	**0.86**	0.00027	**0.0035**	0.055	**0.000050**	0.0000058	<0.05	**0.00073**	40	0.00034	**0.00304**	**0.0057**	**0.69**	0.0041	0.0053	13	0.182
7/7/2012	<0.20	0.28	0.012	4.72	**0.54**	0.00024	0.0034	0.057	**0.000026**	<0.000005	<0.05	**0.00060**	52	0.00016	**0.00248**	**0.0042**	0.37	0.0014	**0.0055**	15	0.138
8/3/2012	<0.20	0.36	0.011	5.00	**0.32**	0.00019	**0.0036**	0.059	**0.000021**	<0.000005	<0.05	**0.00047**	51	<0.00010	**0.00154**	**0.0033**	0.33	0.0014	0.0053	16	0.116
9/22/2012	<0.20	0.24	0.008	4.36	**0.25**	0.00021	**0.0040**	0.065	**0.000016**	<0.000005	<0.05	**0.00056**	58	<0.00010	**0.00224**	0.0023	0.29	0.0012	**0.0056**	17	0.161
10/12/2012	<0.20	0.31	0.019	2.38	**0.26**	0.00021	**0.0049**	0.070	**0.000020**	<0.000005	<0.05	**0.00064**	60	0.00011	**0.00295**	**0.0030**	**0.49**	0.0056	0.0054	**19**	0.231
11/24/2012	<0.20	0.29	0.006	4.40	0.08	0.00014	**0.0037**	**0.090**	<0.000050	<0.000025	<0.25	**0.00052**	71	<0.00050	**0.00146**	0.0017	0.33	0.0014	**0.0056**	**21**	0.188
12/8/2012	0.12	0.25	0.005	3.45	0.03	0.00016	0.0030	**0.101**	<0.000010	<0.000005	<0.05	**0.00051**	71	0.00012	**0.00082**	0.0011	0.31	0.0014	0.0050	**22**	0.201
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	15	15	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	0.20	0.25	0.0070	4.00	0.147	0.00018	0.0037	0.074	0.000013	0.000005	< 0.05	0.000500	60.5	0.00014	0.001230	0.00193	0.317	0.00139	0.0051	18.6	0.1480
mean	0.18	0.25	0.0131	4.45	0.257	0.00021	0.0039	0.073	0.000020	0.000007	< 0.06	0.000503	56.8	0.00026	0.001440	0.00251	0.437	0.00268	0.0049	17.0	0.1560
standard deviation	0.10	0.08	0.0160	2.81	0.264	0.00013	0.0012	0.015	0.000013	0.000006	< 0.05	0.000102	13.2	0.00027	0.000827	0.00151	0.313	0.00336	0.0009	4.3	0.0408
minimum	0.05	0.09	0.0020	1.92	0.029	0.00011	0.0023	0.054	< 0.000010	< 0.000005	< 0.05	0.000286	25.2	< 0.00010	0.000420	0.00094	0.226	0.00056	0.0025	6.2	0.0883
maximum	0.48	0.36	0.0643	14.00	0.863	0.00064	0.0084	0.101	0.000050	0.000025	< 0.25	0.000725	70.7	0.00120	0.003040	0.00574	1.380	0.01390	0.0056	21.9	0.2390
# < detection limit	7	1	0	0	0	0	0	0	8	16	18	0	0	6	0	0	0	0	0	0	0
% < detection limit	47%	7%	0%	0%	0%	0%	0%	0%	44%	89%	100%	0%	0%	33%	0%	0%	0%	0%	0%	0%	0%
# > background	1	0	2	1	9	0	15	6	9	3	1	18	0	1	18	7	5	2	4	10	0
% > background	7%	0%	13%	7%	50%	0%	83%	33%	50%	17%	6%	100%	0%	6%	100%	39%	28%	11%	22%	56%	0%
# > guideline	0				9		1				0	18		0		7	2	4			0
% > guideline	0%				50%		6%				0%	100%		0%		39%	11%	22%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.12: Water quality concentrations for KV-5, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011	<0.00001	**0.0010**	**0.0160**	<0.002	**0.76**	0.00041	2.54	<0.000005	**2.81**	0.24	34	<0.000002	<0.00001	<0.0005	0.0008	<0.0002	**0.077**	<0.0001
5/25/2011	0.00001	**0.0006**	**0.0084**	**0.033**	0.60	0.00027	2.28	**0.000093**	0.60	0.09	<50	0.000012	<0.00020	**0.0110**	0.0004	**0.0016**	**0.041**	**0.0004**
7/14/2011	<0.00001	**0.0004**	**0.0167**	0.017	0.49	0.00037	2.20	0.000009	1.33	0.18	25	0.000005	<0.00001	0.0024	0.0007	0.0004	**0.075**	0.0001
10/23/2011	<0.00001	**0.0006**	**0.0130**	0.009	0.53	0.00047	2.40	0.000017	1.62	0.22	30	0.000002	<0.00001	0.0008	0.0011	<0.0002	**0.063**	<0.0001
11/25/2011	<0.00002	**0.0007**	**0.0142**	0.006	**0.67**	0.00051	3.20	0.000007	**2.31**	0.24	34	<0.000002	0.00012	0.0006	0.0011	0.0002	**0.069**	<0.0001
12/16/2011	<0.00001	**0.0007**	**0.0147**	0.004	0.63	0.00052	3.00	<0.000005	**2.37**	0.24	32	<0.000002	0.00003	<0.0005	0.0010	<0.0002	**0.073**	<0.0001
1/14/2012	<0.00001	**0.0008**	**0.0120**	0.005	**0.71**	0.00058	3.70	<0.000005	**2.35**	0.24	39	<0.000002	<0.00020	<0.0005	0.0010	<0.0002	**0.060**	<0.0001
2/15/2012	<0.00001	**0.0008**	**0.0134**	0.004	**0.76**	0.00051	3.40	0.000014	**2.77**	0.24	35	<0.000002	<0.00020	<0.0005	0.0010	<0.0002	**0.066**	<0.0001
3/15/2012	<0.00001	**0.0009**	**0.0115**	0.005	**0.72**	0.00050	3.20	<0.000005	**2.84**	0.25	31	<0.000002	<0.00020	<0.0005	0.0009	<0.0002	**0.059**	<0.0001
4/8/2012	<0.00001	**0.0010**	**0.0124**	0.003	**0.72**	0.00050	3.30	<0.000005	**2.75**	0.25	35	<0.000002	<0.00020	<0.0005	0.0010	<0.0002	**0.058**	<0.0001
5/6/2012	<0.00001	0.0004	**0.0084**	**0.052**	**0.79**	0.00033	2.36	**0.000091**	0.98	0.12	16	0.000011	<0.00020	**0.0121**	0.0006	**0.0009**	**0.076**	**0.0003**
6/7/2012	<0.00001	**0.0005**	**0.0207**	**0.020**	0.51	0.00052	2.33	0.000041	1.21	0.16	24	0.0000057	<0.00020	0.0045	0.0007	0.0005	**0.118**	0.0002
7/7/2012	<0.00001	**0.0005**	**0.0192**	0.009	0.39	0.00053	2.45	0.000011	1.41	0.19	28	0.0000042	<0.00020	0.0028	0.0009	0.0003	**0.096**	<0.0001
8/3/2012	<0.00001	**0.0005**	**0.0146**	0.005	0.38	0.00045	2.28	<0.000005	1.49	0.20	27	0.0000030	<0.00020	0.0012	0.0009	<0.0002	**0.066**	<0.0001
9/22/2012	<0.00001	**0.0006**	**0.0168**	0.004	0.54	0.00049	2.34	<0.000005	1.76	0.22	34	<0.000002	<0.00020	0.0007	0.0010	<0.0002	**0.077**	<0.0001
10/12/2012	<0.00001	**0.0006**	**0.0198**	0.017	0.55	0.00056	2.61	0.000006	1.93	0.22	34	0.0000030	<0.00020	0.0021	0.0010	<0.0002	**0.095**	<0.0001
11/24/2012	<0.00005	**0.0008**	**0.0194**	<0.010	**0.73**	0.00075	3.24	<0.000025	**2.72**	0.25	35	<0.000010	<0.00100	<0.0025	0.0010	<0.0010	**0.099**	<0.0005
12/8/2012	<0.00001	**0.0010**	**0.0134**	0.004	**0.76**	0.00053	3.42	0.000006	**3.11**	0.26	36	0.000002	<0.00020	<0.0005	0.0010	<0.0002	**0.077**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	0.00001	0.00065	0.01440	0.006	0.65	0.00051	2.58	0.000007	2.12	0.230	34	0.000002	0.0002	0.0008	0.0010	0.0002	0.0737	0.0001
mean	0.00001	0.00068	0.01470	0.012	0.62	0.00049	2.79	0.000020	2.02	0.211	32	0.000004	0.00020	0.0025	0.0009	0.0004	0.0746	0.0002
standard deviation	0.00001	0.00022	0.00362	0.013	0.13	0.00010	0.50	0.000028	0.75	0.047	7	0.000003	0.00021	0.0035	0.0002	0.0004	0.0181	0.0001
minimum	< 0.00001	0.00035	0.00840	0.002	0.38	0.00027	2.20	< 0.000005	0.60	0.093	16	< 0.000002	< 0.00001	< 0.0005	0.0004	< 0.0002	0.0410	< 0.0001
maximum	0.00005	0.00102	0.02070	0.052	0.79	0.00075	3.70	0.000093	3.11	0.257	50	0.000012	0.001	0.0121	0.0011	0.0016	0.1180	0.0005
# < detection limit	17	0	0	2	0	0	0	8	0	0	1	9	16	8	0	12	0	14
% < detection limit	94%	0%	0%	11%	0%	0%	0%	44%	0%	0%	6%	50%	89%	44%	0%	67%	0%	78%
# > background	2	17	18	3	9	0	0	2	9	0	0	0	1	2	0	3	18	3
% > background	11%	94%	100%	17%	50%	0%	0%	11%	50%	0%	0%	0%	6%	11%	0%	17%	100%	17%
# > guideline	0	0	0			0		0				0			0		18	
% > guideline	0%	0%	0%			0%		0%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.13: Water quality concentrations for KV-6, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	L/s	pH units	pH units	µS/cm	µS/cm	µS/cm	C	mg/L	%	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/12/2011		7.85	7.59	**423**		**854**	0.0				2	**481**	**475**	**130**	**160**		**300**	**0.046**	<0.005
2/8/2011		8.11	7.82	258		**940**	0.0				1	**502**	**485**	**130**	**160**		**350**	**0.140**	<0.005
3/22/2011		7.73	7.61	**483**		**920**	0.5				2	**573**	**544**	**140**	**170**		**390**	**0.100**	<0.005
4/19/2011			7.69	**1127**		**955**	0.8				1	**564**	**566**	**130**	**160**		**380**	**0.089**	<0.005
5/25/2011	136	7.84	7.78	**446**		581	**12.1**				3	303	304	85	100		180		
6/22/2011	80	8.23	7.98	**588**		**829**	**10.5**				1	**470**	**464**	**100**	**120**		**290**	0.018	
7/13/2011	91	7.88	7.80		**730**	**748**	**12.8**				2	**407**	**418**	91	110		**270**	**0.043**	<0.005
8/17/2011	127	7.78	7.81		**772**	**788**	**8.1**				2	**444**	**441**	**110**	**130**		**280**		
9/24/2011	127	7.52	8.09		**842**	**848**	4.4				1	**447**	**451**	**120**	**150**		**289**	0.009	<0.005
10/29/2011	88	7.66	7.55		**970**	**929**	0.4	10.56	75	244	1	**511**	**527**	**120**	**150**		**356**	**0.063**	<0.050
11/21/2011	75	7.49	7.90			**896**	0.1	**9.64**	**66**		3	**497**	**493**	**133**	**162**		**342**	**0.035**	<0.005
12/14/2011	107	7.36	7.64		**913**	**906**	-0.1	12.78	87		4	**505**	**506**	**138**	**168**		**346**	**0.180**	<0.005
1/15/2012		7.30	7.59		**829**	**867**	0	11.10	76	283	2	**468**	**458**	**130**	**158**		**294**	**0.110**	<0.005
2/13/2012	77	7.21	8.04		**927**	**919**	-0.1	12.63	86	31	1	**525**	**545**	**139**	**170**		**329**	**0.130**	<0.005
3/11/2012	77	**7.10**	8.16		**938**	**914**	-0.1	13.14	90	293	1	**518**	**537**	**135**	**165**		**344**	**0.120**	<0.050
4/8/2012	62	7.69	7.77		**1022**	**927**	0.1	13.55	93	44	2	**483**	**502**	**131**	**159**		**312**	**0.120**	<0.005
5/1/2012	147	7.67	7.62		526	527	1.9	12.53	91	185	3	271	268	66	81	<0.50	196	**0.036**	<0.050
5/7/2012	105	7.93	7.75		507	539	2.3	13.33	97	221	3	281	288	76	93	1.1	185	**0.032**	<0.050
6/3/2012	89	7.92	7.97		**830**	**759**	**11**	14.70	134	344	<1	365	364	**98**	**120**	1.2	**278**	0.025	<0.050
7/4/2012	85	7.93	8.06		**875**	**883**	**13.1**	10.89	104	68	2	**545**	**459**	**96**	**118**	1.3	**353**	**0.059**	<0.050
8/1/2012	91	7.82	8.02		**960**	**866**	**12.9**	10.99	104	80	1	**502**	**420**	**106**	**129**	1	**341**	0.028	<0.050
9/23/2012	89	7.75	8.09		**1030**	**921**	**5.6**	11.12	89	75	2	**492**	**527**	**123**	**150**	1.2	**352**	0.012	<0.050
10/15/2012	76	7.56	8.03		**1056**	**941**	0.6	11.86	83	81	<1	**498**	**494**	**124**	**151**	1.2	**365**	**0.036**	<0.050
11/21/2012		8.00	8.06			**928**	0.1	12.00	82	**361**	3	**526**	**513**	**140**	**171**	**1.8**	**359**	**0.057**	<0.050
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	18	23	24	6	16	24	24	15	15	13	24	24	24	24	24	8	24	22	21
median	89	7.75	7.82	465	894	890	0.7	12.00	89	185.0	2	495	480	124	151	1.20	335	0.05	< 0.005
mean	96	7.71	7.85	554	858	841	4.0	12.05	91	177.7	2	466	460	116	142	1.16	312	0.07	< 0.026
standard deviation	24	0.28	0.19	300	162	126	5.2	1.35	16	119.9	1	83	82	22	27	0.36	59	0.05	< 0.023
minimum	62	7.10	7.55	258	507	527	-0.1	9.64	66	30.9	< 1	271	268	66	81	0.50	180	0.01	< 0.005
maximum	147	8.23	8.16	1127	1056	955	13.1	14.70	134	361.3	4	573	566	140	171	1.80	390	0.18	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	21
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%	13%	0%	0%	100%
# > background		1	0	5	14	21	8	1	1	1	0	20	20	20	20	1	21	17	0
% > background		4%	0%	83%	88%	88%	33%	7%	7%	8%	0%	83%	83%	83%	83%	13%	88%	77%	0%
# > guideline		0	0					0			0					0		19	0
% > guideline		0%	0%					0%			0%					0%		86%	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.13: Water quality concentrations for KV-6, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011	0.24			0.70	0.004	0.00021	**0.0047**	0.060	<0.000010	<0.000005	<0.05	**0.00080**	**150**	0.00060	**0.00124**	0.0002	0.25	**0.0066**	**0.0136**	**26**	**1.050**
2/8/2011	0.23		0.003	1.50	0.006	0.00020	**0.0075**	0.060	<0.000010	<0.000005	<0.05	**0.00073**	**161**	0.00030	**0.00165**	0.0001	0.40	**0.0080**	**0.0163**	**24**	**1.370**
3/22/2011	0.22		0.007	1.30	0.010	0.00019	**0.0087**	0.063	<0.000010	<0.000005	<0.05	**0.00065**	**183**	0.00040	**0.00166**	0.0003	**0.49**	0.0038	**0.0158**	**28**	**1.350**
4/19/2011	0.26		0.007	1.20	0.009	0.00021	**0.0082**	0.058	<0.000010	<0.000005	<0.05	**0.00074**	**180**	0.00050	**0.00160**	0.0004	0.40	0.0049	**0.0159**	**28**	**1.080**
5/25/2011			0.008	8.60	0.025	0.00040	**0.0058**	0.037	<0.000010	<0.000005	<0.05	**0.00189**	100	0.00030	**0.00035**	0.0011	0.36	**0.0081**	**0.0078**	13	**0.404**
6/22/2011			0.008	<0.50	0.008	0.00034	**0.0042**	0.055	<0.000010	<0.000005	<0.05	**0.00145**	**146**	0.00020	0.00016	0.0004	0.14	0.0044	**0.0118**	**26**	**0.288**
7/13/2011	<0.20		0.003	4.50	0.010	0.00038	**0.0050**	0.044	<0.000010	<0.000005	<0.05	**0.00147**	**127**	0.00030	0.00021	0.0006	0.18	**0.0060**	**0.0103**	**22**	**0.281**
8/17/2011			0.004	5.00	0.019	0.00032	**0.0049**	0.038	<0.000010	<0.000005	<0.05	**0.00185**	**138**	0.00030	**0.00034**	0.0007	0.25	**0.0085**	**0.0121**	**24**	**0.344**
9/24/2011	0.10		0.004	1.90	0.011	0.00028	**0.0053**	0.043	<0.000010	<0.000005	<0.05	**0.00215**	**141**	0.00030	**0.00044**	0.0004	**0.54**	0.0041	**0.0135**	**23**	**0.441**
10/29/2011	<0.20	0.30	0.003	0.80	0.005	0.00025	**0.0036**	0.053	<0.000010	<0.000005	<0.05	**0.00132**	**159**	<0.00010	**0.00243**	0.0003	0.30	0.0024	**0.0175**	**28**	**1.320**
11/21/2011	0.18	0.27	0.010	1.70	0.010	0.00032	**0.0060**	0.059	<0.000010	<0.000005	<0.05	**0.00140**	**153**	0.00020	**0.00242**	0.0007	0.37	**0.0155**	**0.0158**	**28**	**1.640**
12/14/2011	0.23	**1.20**	0.013	2.10	0.011	0.00039	**0.0070**	0.064	<0.000010	<0.000005	<0.05	**0.00123**	**159**	**0.00090**	**0.00234**	0.0025	**0.49**	**0.0075**	**0.0156**	**26**	**1.840**
1/15/2012	0.25	0.28	0.006	0.78	0.020	0.00026	**0.0062**	0.062	<0.000010	<0.000005	<0.05	**0.00114**	**149**	0.00060	**0.00187**	0.0012	**0.54**	**0.0160**	**0.0146**	**23**	**1.060**
2/13/2012	0.23	0.20	0.009	1.08	0.003	0.00017	**0.0103**	0.057	<0.000010	<0.000005	<0.05	**0.00090**	**167**	<0.0001	**0.00230**	0.0002	**0.57**	0.0039	**0.0166**	**26**	**1.330**
3/11/2012	0.27	<0.20	0.008	1.57	0.004	0.00018	**0.0102**	0.059	<0.000010	<0.000005	<0.05	**0.00082**	**163**	0.00010	**0.00213**	0.0002	**0.48**	0.0036	**0.0180**	**27**	**1.250**
4/8/2012	0.26	0.14	0.007	0.90	0.009	0.00018	**0.0097**	0.055	<0.000010	<0.000005	<0.05	**0.00078**	**151**	<0.0001	**0.00219**	0.0002	**0.51**	0.0031	**0.0175**	**26**	**1.070**
5/1/2012	**1.06**	0.11	0.021	**10.40**	0.041	0.00038	**0.0082**	0.038	0.000010	<0.000005	<0.05	**0.00378**	87	0.00017	**0.00145**	0.0012	**0.99**	**0.0135**	**0.0079**	13	**0.703**
5/7/2012	<0.05	**0.47**	0.018	8.55	0.029	0.00052	**0.0096**	0.042	<0.000010	<0.000005	<0.05	**0.00239**	88	0.00018	**0.00124**	0.0014	**0.87**	**0.0225**	**0.0077**	15	**0.719**
6/3/2012	<0.20	0.28	0.005	3.95	0.007	0.00029	**0.0037**	0.047	<0.000010	<0.000005	<0.05	**0.00073**	112	0.00019	0.00023	0.0008	0.15	0.0034	**0.0118**	**21**	**0.250**
7/4/2012	<0.20	0.22	0.006	2.55	0.008	0.00036	**0.0049**	0.045	<0.000010	<0.000005	<0.05	**0.00074**	**171**	<0.00010	0.00022	0.0009	0.21	0.0056	**0.0173**	**29**	**0.247**
8/1/2012	<0.20	0.30	0.006	2.86	0.007	0.00035	**0.0052**	0.046	<0.000010	<0.000005	<0.05	**0.00086**	**157**	<0.00010	0.00026	0.0004	0.19	0.0048	**0.0172**	**27**	**0.343**
9/23/2012	<0.20	0.23	0.007	2.81	0.007	0.00021	**0.0045**	0.048	<0.000010	<0.000005	<0.05	**0.00108**	**155**	<0.00010	**0.00069**	0.0003	0.31	0.0019	**0.0175**	**26**	**0.517**
10/15/2012	0.22	<0.20	0.004	2.00	0.004	0.00018	**0.0036**	0.050	<0.000010	<0.000005	<0.05	**0.00077**	**160**	0.00026	**0.00064**	0.0004	0.20	0.0027	**0.0170**	**24**	**0.449**
11/21/2012	**0.32**	<0.20	0.009	1.35	0.015	0.00041	**0.0065**	0.069	<0.000010	**0.0000080**	<0.05	**0.00132**	**165**	0.00013	**0.00194**	0.0012	**0.44**	**0.0233**	**0.0157**	**28**	**1.690**
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	21	15	23	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
median	0.22	0.23	0.0070	1.80	0.009	0.00028	0.0059	0.054	0.000010	0.000005	< 0.05	0.00111	154.0	0.00020	0.001345	0.00041	0.382	0.00524	0.016	25.5	0.8845
mean	0.25	0.31	0.0076	2.86	0.012	0.00029	0.0064	0.052	0.000010	0.000005	< 0.05	0.00129	146.7	0.00027	0.001250	0.00067	0.401	0.00767	0.014	24.1	0.8765
standard deviation	0.19	0.26	0.0045	2.73	0.009	0.00010	0.0022	0.009	0.000000	0.000001	< 0.00	0.00072	26.3	0.00020	0.000845	0.00055	0.213	0.00607	0.003	4.5	0.5176
minimum	< 0.05	0.11	0.0030	0.50	0.003	0.00017	0.0036	0.037	< 0.000010	< 0.000005	< 0.05	0.00065	86.7	< 0.00010	0.000161	0.00014	0.143	0.00189	0.008	13.2	0.2470
maximum	1.06	1.20	0.0211	10.40	0.041	0.00052	0.0103	0.069	0.000010	0.000008	< 0.05	0.00378	183.0	0.00090	0.002430	0.00248	0.991	0.02330	0.018	28.5	1.8400
# < detection limit	7	3	0	1	0	0	0	0	23	23	24	0	0	6	0	0	0	0	0	0	0
% < detection limit	33%	20%	0%	4%	0%	0%	0%	0%	96%	96%	100%	0%	0%	25%	0%	0%	0%	0%	0%	0%	0%
# > background	2	2	0	1	0	0	24	0	0	1	0	24	20	1	19	0	10	11	24	21	24
% > background	10%	13%	0%	4%	0%	0%	100%	0%	0%	4%	0%	100%	83%	4%	79%	0%	42%	46%	100%	88%	100%
# > guideline	0				0		16				0	24		0		1	0	20			12
% > guideline	0%				0%		67%				0%	100%		0%		4%	0%	83%			50%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.13: Water quality concentrations for KV-6, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011	<0.00001	0.0002	**0.0042**	0.007	0.42	0.00096	**4.23**	0.000016	1.61	0.25	**125**	0.000002	0.00001	<0.0005	**0.0046**	<0.0002	**0.123**	**0.0004**
2/8/2011	<0.00001	0.0002	**0.0043**	0.005	0.43	0.00082	3.75	<0.000005	1.48	0.27	**122**	0.000003	<0.00001	<0.0005	**0.0045**	<0.0002	**0.101**	<0.0001
3/22/2011	<0.00001	0.0002	**0.0047**	0.010	0.48	0.00088	**4.82**	0.000010	1.69	0.27	**139**	<0.000002	<0.00001	<0.0005	**0.0049**	<0.0002	**0.103**	<0.0001
4/19/2011	<0.00001	0.0002	**0.0047**	0.010	0.51	0.00087	**4.59**	<0.000005	1.70	0.27	**140**	<0.000002	<0.00001	<0.0005	**0.0049**	<0.0002	**0.104**	<0.0001
5/25/2011	<0.00001	**0.0004**	**0.0028**	0.012	0.51	0.00066	2.92	0.000020	0.95	0.16	74	0.000003	<0.00001	<0.0005	0.0021	<0.0002	**0.190**	<0.0001
6/22/2011	<0.00001	0.0002	**0.0021**	0.005	0.21	0.00078	2.16	0.000013	1.57	0.25	**135**	0.000008	<0.00001	<0.0005	**0.0043**	<0.0002	**0.207**	<0.0001
7/13/2011	<0.00001	0.0003	**0.0024**	0.008	0.17	0.00066	2.32	0.000007	1.43	0.22	**108**	0.000002	<0.00001	<0.0005	**0.0036**	<0.0002	**0.183**	<0.0001
8/17/2011	<0.00001	0.0002	**0.0032**	0.008	0.32	0.00074	3.20	0.000029	1.54	0.22	**117**	0.000003	<0.00001	<0.0005	**0.0040**	<0.0002	**0.226**	<0.0001
9/24/2011	<0.00001	0.0004	**0.0026**	0.007	0.41	0.00077	3.40	0.000026	1.41	0.24	**116**	<0.000002	0.00018	<0.0005	**0.0045**	<0.0002	**0.275**	<0.0001
10/29/2011	<0.00001	0.0002	**0.0055**	0.006	0.43	0.00082	4.00	0.000020	1.63	0.27	**143**	<0.000002	0.00013	<0.0005	**0.0042**	<0.0002	**0.218**	<0.0001
11/21/2011	<0.00001	0.0002	**0.0061**	0.008	0.47	0.00096	4.10	<0.000005	1.77	0.26	**131**	0.000003	**0.00055**	<0.0005	**0.0046**	<0.0002	**0.219**	<0.0001
12/14/2011	<0.00001	0.0002	**0.0064**	0.007	0.61	0.00094	4.10	0.000010	1.87	0.26	**122**	0.00001	0.00013	<0.0005	**0.0039**	<0.0002	**0.175**	<0.0001
1/15/2012	<0.00001	0.0002	**0.0053**	**0.024**	0.46	**0.00111**	**4.30**	0.000011	**2.43**	0.24	**138**	0.000003	**0.00050**	<0.0005	**0.0041**	<0.0002	**0.149**	<0.0001
2/13/2012	<0.00001	0.0002	**0.0060**	0.012	0.47	0.00091	**4.30**	<0.000005	1.60	0.24	**131**	0.0000020	<0.00020	<0.0005	**0.0042**	<0.0002	**0.139**	<0.0001
3/11/2012	<0.00001	0.0002	**0.0056**	0.014	0.50	0.00096	**4.20**	0.000008	1.70	0.25	**143**	0.0000040	<0.00020	<0.0005	**0.0034**	<0.0002	**0.119**	<0.0001
4/8/2012	<0.00001	0.0002	**0.0061**	0.008	0.43	0.00089	3.80	<0.000005	1.57	0.25	**131**	0.0000030	<0.00020	<0.0005	**0.0039**	<0.0002	**0.117**	<0.0001
5/1/2012	<0.00001	0.0002	**0.0044**	0.017	0.54	0.00055	2.47	0.000041	0.90	0.14	66	0.000005	<0.00020	0.0012	0.0017	<0.0002	**0.364**	<0.0001
5/7/2012	<0.00001	0.0003	**0.0044**	0.016	0.55	0.00052	2.68	**0.000063**	1.02	0.15	70	0.000006	<0.00020	0.0007	0.0021	<0.0002	**0.318**	0.0001
6/3/2012	<0.00001	0.0002	**0.0029**	0.014	0.33	0.00088	2.04	0.000010	1.75	0.21	**106**	<0.000002	<0.00020	0.0033	**0.0038**	<0.0002	**0.123**	<0.0001
7/4/2012	<0.00001	0.0003	**0.0021**	0.013	0.18	0.00076	2.46	0.000009	1.75	0.26	**152**	0.0000026	<0.00020	<0.0005	**0.0037**	<0.0002	**0.099**	<0.0001
8/1/2012	<0.00001	0.0003	**0.0028**	0.002	0.24	0.00075	2.62	0.000010	1.64	0.27	**133**	<0.000002	<0.00020	<0.0005	**0.0036**	<0.0002	**0.105**	<0.0001
9/23/2012	<0.00001	0.0002	**0.0041**	0.002	0.39	0.00085	3.11	<0.000005	1.53	0.27	**140**	<0.000002	<0.00020	<0.0005	**0.0040**	<0.0002	**0.163**	<0.0001
10/15/2012	<0.00001	0.0002	**0.0035**	0.004	0.41	0.00086	4.07	0.000005	1.45	0.27	**144**	0.000002	**0.00035**	<0.0005	**0.0039**	<0.0002	**0.099**	<0.0001
11/21/2012	<0.00001	0.0002	**0.0068**	0.006	0.44	0.00101	**4.20**	0.000046	1.77	0.26	**127**	0.000007	<0.00020	<0.0005	**0.0047**	0.00022	**0.173**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
median	< 0.00001	0.00021	0.00434	0.008	0.43	0.00085	3.78	0.000010	1.61	0.252	131	0.000003	0.00020	0.0005	0.0040	0.0002	0.1560	0.0001
mean	< 0.00001	0.00023	0.00429	0.009	0.41	0.00083	3.49	0.000016	1.57	0.240	123	0.000003	0.00016	0.0007	0.0039	0.0002	0.1705	0.0001
standard deviation	< 0.00000	0.00006	0.00145	0.005	0.12	0.00014	0.85	0.000015	0.31	0.038	23	0.000002	0.00015	0.0006	0.0008	0.0000	0.0721	0.0001
minimum	< 0.00001	0.00015	0.00210	0.002	0.17	0.00052	2.04	< 0.000005	0.90	0.143	66	< 0.000002	0.00001	< 0.0005	0.0017	< 0.0002	0.0988	< 0.0001
maximum	< 0.00001	0.00037	0.00677	0.024	0.61	0.00111	4.82	0.000063	2.43	0.274	152	0.000010	0.00055	0.0033	0.0049	0.0002	0.3640	0.0004
# < detection limit	24	0	0	0	0	0	0	6	0	0	0	7	17	21	0	23	0	22
% < detection limit	100%	0%	0%	0%	0%	0%	0%	25%	0%	0%	0%	29%	71%	88%	0%	96%	0%	92%
# > background	0	1	24	1	0	1	7	1	1	0	21	0	3	0	21	0	24	1
% > background	0%	4%	100%	4%	0%	4%	29%	4%	4%	0%	88%	0%	13%	0%	88%	0%	100%	4%
# > guideline	0	0	0			2		0				0			0		24	
% > guideline	0%	0%	0%			8%		0%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.14: Water quality concentrations for KV-7, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/13/2011		8.40	7.90	212		699	0.1				<1	383	**396**	**140**	**180**		210	**0.240**	<0.005
2/9/2011		8.21	7.98	**632**		**763**	0.0				<1	**412**	349	**150**	**180**		**250**	**0.033**	<0.005
3/22/2011		8.02	7.66	**385**		**820**	0.1				<1	**495**	**487**	**160**	**200**		**280**	0.016	<0.005
4/19/2011			7.90	**435**		**813**	0.9				2	**489**	**465**	**140**	**170**		**280**	0.026	<0.005
5/13/2011	357	7.66	7.71	170		315	0.5				2	159	149	64	79		100	0.016	<0.005
6/22/2011	105	8.47	8.07	**442**		677	**8.1**				<1	**385**	380	**130**	**160**		200	**0.037**	0.006
7/20/2011		8.40	7.73		301	304	4.1				**72**	152	155	70	86		88		
8/18/2011	259	7.30	8.01		448	463	**5.3**				15	250	243	**110**	**130**		130	0.026	<0.500
9/23/2011	286	8.18	8.16		623	630	2.7				2	325	319	**140**	**170**		179	**0.130**	<0.005
10/24/2011	173	8.20	8.09		**722**	690	0.3	10.68	73	282	3	355	368	**140**	**170**		195	**0.038**	<0.005
11/26/2011	126	8.19	8.13			**734**	-0.1	13.39	92		<1	**417**	**409**	**147**	**180**		**235**	**0.037**	<0.005
12/14/2011		8.14	7.82		**742**	**724**	-0.1	12.93	89		3	**396**	**389**	**142**	**173**		**237**	**0.088**	<0.005
1/13/2012	154	7.80	8.12		**714**	**755**	0.0	12.00	82		2	**391**	**406**	**148**	**181**		**225**	**0.042**	<0.005
2/10/2012		7.88	8.26		**765**	**751**	-0.1	14.52	99	95	1	**407**	**426**	**150**	**183**		**276**	**0.053**	<0.005
3/10/2012		7.82	8.25			**768**	-0.1	16.10	110	61	<1	**421**	**400**	**150**	**183**		**251**	**0.043**	<0.050
3/11/2012		7.83			**786**		-0.1	15.13	104	57									
4/6/2012		7.86	8.16			**760**	0.0			69	<1	**391**	**410**	**148**	**180**		215	**0.031**	<0.005
5/1/2012	540	8.05	7.69		290	284	0.2	14.98	103	171	**45**	150	145	57	70	1.2	85	0.027	<0.050
5/7/2012	600	8.17	7.81		245	260	0.7	15.34	107	245	12	135	136	58	71	**1.4**	75	0.009	<0.050
6/1/2012	369	7.73	7.93		313	431	**6.8**				5	198	197				134		<0.050
7/5/2012		8.20	8.13		638	583	**7.2**	12.40	103	107	2	348	267	**114**	**140**	1.2	185	0.024	<0.050
7/16/2012	206																		
8/2/2012	258	8.06	8.09		618	577	**6.7**	12.95	106	115	3	326	308	**121**	**147**	0.8	173	0.030	<0.050
9/21/2012	270	8.01	8.08		671	602	3.8	12.58	96	119	2	296	316	**131**	**160**	1.3	174	0.007	<0.050
10/15/2012		7.80	8.10		**761**	674	-0.1	12.61	86	116	1	339	346	**138**	**168**	**1.7**	199	0.024	<0.050
11/19/2012		8.12	8.11		**717**	**716**	0.0	13.60	93	**428**	1	**385**	382	**153**	**187**	1.0	212	**0.034**	**0.063**
12/7/2012		**7.08**	8.10		**846**	**744**	0.1				3	**401**	388	**148**	**181**	1.1	**236**	**0.052**	<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	13	25	25	6	17	25	26	14	14	12	25	25	25	24	24	8	25	23	24
median	259	8.05	8.08	410	671	690	0.2	13.17	97	115.4	2	383	368	140	170	1	200	0.03	0.005
mean	285	7.98	8.00	379	600	621	1.8	13.52	96	155.4	7	336	329	127	155	1	193	0.05	0.043
standard deviation	151	0.32	0.18	169	199	176	2.8	1.51	11	110.9	16	105	104	32	39	0	61	0.05	0.100
minimum	105	7.08	7.66	170	245	260	-0.1	10.68	73	56.8	< 1	135	136	57	70	1	75	0.01	< 0.005
maximum	600	8.47	8.26	632	846	820	8.1	16.10	110	428.1	72	495	487	160	200	1.7	280	0.24	0.500
# < detection limit	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0.00	22
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	28%	0%	0%	0%	0%	0%	0%	0%	92%
# > background		1	0	4	8	11	5	0	0	1	2	12	9	20	20	2	9	13	2
% > background		4%	0%	67%	47%	44%	19%	0%	0%	8%	8%	48%	36%	83%	83%	25%	36%	57%	8%
# > guideline		0	0					0			2					0		19	2
% > guideline		0%	0%					0%			8%					0%		83%	8%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.14: Water quality concentrations for KV-7, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/13/2011	0.17			1.20	0.004	0.00017	0.0017	0.051	<0.000010	<0.000005	<0.05	**0.00030**	115	0.00060	0.00017	0.0003	0.08	0.0017	**0.0076**	**24**	0.181
2/9/2011	0.18		0.003	1.00	0.005	0.00033	0.0019	0.061	<0.000010	<0.000005	<0.05	**0.00065**	**129**	0.00040	0.00014	0.0003	0.07	0.0055	**0.0087**	**22**	0.161
3/22/2011	0.15		<0.0020	1.40	0.005	0.00028	0.0017	0.061	<0.000010	<0.000005	<0.05	**0.00084**	**151**	0.00050	0.00009	0.0012	0.03	0.0032	**0.0095**	**29**	0.122
4/19/2011	0.19		0.004	1.70	0.005	0.00016	0.0017	0.053	<0.000010	<0.000005	<0.05	**0.00035**	**155**	0.00030	0.00007	0.0002	0.04	0.0008	**0.0096**	**25**	0.094
5/13/2011	0.03		0.008	**19.40**	0.034	0.00020	0.0030	0.027	<0.000010	<0.000005	<0.05	**0.00079**	48	0.00040	0.00016	0.0023	0.27	0.0045	0.0028	9	0.126
6/22/2011	0.04		0.004	3.10	0.007	0.00034	0.0024	0.053	<0.000010	<0.000005	<0.05	**0.00058**	117	0.00020	0.00005	0.0006	0.07	0.0010	**0.0068**	**22**	0.034
7/20/2011			0.005	**12.70**	**0.946**	**0.00105**	**0.0179**	0.080	**0.000050**	**0.00004**	<0.05	**0.00411**	45	**0.00160**	**0.00214**	**0.0094**	**2.94**	**0.0648**	0.0032	10	**0.652**
8/18/2011	<2.00		0.003	6.80	0.098	0.00028	0.0031	0.047	<0.000010	<0.000005	<0.05	**0.00090**	75	0.00040	0.00026	0.0018	0.37	0.0057	0.0043	15	0.109
9/23/2011	0.08		0.003	2.50	0.017	0.00025	0.0024	0.049	<0.000010	<0.000005	<0.05	**0.00079**	100	0.00020	0.00015	0.0007	0.16	0.0012	**0.0071**	**19**	0.134
10/24/2011	0.12	0.02	<0.005	1.70	0.016	0.00023	0.0024	0.052	<0.000010	<0.000005	<0.05	**0.00086**	110	0.00020	**0.00042**	0.0008	0.20	0.0021	**0.0087**	**20**	**0.284**
11/26/2011	0.15	0.31	<0.0020	1.68	0.007	0.00019	0.0018	0.053	<0.000010	<0.000005	<0.05	**0.00073**	**127**	0.00020	**0.00056**	0.0004	0.08	0.0009	**0.0097**	**24**	**0.549**
12/14/2011	0.17	0.08	0.005	1.21	0.011	0.00020	0.0034	0.057	<0.000010	<0.000005	<0.05	**0.00075**	121	<0.0001	**0.00060**	0.0005	0.23	0.0027	**0.0090**	**23**	**0.564**
1/13/2012	0.19	0.36	0.005	1.48	0.004	0.00016	0.0033	0.055	<0.000010	<0.000005	<0.05	**0.00056**	120	<0.00010	**0.00059**	0.0002	0.18	0.0011	**0.0098**	**23**	**0.446**
2/10/2012	0.20	0.12	0.003	1.92	0.004	0.00015	**0.0035**	0.056	<0.000010	<0.000005	<0.05	**0.00046**	125	<0.0001	**0.00052**	0.0003	0.18	0.0011	**0.0102**	**23**	**0.367**
3/10/2012	0.28	<0.20	0.004	0.97	0.004	0.00016	**0.0036**	0.055	<0.000010	<0.000005	<0.05	**0.00040**	**128**	<0.00010	**0.00043**	0.0002	0.17	0.0010	**0.0107**	**25**	**0.297**
3/11/2012																					
4/6/2012	0.22	0.07	<0.0020	0.53	0.003	0.00015	0.0029	0.051	<0.000010	<0.000005	<0.05	**0.00030**	120	<0.00010	**0.00031**	0.0002	0.13	0.0008	**0.0104**	**23**	0.165
5/1/2012	<0.20	**0.80**	**0.061**	**18.00**	0.125	0.00031	**0.0102**	0.040	0.000014	<0.000005	<0.05	**0.00224**	45	0.00024	**0.00123**	**0.0034**	**1.15**	**0.0206**	0.0030	9	**0.670**
5/7/2012	<0.05	**0.57**	0.026	**14.50**	0.074	0.00024	**0.0041**	0.028	<0.000010	**0.0000080**	<0.05	**0.00343**	41	0.00012	**0.00041**	**0.0031**	**0.47**	**0.0075**	0.0024	8	0.195
6/1/2012	<0.20	0.25	0.009	<0.50	0.036	0.00037	0.0023	0.039	**0.000015**	<0.000005	<0.05	**0.00049**	58	0.00017	0.00016	**0.0039**	0.15	0.0037	0.0052	13	0.072
7/5/2012	<0.20	0.21	0.004	2.94	0.014	0.00029	0.0026	0.047	<0.000010	<0.000005	<0.05	**0.00045**	107	<0.00010	0.00010	0.0006	0.13	0.0015	**0.0068**	**20**	0.077
7/16/2012																					
8/2/2012	<0.20	0.28	0.005	2.47	0.018	0.00024	0.0027	0.051	<0.000010	<0.000005	<0.05	**0.00052**	99	<0.00010	0.00013	0.0007	0.15	0.0018	**0.0070**	**19**	0.090
9/21/2012	<0.20	0.32	0.005	3.41	0.011	0.00022	0.0023	0.049	<0.000010	<0.000005	<0.05	**0.00072**	90	0.00046	0.00012	0.0006	0.14	0.0008	**0.0062**	18	0.121
10/15/2012	<0.20	0.26	0.003	2.30	0.006	0.00029	0.0021	0.056	<0.000010	<0.000005	<0.05	**0.00126**	104	0.00010	0.00011	0.0010	0.09	0.0010	**0.0076**	**20**	0.106
11/19/2012	<0.20	**0.89**	0.007	1.13	0.009	0.00019	0.0017	0.060	<0.000010	<0.000005	<0.05	**0.00069**	117	<0.00010	0.00029	0.0004	0.07	0.0015	**0.0083**	**23**	**0.329**
12/7/2012	0.19	0.09	0.002	1.28	0.009	0.00039	0.0019	0.061	<0.000010	<0.000005	<0.05	**0.00134**	122	<0.00010	0.00019	0.0004	0.07	0.0023	**0.0084**	**24**	**0.295**
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0035			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	24	16	24	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
median	0.19	0.26	0.0040	1.70	0.009	0.00024	0.0024	0.053	0.000010	0.000005	< 0.05	0.000724	115.0	0.00020	0.00019	0.00062	0.145	0.00166	0.0076	22.2	0.1650
mean	0.24	0.30	0.0075	4.23	0.059	0.00027	0.0035	0.052	0.000012	0.000007	< 0.05	0.000980	102.7	0.00028	0.00038	0.00134	0.303	0.00554	0.0073	19.5	0.2496
standard deviation	0.38	0.25	0.0123	5.56	0.187	0.00018	0.0034	0.011	0.000008	0.000007	< 0.00	0.000937	32.8	0.00031	0.00045	0.00199	0.593	0.01300	0.0025	5.7	0.1908
minimum	0.03	0.02	< 0.0020	0.50	0.003	0.00015	0.0017	0.027	< 0.000010	< 0.000005	< 0.05	0.000298	40.7	0.00010	0.00005	0.00018	0.027	0.00075	0.0024	8.2	0.0336
maximum	2.00	0.89	0.0605	19.40	0.946	0.00105	0.0179	0.080	0.000050	0.000040	< 0.05	0.004110	155.0	0.00160	0.00214	0.00940	2.940	0.06480	0.0107	29.0	0.6700
# < detection limit	9	1	4	1	0	0	0	0	22	23	25	0	0	9	0	0	0	0	0	0	0
% < detection limit	38%	6%	17%	4%	0%	0%	0%	0%	88%	92%	100%	0%	0%	36%	0%	0%	0%	0%	0%	0%	0%
# > background	1	3	1	4	1	1	5	0	2	2	0	25	5	1	10	4	3	3	19	18	10
% > background	4%	19%	4%	16%	4%	4%	20%	0%	8%	8%	0%	100%	20%	4%	40%	16%	12%	12%	76%	72%	40%
# > guideline	0				2		2				0	25		0		4	2	7			0
% > guideline	0%				8%		8%				0%	100%		0%		16%	8%	28%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.14: Water quality concentrations for KV-7, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/13/2011	<0.00001	**0.0004**	**0.0018**	0.005	0.44	0.00088	3.55	0.000013	1.57	0.23	82	0.000002	<0.00001	<0.0005	0.0028	<0.0002	**0.070**	0.0002
2/9/2011	<0.00001	0.0004	0.0015	<0.002	0.41	0.00082	3.27	<0.000005	1.40	0.25	82	<0.000002	<0.00001	<0.0005	0.0029	<0.0002	**0.077**	<0.0001
3/22/2011	<0.00001	**0.0004**	**0.0015**	0.009	**0.92**	0.00092	**4.49**	0.000006	**2.05**	0.28	**112**	<0.000002	0.00001	<0.0005	0.0031	<0.0002	**0.142**	<0.0001
4/19/2011	<0.00001	**0.0004**	0.0014	0.004	0.49	0.00082	4.08	<0.000005	1.66	0.28	**101**	<0.000002	<0.00001	<0.0005	0.0030	<0.0002	**0.077**	<0.0001
5/13/2011	<0.00001	0.0002	**0.0020**	0.016	**0.67**	0.00027	2.14	0.000033	0.70	0.10	34	0.000002	0.00007	0.0007	0.0008	<0.0002	**0.108**	<0.0001
6/22/2011	<0.00001	**0.0004**	0.0010	0.002	0.38	0.00067	2.77	0.000007	1.47	0.24	**90**	0.000003	0.00003	<0.0005	0.0025	<0.0002	**0.081**	<0.0001
7/20/2011	0.00001	**0.0005**	**0.0068**	**0.181**	<0.3	0.00034	3.12	**0.000732**	0.60	0.11	<50	**0.000036**	<0.0002	**0.0240**	0.0008	**0.0026**	**0.370**	**0.0007**
8/18/2011	<0.00001	0.0003	**0.0018**	0.016	0.27	0.00053	2.90	0.000027	0.98	0.16	48	0.000005	<0.00001	0.0028	0.0012	<0.0002	**0.104**	<0.0001
9/23/2011	<0.00001	**0.0005**	0.0014	0.006	0.38	0.00074	3.10	0.000011	1.25	0.21	68	0.000003	0.0001	0.0005	0.0024	<0.0002	**0.107**	<0.0001
10/24/2011	<0.00001	**0.0004**	**0.0017**	0.017	0.45	0.00092	3.30	0.000016	1.34	0.23	82	0.000003	0.00006	0.0005	0.0025	<0.0002	**0.141**	<0.0001
11/26/2011	<0.00001	**0.0004**	**0.0026**	0.006	0.45	0.00093	3.90	0.000006	1.60	0.24	87	0.000002	0.00013	<0.0005	0.0027	<0.0002	**0.131**	<0.0001
12/14/2011	<0.00001	0.0004	**0.0026**	0.002	0.41	0.00099	3.60	0.000009	1.52	0.24	86	0.000005	0.00003	<0.0005	0.0026	<0.0002	**0.115**	<0.0001
1/13/2012	<0.00001	**0.0004**	**0.0026**	0.004	0.43	0.00099	3.90	<0.000005	1.44	0.24	**105**	0.000002	<0.0002	<0.0005	0.0026	<0.0002	**0.095**	<0.0001
2/10/2012	<0.00001	0.0003	**0.0025**	0.005	0.46	0.00089	3.60	<0.000005	1.53	0.24	89	<0.000002	<0.0002	<0.0005	0.0029	<0.0002	**0.083**	<0.0001
3/10/2012	<0.00001	**0.0004**	**0.0022**	0.008	0.48	0.00093	3.80	<0.000005	1.59	0.25	**102**	0.0000030	<0.0002	<0.0005	0.0023	<0.0002	**0.067**	<0.0001
3/11/2012																		
4/6/2012	<0.00001	0.0004	**0.0021**	0.003	0.44	0.00086	3.50	<0.000005	1.57	0.25	**91**	<0.000002	<0.00020	<0.0005	0.0028	<0.0002	**0.055**	<0.0001
5/1/2012	0.000010	0.0002	**0.0035**	**0.054**	0.66	0.00029	1.96	**0.000100**	0.65	0.10	28	0.00001	<0.00020	0.0041	0.0008	0.0005	**0.225**	**0.0004**
5/7/2012	<0.00001	0.0002	**0.0027**	0.018	0.52	0.00033	1.82	0.000040	0.61	0.09	24	0.000004	<0.00020	0.0015	0.0007	0.0002	**0.338**	0.0001
6/1/2012	<0.00001	**0.0004**	**0.0017**	0.011	0.49	0.00045	2.04	**0.000254**	1.77	0.14	47	0.000003	<0.00020	0.0008	0.0014	<0.0002	**0.059**	<0.0001
7/5/2012	<0.00001	**0.0004**	0.0011	0.006	0.28	0.00067	3.26	0.000008	1.37	0.20	70	0.0000022	<0.00020	0.0007	0.0018	<0.0002	**0.061**	<0.0001
7/16/2012																		
8/2/2012	<0.00001	**0.0004**	0.0012	<0.002	0.29	0.00071	3.18	<0.000005	1.36	0.21	68	0.000002	<0.00020	<0.0005	0.0018	<0.0002	**0.068**	<0.0001
9/21/2012	<0.00001	**0.0004**	0.0013	<0.002	0.33	0.00044	2.74	<0.000005	1.17	0.20	61	<0.000002	<0.00020	<0.0005	0.0018	<0.0002	**0.096**	<0.0001
10/15/2012	<0.00001	**0.0004**	0.0013	0.004	0.41	0.00078	3.31	<0.000005	1.25	0.24	83	<0.000002	0.00029	<0.0005	0.0021	<0.0002	**0.159**	<0.0001
11/19/2012	<0.00001	**0.0004**	**0.0023**	0.002	0.42	0.00106	3.59	<0.000005	1.51	0.24	**89**	<0.000002	<0.00020	<0.0005	0.0027	<0.0002	**0.107**	<0.0001
12/7/2012	<0.00001	0.0003	**0.0021**	<0.002	0.42	0.00088	3.70	0.000012	1.57	0.25	87	0.000003	<0.00020	<0.0005	0.0026	<0.0002	**0.178**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
median	0.00001	0.00036	0.00178	0.005	0.43	0.00082	3.30	0.000007	1.44	0.238	82	0.000002	0.00020	0.0005	0.0025	0.0002	0.1040	0.0001
mean	0.00001	0.00036	0.00210	0.015	0.45	0.00072	3.22	0.000053	1.34	0.208	75	0.000004	0.00013	0.0017	0.0021	0.0003	0.1245	0.0001
standard deviation	0.00000	0.00006	0.00115	0.036	0.14	0.00024	0.68	0.000151	0.37	0.058	24	0.000007	0.00009	0.0047	0.0008	0.0005	0.0803	0.0001
minimum	< 0.00001	0.00021	0.00104	0.002	0.27	0.00027	1.82	< 0.000005	0.60	0.087	24	< 0.000002	< 0.00001	< 0.0005	0.0007	< 0.0002	0.0551	< 0.0001
maximum	0.00001	0.00049	0.00680	0.181	0.92	0.00106	4.49	0.000732	2.05	0.278	112	0.000036	0.00029	0.0240	0.0031	0.0026	0.3700	0.0007
# < detection limit	23	0	0	4	1	0	0	10	0	0	1	8	17	16	0	22	0	21
% < detection limit	92%	0%	0%	16%	4%	0%	0%	40%	0%	0%	4%	32%	68%	64%	0%	88%	0%	84%
# > background	0	16	17	2	2	0	1	3	1	0	7	1	0	1	0	1	25	2
% > background	0%	64%	68%	8%	8%	0%	4%	12%	4%	0%	28%	4%	0%	4%	0%	4%	100%	8%
# > guideline	0	0	0			1		2				0			0		25	
% > guideline	0%	0%	0%			4%		8%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.15: Water quality concentrations for KV-9A, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
10/27/2011		7.92	8.18		**953**	**920**	0.0	10.94	76	281	**30**	**557**	**532**				**225**		<0.005
11/28/2011		7.70	8.09			**989**	-0.1	**3.39**	**23**		9	**565**	**556**				**274**		<0.005
12/22/2011		**7.16**	8.10		**1044**	**1020**	-0.1	**6.78**	**46**		10	**586**	**579**				**302**		<0.005
1/23/2012		7.48	8.29		**1448**	**1140**	0.3	**9.62**	**67**		5	**648**	**661**				**333**		<0.005
2/16/2012	0																		
3/14/2012	0	**7.15**	8.09		**1271**	**1270**	-0.1	**5.45**	**37**	-38	**182**	**713**	**733**				**386**		<0.050
4/6/2012		7.52	8.08		**1495**	**1270**	-0.1	**8.16**	**56**	21	10	**721**	**751**				**380**		<0.005
5/2/2012		7.99	7.72		234	232	0.2	13.76	95	196	10	125	116				55		<0.050
6/4/2012	222	7.44	7.97		419	382	**9.3**	10.90	96	319	1	202	178				89		<0.050
7/7/2012	118	7.92	**8.36**		**753**	697	**13.3**	**9.71**	93	113	3	**398**	**415**				182		
8/3/2012	115	7.93	8.21		681	678	**10.5**	10.60	95	304	1	383	382				158		<0.050
9/23/2012	109	7.80	**8.32**			**729**	5.1	11.52	91	118	1	**395**	**400**				185		<0.050
10/14/2012	73	7.19	8.05		**983**	**950**	0.0	11.87	81	-2	3	**507**	**508**				**264**		<0.050
11/20/2012			8.04			**962**	0.1	**2.80**	**42**	345	9	**528**	**542**				**239**		**0.060**
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	7	12	13	0	10	13	13	13	13	10	13	13	13	0	0	0	13	0	12
median	109	7.61	8.09	-	968	950	0.1	9.71	76	156.7	9	528	532	-	-	-	239	-	0.050
mean	91	7.60	8.12	-	928	865	3.0	8.88	69	165.8	21	487	489	-	-	-	236	-	0.032
standard deviation	77	0.32	0.17	-	416	313	4.9	3.37	26	143.2	49	181	191	-	-	-	102	-	0.024
minimum	0	7.15	7.72	-	234	232	-0.1	2.80	23	-37.5	1	125	116	-	-	-	55	-	< 0.005
maximum	222	7.99	8.36	-	1495	1270	13.3	13.76	96	345.4	182	721	751	-	-	-	386	-	0.060
# < detection limit	0	0	0	-	0	0	0	0	0	0	0	0	0	-	-	-	0	-	11
% < detection limit	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	-	0%	-	92%
# > background		2	2	-	7	9	3	7	6	0	2	10	10	-	-	-	8	-	1
% > background		17%	15%	-	70%	69%	23%	54%	46%	0%	15%	77%	77%	-	-	-	62%	-	8%
# > guideline		0	0					5			2					-		-	0
% > guideline		0%	0%					38%			15%					-		-	0%

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light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.15: Water quality concentrations for KV-9A, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
10/27/2011	0.18	**0.48**	0.024	5.10	**0.17**	0.00057	**0.0046**	0.082	**0.000020**	<0.000005	<0.05	**0.00039**	**164**	0.00030	**0.00064**	0.0020	**1.04**	0.0048	**0.0089**	**36**	**0.713**
11/28/2011	0.17	**0.62**	<0.0020	6.47	0.03	0.00050	**0.0040**	**0.103**	<0.000010	<0.000005	<0.05	**0.00042**	**162**	0.00030	**0.00113**	0.0010	**1.67**	0.0044	**0.0095**	**39**	**1.890**
12/22/2011	0.05	**0.64**	0.007	6.58	0.02	0.00048	**0.0049**	**0.104**	<0.000010	<0.000005	<0.05	**0.00036**	**167**	0.00010	**0.00129**	**0.0374**	**1.79**	0.0019	**0.0086**	**41**	**2.470**
1/23/2012	0.11	**0.79**	0.008	8.58	0.03	0.00042	0.0030	**0.108**	<0.000010	<0.000005	<0.05	**0.00106**	**185**	0.00010	**0.00180**	0.0011	**1.00**	0.0020	**0.0105**	**45**	**3.400**
2/16/2012																					
3/14/2012	<0.20	**1.28**	**0.064**	**11.50**	**0.31**	0.00089	**0.0459**	**0.151**	**0.000030**	**0.000014**	<0.05	**0.00212**	**196**	**0.00090**	**0.00286**	**0.0064**	**20.20**	**0.0520**	**0.0118**	**54**	**4.070**
4/6/2012	0.09	**1.23**	0.008	**9.35**	0.02	0.00058	**0.0071**	**0.093**	<0.000010	<0.000005	<0.05	**0.00056**	**199**	0.00020	**0.00191**	0.0014	**2.50**	0.0048	**0.0118**	**54**	**3.990**
5/2/2012	<0.20	**0.59**	0.025	**13.50**	0.05	0.00055	**0.0035**	0.026	<0.000010	<0.000005	<0.05	**0.00050**	37	<0.00010	0.00026	0.0023	**0.81**	**0.0163**	0.0019	8	**0.501**
6/4/2012	<0.20	0.24	0.006	5.65	0.01	**0.00110**	0.0020	0.025	<0.000010	<0.000005	<0.05	**0.00016**	60	<0.00010	0.00009	0.0016	0.16	0.0028	0.0029	13	0.086
7/7/2012					0.01	0.00094	**0.0049**	0.051	<0.000010	<0.000005	<0.05	**0.00027**	116	<0.00010	0.00027	0.0012	**0.56**	**0.0083**	**0.0060**	**27**	**0.370**
8/3/2012	<0.20	0.41	0.005	6.68	0.01	0.00076	**0.0040**	0.048	<0.000010	<0.000005	<0.05	**0.00028**	112	<0.00010	0.00020	0.0010	0.40	0.0046	**0.0059**	**25**	**0.340**
9/23/2012	<0.20	0.36	0.005	5.65	0.01	0.00070	**0.0041**	0.054	<0.000010	<0.000005	<0.05	**0.00022**	114	<0.00010	0.00022	0.0008	**0.47**	0.0048	**0.0061**	**27**	**0.415**
10/14/2012	<0.20	**0.53**	0.006	5.06	0.01	0.00064	**0.0046**	0.082	<0.000010	<0.000005	<0.05	**0.00032**	**149**	<0.00010	**0.00048**	0.0010	**0.74**	**0.0063**	**0.0082**	**33**	**0.945**
11/20/2012	<0.20	**0.80**	0.013	6.74	0.01	0.00027	**0.0096**	**0.154**	<0.000010	<0.000005	<0.05	**0.00043**	**152**	0.00072	**0.00256**	0.0007	**3.53**	**0.0097**	**0.0069**	**36**	**5.960**
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0035			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	12	12	12	12	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
median	0.20	0.60	0.008	6.63	0.022	0.0006	0.0046	0.082	0.000010	0.000005	< 0.05	0.000394	152.0	0.00010	0.000635	0.00123	1.000	0.0048	0.0082	35.9	0.9450
mean	0.17	0.66	0.014	7.57	0.053	0.0006	0.0078	0.083	0.000012	0.000006	< 0.05	0.000544	139.4	0.00025	0.001053	0.00445	2.683	0.0094	0.0076	33.7	1.9346
standard deviation	0.05	0.32	0.017	2.67	0.088	0.0002	0.0116	0.042	0.000006	0.000002	< 0.00	0.000524	49.8	0.00026	0.000957	0.01001	5.348	0.0134	0.0031	14.0	1.8856
minimum	0.05	0.24	0.002	5.06	0.005	0.0003	0.0020	0.025	< 0.000010	< 0.000005	< 0.05	0.000157	36.5	< 0.00010	0.000089	0.00067	0.159	0.0019	0.0019	8.1	0.0864
maximum	0.20	1.28	0.064	13.50	0.309	0.0011	0.0459	0.154	0.000030	0.000014	< 0.05	0.002120	199.0	0.00090	0.002860	0.03740	20.200	0.0520	0.0118	54.3	5.9600
# < detection limit	7	0	1	0	0	0	0	0	11	12	13	0	0	6	0	0	0	0	0	0	0
% < detection limit	58%	0%	8%	0%	0%	0%	0%	0%	85%	92%	100%	0%	0%	46%	0%	0%	0%	0%	0%	0%	0%
# > background	0	9	1	3	2	1	11	6	2	1	0	13	8	1	8	2	11	5	11	11	12
% > background	0%	75%	8%	25%	15%	8%	85%	46%	15%	8%	0%	100%	62%	8%	62%	15%	85%	38%	85%	85%	92%
# > guideline	0				2		3				0	12		0		2	6	10			6
% > guideline	0%				15%		23%				0%	92%		0%		15%	46%	77%			46%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.15: Water quality concentrations for KV-9A, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
10/27/2011	<0.00001	0.0003	**0.0016**	0.020	**0.73**	0.00066	**4.80**	0.000031	**3.05**	0.34	**102**	0.000006	0.00006	0.0037	0.0016	**0.0008**	**0.069**	<0.0001
11/28/2011	<0.00002	**0.0004**	**0.0018**	0.011	**0.91**	0.00082	**4.70**	0.000030	**3.10**	**0.37**	**102**	0.000009	0.00012	0.0014	0.0018	0.0003	**0.087**	<0.0001
12/22/2011	<0.00001	0.0003	**0.0106**	0.010	**1.33**	0.00062	**5.10**	0.000014	**3.83**	**0.41**	**117**	0.000008	0.00003	0.0006	0.0017	<0.0002	**0.065**	0.0001
1/23/2012	<0.00001	0.0003	**0.0027**	0.012	**1.77**	0.00038	**6.10**	0.000015	**4.99**	**0.44**	**122**	0.000014	<0.00020	0.0007	0.0019	<0.0002	**0.111**	0.0001
2/16/2012																		
3/14/2012	<0.00001	0.0003	**0.0050**	**0.056**	**2.11**	0.00051	**7.20**	**0.000393**	**6.52**	**0.52**	**135**	**0.000038**	<0.00020	**0.0114**	0.0016	**0.0022**	**0.157**	**0.0007**
4/6/2012	<0.00001	**0.0004**	**0.0040**	0.017	**2.27**	0.00014	**6.70**	0.000021	**6.52**	**0.52**	**153**	0.000015	<0.00020	0.0007	0.0016	<0.0002	**0.058**	0.0002
5/2/2012	<0.00001	0.0002	0.0011	0.020	**0.71**	0.00013	1.63	**0.000097**	0.68	0.08	18	0.000011	<0.00020	0.0015	0.0002	0.0003	**0.058**	<0.0001
6/4/2012	<0.00001	0.0002	0.0007	0.007	0.47	0.00028	1.95	0.000026	1.28	0.15	29	0.000006	<0.00020	<0.0005	0.0004	<0.0002	**0.024**	<0.0001
7/7/2012	<0.00001	0.0003	0.0010	0.010	0.41	0.00025	3.41	0.000046	**2.64**	0.30	68	0.000015	<0.00020	<0.0005	0.0012	<0.0002	**0.024**	<0.0001
8/3/2012	<0.00001	**0.0004**	0.0009	<0.002	0.37	0.00018	3.52	0.000009	**2.05**	0.28	59	0.000009	<0.00020	<0.0005	0.0012	<0.0002	**0.024**	<0.0001
9/23/2012	<0.00001	0.0003	0.0009	0.004	**0.66**	0.00022	3.35	0.000012	**2.41**	0.30	73	0.000006	<0.00020	<0.0005	0.0012	<0.0002	**0.023**	<0.0001
10/14/2012	<0.00001	0.0003	0.0012	0.006	**0.82**	0.00029	**4.27**	0.000014	**2.88**	**0.37**	**107**	0.000007	0.00028	<0.0005	0.0015	<0.0002	**0.041**	<0.0001
11/20/2012	<0.00001	**0.0004**	**0.0030**	0.011	**1.03**	0.00009	**5.06**	0.000015	**3.47**	**0.40**	**93**	0.000010	<0.00020	0.0005	0.0010	<0.0002	**0.053**	0.0002
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
median	< 0.00001	0.00032	0.00164	0.011	0.82	0.00028	4.70	0.000021	3.05	0.366	102	0.000009	0.00020	0.0006	0.00145	0.0002	0.0578	0.0001
mean	< 0.00001	0.00031	0.00265	0.014	1.05	0.00035	4.45	0.000056	3.34	0.344	91	0.000012	0.00018	0.0018	0.00129	0.0004	0.0611	0.0002
standard deviation	0.00000	0.00007	0.00273	0.014	0.64	0.00023	1.68	0.000104	1.78	0.128	40	0.000008	0.00007	0.0030	0.00051	0.0006	0.0393	0.0002
minimum	< 0.00001	0.00016	0.00070	0.002	0.37	0.00009	1.63	0.000009	0.68	0.080	18	0.000006	0.00003	< 0.0005	0.00020	< 0.0002	0.0231	< 0.0001
maximum	< 0.00002	0.00041	0.01060	0.056	2.27	0.00082	7.20	0.000393	6.52	0.522	153	0.000038	0.00028	0.0114	0.00187	0.0022	0.1570	0.0007
# < detection limit	13	0	0	1	0	0	0	0	0	0	0	0	9	5	0	9	0	8
% < detection limit	100%	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%	69%	38%	0%	69%	0%	62%
# > background	1	4	7	1	10	0	8	2	11	7	8	1	0	1	0	2	13	1
% > background	8%	31%	54%	8%	77%	0%	62%	15%	85%	54%	62%	8%	0%	8%	0%	15%	100%	8%
# > guideline	0	0	0			0		1				0			0		13	
% > guideline	0%	0%	0%			0%		8%				0%			0%		100%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.16: Water quality concentrations for KV-9, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011		8.23	7.74	163		673	0.2				<1	337	362				160		
5/12/2011	1,179	7.80	7.54	133		233	1.6				3	121	113				60		
7/14/2011	541	7.86	8.04		409	421	**13.4**				<1	234	233				86		
10/23/2011	155	8.06	7.99		650	621	1.0	10.85	**29**	273	<1	326	344				139		<0.005
11/25/2011		7.99	8.19			617	1.9	**9.37**	**68**		<1	341	373				149		<0.005
12/16/2011		7.36	7.91		589	593	2.0	**6.87**	**50**		<1	318	348				128		<0.005
1/14/2012		7.20	8.14		561	598	0.9	**8.10**	**57**	281	<1	327	327				124		<0.005
2/15/2012		7.58	8.24		589	590	1.1	**9.34**	**66**	22	<1	320	361				112		<0.005
3/15/2012		7.62	8.26		606	595	0.2	**9.06**	**62**	49	10	307	314				123		<0.050
4/8/2012	12	7.88	8.14		640	606	0.5	**9.65**	**67**	99	<1	313	329				132		<0.005
5/4/2012	1,574	7.30	8.06		462	237	1.2				9	123	119				53		<0.050
6/7/2012	430	7.78	8.20		456	400	**9.2**	**9.80**	85	300	<1	220	221				87		<0.050
7/7/2012	244	7.91	**8.35**		615	561	**12.1**	**9.06**	84	116	<1	323	273				135		<0.050
8/3/2012	239	7.88	8.23		532	527	**11.3**	**9.40**	86	280	<1	299	281				110		<0.050
9/22/2012	245	7.73	8.27			570	5.1	10.68	84	92	<1	310	311				129		<0.050
10/12/2012	137	**6.70**	**8.32**		**708**	631	2.1	**10.22**	75	183	<1	335	336				148		<0.050
11/24/2012			8.21			588					1	316	315				136		<0.050
12/8/2012		7.18	8.18		660	585	2.0	**10.07**	73		4	312	303				136		<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	10	17	18	2	13	18	17	13	13	10	18	18	18	0	0	0	18	0	15
median	244	7.78	8.19	148	589	589	1.9	9.40	68	149.7	1	315	315	-	-	-	129	-	< 0.050
mean	475	7.65	8.11	148	575	536	3.9	9.42	68	169.6	2	288	292	-	-	-	119	-	< 0.029
standard deviation	506	0.39	0.21	21	89	128	4.6	1.06	16	106.8	3	68	76	-	-	-	30	-	< 0.023
minimum	12	6.70	7.54	133	409	233	0.2	6.87	29	22.4	1	121	113	-	-	-	53	-	< 0.005
maximum	1574	8.23	8.35	163	708	673	13.4	10.85	86	300.4	10	341	373	-	-	-	160	-	< 0.050
# < detection limit	0	0	0	0	0	0	0	0	0	0	13	0	0	-	-	-	0	-	15
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	72%	0%	0%	-	-	-	0%	-	100%
# > background		1	2	0	1	0	4	11	7	0	0	0	0	-	-	-	0	-	0
% > background		6%	11%	0%	8%	0%	24%	85%	54%	0%	0%	0%	0%	-	-	-	0%	-	0%
# > guideline		0	0					7			0					-		-	0
% > guideline		0%	0%					54%			0%					-		-	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.16: Water quality concentrations for KV-9, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011					0.006	0.00040	0.0014	**0.107**	<0.00001	<0.000005	<0.05	**0.00040**	96	0.00030	0.00009	0.0006	0.13	**0.0092**	0.0024	**24**	**0.253**
5/12/2011					0.027	**0.00183**	**0.0037**	0.019	<0.00001	<0.000005	<0.05	**0.00126**	34	0.00050	0.00013	**0.0044**	0.33	**0.0693**	0.0016	9	0.198
7/14/2011					0.008	**0.00139**	0.0026	0.035	<0.00001	<0.000005	<0.05	**0.00056**	66	0.00030	0.00005	0.0025	0.06	**0.0083**	0.0028	17	0.028
10/23/2011	0.1	0.07	<0.0050	4.70	0.008	0.00085	0.0019	0.063	<0.00001	<0.000005	<0.05	**0.00042**	95	0.00010	0.00006	0.0011	0.14	**0.0074**	0.0045	**22**	0.075
11/25/2011	0.15	0.30	<0.0020	4.35	0.034	0.00093	0.0034	**0.085**	<0.00001	<0.000005	<0.05	**0.00060**	95	<0.00010	0.00011	0.0022	0.36	**0.0402**	0.0031	**25**	0.212
12/16/2011	0.15	0.11	<0.0020	3.21	0.001	0.00054	0.0007	**0.087**	<0.00001	<0.000005	<0.05	**0.00020**	89	<0.00010	0.00004	0.0012	0.07	0.0006	0.0027	**23**	0.033
1/14/2012	0.15	0.14	<0.0020	2.83	0.005	0.00057	0.0007	**0.089**	<0.00001	<0.000005	<0.05	**0.00022**	93	<0.00010	0.00006	0.0014	0.06	0.0019	0.0027	**23**	0.029
2/15/2012	0.12	0.22	<0.0020	2.02	0.001	0.00050	0.0006	**0.083**	<0.00001	<0.000005	<0.05	**0.00018**	89	<0.00010	0.00005	0.0010	0.05	0.0011	0.0025	**24**	0.028
3/15/2012	<0.20	0.26	0.003	1.81	0.011	0.00066	0.0015	0.080	<0.00001	<0.000005	<0.05	**0.00030**	85	0.00010	0.00006	0.0011	0.17	**0.0146**	0.0027	**23**	0.079
4/8/2012	0.10	0.12	<0.0020	2.05	0.003	0.00043	0.0006	**0.092**	<0.00001	<0.000005	<0.05	**0.00023**	88	<0.00010	0.00005	0.0011	0.04	0.0006	0.0026	**23**	0.075
5/4/2012	0.21	0.33	0.025	**15.10**	0.038	**0.00159**	**0.0043**	0.024	<0.00001	<0.000005	<0.05	**0.00168**	35	<0.00010	0.00011	**0.0040**	**0.45**	**0.0784**	0.0015	9	**0.271**
6/7/2012	<0.20	0.21	0.005	5.50	0.007	**0.00139**	0.0020	0.038	<0.00001	<0.000005	<0.05	**0.00044**	63	<0.00010	0.00004	0.0017	0.06	**0.0085**	0.0028	15	0.025
7/7/2012	<0.20	0.24	0.005	5.52	0.010	**0.00130**	0.0024	0.051	<0.00001	<0.000005	<0.05	**0.00045**	93	<0.00010	0.00005	0.0018	0.07	0.0054	0.0038	**22**	0.025
8/3/2012	<0.20	0.29	0.003	6.62	0.003	**0.00099**	0.0024	0.050	<0.00001	<0.000005	<0.05	**0.00039**	85	<0.00010	0.00005	0.0015	0.06	0.0031	0.0038	**21**	0.023
9/22/2012	<0.20	0.24	0.004	5.93	0.005	0.00079	0.0023	0.052	<0.00001	<0.000005	<0.05	**0.00030**	88	<0.00010	0.00005	0.0010	0.10	0.0042	0.0040	**22**	0.025
10/12/2012	<0.20	0.26	<0.0020	4.63	0.003	0.00069	0.0018	0.065	<0.00001	<0.000005	<0.05	**0.00029**	95	<0.00010	0.00007	0.0014	0.09	0.0036	0.0040	**24**	0.043
11/24/2012	<0.20	0.22	0.004	2.65	0.001	0.00045	0.0007	**0.097**	<0.00001	<0.000005	<0.05	**0.00032**	88	0.00012	0.00005	0.0011	0.06	0.0009	0.0030	**24**	0.084
12/8/2012	0.04	0.19	0.005	2.71	0.059	**0.00112**	**0.0070**	**0.107**	<0.00001	<0.000005	<0.05	**0.00128**	87	<0.00010	0.00016	0.0023	**0.77**	**0.0700**	0.0027	**23**	**0.429**
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	15	15	15	15	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	0.20	0.22	0.0032	4.35	0.007	0.0008	0.0020	0.073	< 0.00001	< 0.000005	< 0.05	0.000394	87.9	0.00010	0.000057	0.00138	0.081	0.00639	0.0027	23.1	0.0586
mean	0.16	0.21	0.0047	4.64	0.013	0.0009	0.0022	0.068	< 0.00001	< 0.000005	< 0.05	0.000528	81.3	0.00015	0.000071	0.00174	0.170	0.01818	0.0030	20.6	0.1075
standard deviation	0.05	0.08	0.0058	3.29	0.016	0.0004	0.0016	0.028	0.00000	0.000000	0.00	0.000428	19.2	0.00011	0.000035	0.00103	0.191	0.02666	0.0008	5.0	0.1163
minimum	0.04	0.07	0.0020	1.81	0.001	0.0004	0.0006	0.019	< 0.00001	< 0.000005	< 0.05	0.000176	34.1	< 0.00010	0.000041	0.00057	0.040	0.00061	0.0015	8.7	0.0228
maximum	0.21	0.33	0.0250	15.10	0.059	0.0018	0.0070	0.107	< 0.00001	< 0.000005	< 0.05	0.001680	95.7	0.00050	0.000161	0.00439	0.767	0.07840	0.0045	25.2	0.4290
# < detection limit	7	0	7	0	0	0	0	0	18	18	18	0	0	12	0	0	0	0	0	0	0
% < detection limit	47%	0%	47%	0%	0%	0%	0%	0%	100%	100%	100%	0%	0%	67%	0%	0%	0%	0%	0%	0%	0%
# > background	0	0	0	1	0	7	3	8	0	0	0	18	0	0	0	2	2	9	0	14	3
% > background	0%	0%	0%	7%	0%	39%	17%	44%	0%	0%	0%	100%	0%	0%	0%	11%	11%	50%	0%	78%	17%
# > guideline	0				0		1				0	18		0		3	0	12			0
% > guideline	0%				0%		6%				0%	100%		0%		17%	0%	67%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.16: Water quality concentrations for KV-9, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/10/2011	<0.00001	0.0002	**0.0019**	<0.002	0.50	0.00004	2.25	<0.000005	1.81	0.21	49	0.000012	<0.00001	<0.0005	0.0011	<0.0002	**0.015**	<0.0001
5/12/2011	<0.00001	0.0002	**0.0250**	0.018	**0.80**	0.00005	1.82	**0.000264**	0.71	0.08	19	0.000028	0.00007	<0.0005	0.0002	<0.0002	**0.103**	<0.0001
7/14/2011	<0.00001	0.0002	0.0009	0.006	0.31	0.00010	2.62	**0.000050**	1.41	0.15	32	0.000017	0.00005	<0.0005	0.0005	<0.0002	**0.042**	<0.0001
10/23/2011	<0.00001	0.0003	0.0006	0.004	0.54	0.00022	3.10	**0.000063**	1.69	0.22	53	0.000009	<0.00001	<0.0005	0.0011	<0.0002	**0.031**	<0.0001
11/25/2011	<0.00001	0.0002	0.0006	0.009	0.60	0.00026	2.90	**0.000473**	1.89	0.20	53	0.000017	0.00005	0.0011	0.0011	0.0002	**0.045**	<0.0001
12/16/2011	<0.00001	0.0002	0.0003	<0.002	0.51	0.00022	2.60	<0.000005	1.73	0.20	43	0.000006	0.00004	<0.0005	0.0010	<0.0002	**0.016**	<0.0001
1/14/2012	<0.00001	0.0003	0.0004	0.002	0.58	0.00026	3.00	0.000012	**3.05**	0.19	51	0.000006	<0.0002	<0.0005	0.0010	<0.0002	**0.021**	<0.0001
2/15/2012	<0.00001	0.0002	0.0003	0.003	0.54	0.00014	2.60	0.000007	1.74	0.18	45	<0.000002	<0.00020	<0.0005	0.0011	<0.0002	0.013	<0.0001
3/15/2012	<0.00001	0.0002	0.0003	0.003	0.50	0.00021	2.40	**0.000153**	1.65	0.19	39	0.000008	**0.00040**	<0.0005	0.0011	<0.0002	**0.021**	<0.0001
4/8/2012	<0.00001	0.0003	0.0006	<0.002	0.50	0.00018	2.50	<0.000005	1.65	0.19	41	0.000005	<0.00020	<0.0005	0.0011	<0.0002	**0.026**	<0.0001
5/4/2012	<0.00001	0.0001	0.0011	0.020	**0.69**	0.00009	1.68	**0.000359**	0.71	0.08	17	0.000031	<0.00020	0.0013	0.0002	<0.0002	**0.101**	<0.0001
6/7/2012	<0.00001	0.0002	0.0006	0.003	0.45	0.00015	1.97	**0.000080**	1.31	0.15	31	0.0000121	<0.00020	<0.0005	0.0006	<0.0002	**0.037**	<0.0001
7/7/2012	<0.00001	0.0003	0.0006	0.004	0.46	0.00012	2.93	0.000032	**2.00**	0.21	47	0.0000169	<0.00020	0.0006	0.0009	<0.00020	**0.031**	<0.0001
8/3/2012	<0.00001	0.0003	0.0006	<0.002	0.41	0.00011	3.06	0.000013	1.75	0.20	40	0.0000120	<0.00020	<0.0005	0.0009	<0.00020	**0.028**	<0.0001
9/22/2012	<0.00001	0.0003	0.0006	0.002	0.56	0.00012	3.01	0.000012	1.81	0.22	48	0.0000080	<0.00020	<0.0005	0.0010	<0.00020	**0.025**	<0.0001
10/12/2012	<0.00001	0.0003	0.0006	<0.002	0.54	0.00012	3.20	0.000008	**1.98**	0.23	53	0.0000080	<0.00020	<0.0005	0.0011	<0.0002	**0.026**	<0.0001
11/24/2012	<0.00001	0.0003	0.0006	0.003	0.57	0.00006	2.66	0.000006	**1.99**	0.20	45	0.000008	<0.00020	<0.0005	0.0011	<0.0002	**0.021**	<0.0001
12/8/2012	<0.00001	0.0002	0.0012	0.015	0.60	0.00004	2.67	**0.000681**	1.87	0.20	49	0.000023	<0.00020	0.0017	0.0011	0.0002	**0.065**	0.0002
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
median	< 0.00001	0.00022	0.00061	0.003	0.54	0.00012	2.64	0.000022	1.75	0.198	45	0.000011	0.00020	0.0005	0.00104	0.0002	0.0271	0.0001
mean	< 0.00001	0.00023	0.00205	0.006	0.54	0.00014	2.61	0.000124	1.71	0.182	42	0.000013	0.00016	0.0006	0.00089	0.0002	0.0371	0.0001
standard deviation	0.000000	0.00005	0.00574	0.006	0.11	0.00007	0.45	0.000195	0.51	0.043	11	0.000008	0.00010	0.0003	0.00030	0.0000	0.0267	0.0000
minimum	< 0.00001	0.00014	0.00030	< 0.002	0.31	0.00004	1.68	< 0.000005	0.71	0.076	17	< 0.000002	< 0.00001	< 0.0005	0.00016	< 0.0002	0.0133	< 0.0001
maximum	< 0.00001	0.00030	0.02500	0.020	0.80	0.00026	3.20	0.000681	3.05	0.226	53	0.000031	0.00040	0.0017	0.00113	0.0002	0.1030	0.0002
# < detection limit	18	0	0	5	0	0	0	3	0	0	0	1	13	14	0	16	0	17
% < detection limit	100%	0%	0%	28%	0%	0%	0%	17%	0%	0%	0%	6%	72%	78%	0%	89%	0%	94%
# > background	0	0	2	0	2	0	0	8	4	0	0	0	1	0	0	0	17	0
% > background	0%	0%	11%	0%	11%	0%	0%	44%	22%	0%	0%	0%	6%	0%	0%	0%	94%	0%
# > guideline	0	0	0			0		5				0			0		15	
% > guideline	0%	0%	0%			0%		28%				0%			0%		83%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.17: Water quality concentrations for KV-38, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	**L/s**	**pH units**	**pH units**	**µS/cm**	**µS/cm**	**µS/cm**	**C**	**mg/L**	**%**	**mV**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011		8.12	7.56	173			0.1				1.0	78	72	44	53		40		
5/25/2011		7.73	**7.39**	77			4.3				13.0	34	34	12	15		22		
7/14/2011		7.75	**7.37**	129	128		**5.7**				3.0	61	60	26	32		31		
10/30/2011	**2,367**	7.86	7.66	180	185		0.6	10.6	74	271	<1	87	78	41	50		41		<0.05
12/18/2011	205	7.56	7.72	182	183		0.0	13.0	89		<1.0	83	80				43		
1/18/2012	100	7.62	7.72	186	174		0.0	11.7	80	**369**	<1.0	80	84				43		<0.005
2/9/2012	169	7.84	7.93	180	186		0.1	14.1	97	172	<1.0	87	85	46	56		43		<0.005
3/9/2012	134	7.44	7.80	185	188		-0.1	12.7	87	0	1.8	88	85				42		<0.05
4/7/2012	107	8.20	7.90	188	217		0.1	15.7	108	210	<1.0	86	87				42		<0.005
5/6/2012	128	7.74	7.82	181	173		0.9	13.5	95	71	<1.0	86	84	44	54	<0.50	43		<0.005
6/1/2012	**998**	7.68	7.65	122	95		2.6				1.9	51	51				30		<0.05
7/2/2012	**1,545**	7.64	7.58	140	152		4.6	12.7	99	91	7.3	67	64	28	35	<0.50	35		<0.05
8/1/2012	668	**7.13**	7.73	178	198		4.9	13.5	105	105	<1.0	84	86				48		<0.05
9/20/2012	647	7.95	7.88	187			4.2	12.3	94	90	<1.0	85	87				53		<0.05
10/16/2012			7.76	184							<1.0	89	85	38	46	<0.50	50		<0.05
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	11	14	15	15	11	0	14	10	10	9	15	15	15	8	8	3	15	0	11
median	205	7.74	7.72	180.00	182.50	-	0.75	12.87	94.45	105.30	1.00	84.40	83.60	39.50	48.20	0.50	42.30	-	0.05
mean	643	7.73	7.70	164.80	170.87	-	2.00	12.97	92.72	153.35	2.47	76.39	74.79	34.94	42.63	0.50	40.38	-	0.03
standard deviation	737	0.27	0.17	32.69	34.31	-	2.25	1.38	10.63	114.33	3.35	16.13	15.69	11.87	14.26	0.00	8.14	-	0.02
minimum	100	7.13	7.37	77.00	94.69	-	-0.10	10.58	73.70	0.09	1.00	34.30	34.40	12.00	15.00	0.50	22.00	-	0.01
maximum	2367	8.20	7.93	188.00	217.30	-	5.70	15.71	107.70	369.40	13.00	89.10	87.20	45.80	55.80	0.50	53.40	-	0.05
# < detection limit	0	0	0	0	0	-	0	0	0	0	9	0	0	0	0	3	0	-	11
% < detection limit	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	60%	0%	0%	0%	0%	100%	0%	-	100%
# > background		1	2	0	0	-	1	0	0	1	0	0	0	0	0	0	0	-	0
% > background	0%	7%	13%	0%	0%	-	7%	0%	0%	11%	0%	0%	0%	0%	0%	0%	0%	-	0%
# > guideline		0	0			-		0			0					0		-	0
% > guideline	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.17: Water quality concentrations for KV-38, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011			0.006	<0.5	0.004	0.00024	0.0025	0.062	<0.00001	<0.000005	<0.05	0.00007	24	0.00040	0.00002	0.0001	0.03	0.0002	0.0011	4	0.005
5/25/2011			0.009	4.60	0.077	0.00043	**0.0050**	0.033	<0.00001	<0.000005	<0.05	**0.00078**	10	0.00030	0.00015	0.0016	0.20	**0.0103**	<0.0005	2	0.032
7/14/2011			0.004	2.80	0.039	0.00039	0.0031	0.042	<0.00001	**0.000009**	<0.05	**0.00029**	19	0.00040	0.00005	0.0013	0.07	0.0013	0.0007	4	0.009
10/30/2011	<0.2	0.20	0.005	0.90	0.006	0.00025	0.0023	0.060	<0.00001	<0.000005	<0.05	0.00009	27	<0.0001	0.00001	0.0002	0.02	0.0002	0.0011	5	0.004
12/18/2011					0.004	0.00022	0.0026	0.059	<0.00001	<0.000005	<0.05	0.00008	25	0.00020	0.00001	0.0003	0.02	0.0001	0.0011	5	0.003
1/18/2012	0.18	0.04	0.007	<0.50	0.003	0.00024	0.0026	0.061	<0.00001	<0.000005	<0.05	0.00008	25	0.00020	0.00001	0.0002	0.02	0.0004	0.0013	5	0.003
2/9/2012	0.27	0.04	0.008	0.92	0.003	0.00022	0.0025	0.057	<0.00001	<0.000005	<0.05	0.00008	27	<0.0001	0.00001	0.0002	0.01	0.0001	0.0011	5	0.002
3/9/2012	0.26	<0.20	0.010	<0.50	0.011	0.00025	0.0028	0.059	<0.00001	<0.000005	<0.05	0.00010	27	0.00010	0.00004	0.0003	0.04	0.0037	0.0012	5	0.006
4/7/2012	0.16	0.04	0.004	<0.50	0.002	0.00025	0.0026	0.056	<0.00001	<0.000005	<0.05	0.00008	26	<0.0001	0.00001	0.0002	0.01	0.0001	0.0011	5	0.002
5/6/2012	0.10	**0.51**	0.007	1.29	0.007	0.00027	0.0030	0.057	<0.000010	<0.0000050	<0.050	0.00011	26	<0.00010	0.00001	0.0005	0.03	0.0003	0.0011	5	0.004
6/1/2012	<0.20	0.23	0.010	2.70	0.036	0.00029	0.0030	0.042	<0.000010	<0.0000050	<0.050	**0.00042**	15	0.00011	0.00005	0.0013	0.07	0.0013	0.0006	3	0.008
7/2/2012	<0.20	<0.20	0.008	1.80	0.040	0.00027	0.0033	0.044	<0.000010	<0.0000050	<0.050	**0.00017**	21	0.00026	0.00007	0.0008	0.12	0.0018	0.0006	4	0.013
8/1/2012	<0.20	0.24	0.004	0.94	0.006	0.00027	0.0026	0.056	<0.000010	<0.0000050	<0.050	**0.00017**	26	<0.00010	0.00003	0.0004	0.03	0.0002	0.0009	5	0.007
9/20/2012	<0.20	<0.20	0.005	1.02	0.007	0.00026	0.0027	0.059	<0.000010	<0.0000050	<0.050	0.00014	26	<0.00010	0.00002	0.0004	0.03	0.0001	0.0008	5	0.006
10/16/2012	<0.20	0.22		0.72	0.065	0.00028	**0.0062**	0.069	<0.000010	<0.0000050	<0.050	**0.00031**	28	0.00019	0.00021	0.0013	0.38	0.0048	0.0010	5	0.044
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	11	11	13	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
median	0.20	0.20	0.01	0.93	0.01	0.00	0.00	0.06	0.00001	0.00	0.05	0.00	25.60	0.00	0.00	0.00	0.03	0.00	0.00	4.71	0.01
mean	0.20	0.19	0.01	1.41	0.02	0.00	0.00	0.05	0.00	0.00	0.05	0.00	23.44	0.00	0.00	0.00	0.07	0.00	0.00	4.35	0.01
standard deviation	0.04	0.13	0.00	1.20	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	5.12	0.00	0.00	0.00	0.10	0.00	0.00	0.84	0.01
minimum	0.10	0.04	0.00	0.50	0.00	0.00	0.00	0.03	0.00	0.00	0.05	0.00	10.40	0.00	0.00	0.00	0.01	0.00	0.00	2.03	0.00
maximum	0.27	0.51	0.01	4.60	0.08	0.00	0.01	0.07	0.00	0.00	0.05	0.00	27.90	0.00	0.00	0.00	0.38	0.01	0.00	5.10	0.04
# < detection limit	6	3	0	4	0	0	0	0	15	14	15	0	0	6	0	0	0	0	1	0	0
% < detection limit	55%	27%	0%	29%	0%	0%	0%	0%	100%	93%	100%	0%	0%	40%	0%	0%	0%	0%	7%	0%	0%
# > background	0	1	0	0	0	0	2	0	0	1	0	6	0	0	0	0	0	1	0	0	0
% > background	0%	9%	0%	0%	0%	0%	13%	0%	0%	7%	0%	40%	0%	0%	0%	0%	0%	7%	0%	0%	0%
# > guideline	0				0		1				0	6		0		0	0	3			0
% > guideline	0%	0%	0%	0%	0%	0%	7%	0%	0%	0%	0%	40%	0%	0%	0%	0%	0%	20%	0%	0%	0%

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dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.17: Water quality concentrations for KV-38, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2/8/2011	<0.00001	0.0003	0.0003	0.007	0.17	0.00062	3.57	<0.000005	0.99	0.09	11	<0.000002	<0.00001	<0.0005	0.0002	<0.0002	0.007	<0.0001
5/25/2011	<0.00001	0.0001	0.0009	**0.029**	0.32	0.00031	1.46	**0.000056**	0.30	0.03	<10	0.000003	<0.00001	0.0015	0.0001	<0.0002	**0.067**	<0.0001
7/14/2011	<0.00001	0.0001	0.0006	0.008	0.12	0.00039	2.21	0.000009	0.56	0.06	11	<0.000002	0.00004	<0.0005	0.0001	<0.0002	**0.026**	<0.0001
10/30/2011	<0.00001	0.0002	0.0002	0.003	0.16	0.00075	3.60	<0.000005	0.91	0.08	16	<0.000002	0.00010	<0.0005	0.0002	<0.0002	0.008	<0.0001
12/18/2011	<0.00001	0.0002	0.0003	0.004	0.16	0.00076	3.40	<0.000005	1.01	0.09	15	<0.000002	0.00004	<0.0005	0.0002	<0.0002	0.008	<0.0001
1/18/2012	<0.00001	0.0002	0.0002	0.009	0.19	0.00078	3.70	0.000022	1.04	0.09	17	<0.000002	<0.0002	<0.0005	0.0002	<0.0002	0.008	<0.0001
2/9/2012	<0.00001	0.0002	0.0002	0.007	0.18	0.00080	3.70	<0.000005	1.06	0.09	16	<0.000002	<0.0002	<0.0005	0.0002	<0.0002	0.007	<0.0001
3/9/2012	<0.00001	0.0002	0.0002	0.020	0.19	0.00080	3.70	0.000006	1.10	0.09	15	<0.000002	<0.0002	<0.0005	0.0002	<0.0002	0.010	<0.0001
4/7/2012	<0.00001	0.0002	0.0002	0.004	0.17	0.00080	3.50	<0.000005	1.13	0.09	15	<0.000002	<0.0002	<0.0005	0.0003	<0.0002	0.007	<0.0001
5/6/2012	<0.00001	0.0002	0.0003	0.006	0.26	0.00092	3.36	<0.000005	1.08	0.09	16	<0.0000020	<0.00020	<0.00050	0.0003	<0.00020	0.011	<0.00010
6/1/2012	<0.00001	0.0001	0.0009	0.010	0.23	0.00045	1.74	**0.000081**	0.61	0.06	10	<0.0000020	<0.00020	0.0006	0.0001	<0.00020	**0.039**	<0.00010
7/2/2012	<0.00001	0.0001	0.0006	0.006	0.08	0.00045	2.17	0.000017	0.51	0.06	14	<0.0000020	<0.00020	0.0008	0.0001	<0.00020	**0.015**	<0.00010
8/1/2012	<0.00001	0.0002	0.0004	<0.0020	0.10	0.00067	2.90	<0.000005	0.78	0.08	17	<0.0000020	<0.00020	<0.00050	0.0001	<0.00020	**0.016**	<0.00010
9/20/2012	<0.00001	0.0002	0.0003	0.003	0.15	0.00070	2.72	<0.000005	0.75	0.08	19	<0.0000020	<0.00020	<0.00050	0.0001	<0.00020	0.011	<0.00010
10/16/2012	<0.00001	0.0001	0.0006	**0.026**	0.15	0.00071	3.44	0.000014	0.78	0.09	20	0.000002	<0.00020	0.0024	0.0002	<0.00020	**0.022**	<0.00010
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
median	0.00	0.00	0.00	0.01	0.17	0.00	3.40	0.00	0.91	0.09	15.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
mean	0.00	0.00	0.00	0.01	0.17	0.00	3.01	0.00	0.84	0.08	14.80	0.00	0.00	0.00	0.00	0.00	0.02	0.00
standard deviation	0.00	0.00	0.00	0.01	0.06	0.00	0.77	0.00	0.25	0.02	3.10	0.00	0.00	0.00	0.00	0.00	0.02	0.00
minimum	0.00	0.00	0.00	0.00	0.08	0.00	1.46	0.00	0.30	0.03	10.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
maximum	0.00	0.00	0.00	0.03	0.32	0.00	3.70	0.00	1.13	0.09	20.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
# < detection limit	15	0	0	1	0	0	0	8	0	0	1	13	12	11	0	15	0	15
% < detection limit	100%	0%	0%	7%	0%	0%	0%	53%	0%	0%	7%	87%	80%	73%	0%	100%	0%	100%
# > background	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	6	0
% > background	0%	0%	0%	13%	0%	0%	0%	13%	0%	0%	0%	0%	0%	0%	0%	0%	40%	0%
# > guideline	0	0	0			0		0				0			0		4	
% > guideline	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	27%	0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH

Table A.18: Water quality concentrations for KV-41, 2011-2012.

Analytes	Discharge (Flow)	pH (field)	pH (lab)	Conductivity (field)	Specific Conductance (field)	Specific Conductance (lab)	Temperature (field)	Dissolved Oxygen (field)	Dissolved Oxygen (field)	ORP (field)	Total Suspended Solids	Hardness (from total)	Hardness (from dissolved)	Total Alkalinity	Alkalinity bicarbonate HCO3	Chloride	Dissolved Sulphate	Ammonia (N)	Nitrite (N)
Sample Date	L/s	pH units	pH units	µS/cm	µS/cm	µS/cm	C	mg/L	%	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/12/2011		7.98	7.51	161		246	0.2				4	123	115	52	64		69	<0.005	<0.005
2/8/2011		7.97	7.70	112		251	0.0				3	118	99	54	66		64	0.014	<0.005
3/22/2011		8.11	7.70	140		256	1.2				4	127	123	60	74		70	0.013	<0.005
4/19/2011			7.83	**331**		256	0.6				1	127	126	60	73		67	0.007	<0.005
5/13/2011		7.92	7.64	136		248	0.8				2	116	117	55	67		59	0.008	<0.005
6/21/2011	1,055	**8.52**	7.66	92		148	**5.3**				**70**	69	69	33	40		35	**0.032**	0.033
7/13/2011	1,075	7.92	7.67		167	160	**7.8**				**29**	78	77	37	45		37	**0.037**	0.021
8/17/2011	1,713	8.29	7.98			180	**5.2**				**41**	82	85	35	43		47	0.022	<0.500
9/17/2011	973	**7.03**	7.80		158	194	2.6				**34**	88	87	45	55		44	0.012	0.005
9/23/2011	767	8.04	7.91		189	190	4.0				**140**	90	87	44	54		45	0.023	0.018
10/30/2011	404	7.89	7.72		218	204	0.8	10.86	76	277	3	97	94	48	58		50	**0.043**	<0.05
11/20/2011		7.87	7.75		217	226	0.1	14.00	96	156	<1	110	98	54	66		61		<0.005
12/18/2011			7.70			221					3	110	111	50	61		56	<0.005	<0.005
12/18/2011	268	7.66	7.65		226	223	0.0	13.15	90		3	103	103	50	61		60	**0.048**	<0.005
1/17/2012	251	8.48	7.63		220	231	0.0	11.90	82	**351**	4	108	100	54	66		55	0.022	<0.005
2/13/2012		7.53	7.88		240	243	0.1	14.50	100	184	3	109	118	54	66		60	0.017	0.022
3/9/2012	182	7.46	7.98		244	245	0.0	13.38	92	60	2	115	113	57	70		60	0.014	<0.050
4/7/2012		7.69	7.95			254	0.1			209	<1	118	116	57	70		61	0.012	<0.005
5/1/2012	202	8.20	7.86		249	252	1.4	13.92	99	203	**53**	122	120	54	66	**2.4**	60	0.010	0.052
5/31/2012	1,656	7.78	7.62		98	123	4.1				**246**	60	51	29	35	1.1	26	**0.053**	<0.050
7/2/2012	1,958	7.79	7.49		164	154	**5.2**	12.51	99	81	**540**	96	67	33	40	1.1	35	**0.034**	0.052
7/8/2012		7.90	7.82		182	173	**6.0**	12.20	98	106	**197**	85	74	37	46		40	0.016	<0.050
8/1/2012	884	7.51	7.75		213	194	**6.4**	13.12	107	103	**166**	101	95	43	52	0.66	50	**0.034**	<0.050
9/21/2012	795	7.73	7.74		220	200	3.7	12.66	96	102	13	85	88	41	50	0.67	52	0.014	<0.050
10/16/2012	566	7.67	7.83		227	201	1.1	13.05	92	193	5	95	93	46	56	0.58	50	0.015	<0.050
11/18/2012		**6.84**	**7.04**		239	221	0.3	**8.60**	76		5	108	108	51	63	<0.50	56	0.013	**0.073**
11/18/2012		**6.84**	7.98		239	223	0.3	**8.60**	76		7	110	111	53	65	0.96	58	0.017	<0.050
12/6/2012		**6.76**	7.86		267	241	0.0			145	9	110	108	57	70	0.76	64	**0.071**	<0.005
guideline		6.5-9.0						6.5 - 9.5			25.7					120	309	0.019	0.060
background	8 - 711	7.17 - 8.49	7.44 - 8.30	275	699	714	5.2	10.3	72	349	20.7	384	389	93	113	1.3	221	0.031	0.056
n	15	26	28	6	19	28	27	14	14	13	28	28	28	28	28	9	28	27	28
median	795	7.83	7.75	138	220	222	0.8	12.86	94	156.1	5	108	100	51	62	0.76	56	0.016	0.022
mean	850	7.75	7.74	162	209	213	2.1	12.32	91	166.8	57	102	98	48	59	0.97	53	0.023	0.044
standard deviation	572	0.47	0.19	86	41	37	2.5	1.82	10	82.5	115	17	19	9	11	0.58	11	0.016	0.092
minimum	182	6.76	7.04	92	98	123	0.0	8.60	76	59.8	< 1	60	51	29	35	0.50	26	0.005	< 0.005
maximum	1958	8.52	7.98	331	267	256	7.8	14.50	107	351.2	540	127	126	60	74	2.40	70	0.071	0.500
# < detection limit	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	2	20
% < detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	0%	0%	0%	0%	11%	0%	7%	71%
# > background		5	1	1	0	0	6	2	0	1	10	0	0	0	0	1	0	8	2
% > background		19%	4%	17%	0%	0%	22%	14%	0%	8%	36%	0%	0%	0%	0%	11%	0%	30%	7%
# > guideline		0	0					2			10					0		11	2
% > guideline		0%	0%					14%			36%					0%		41%	7%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.18: Water quality concentrations for KV-41, 2011-2012.

Analytes	Nitrate (N)	Total Kjeldahl Nitrogen	Total Phosphate	Dissolved Organic Carbon	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Boron (B)	Total Cadmium (Cd)	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011	0.26			0.60	0.032	0.00036	0.0010	0.048	<0.00001	<0.000005	<0.05	0.00008	38	0.00080	0.00010	0.0007	0.08	0.0020	0.0018	6.6	0.011
2/8/2011	**0.33**		0.007	0.60	0.021	0.00030	0.0009	0.049	<0.00001	<0.000005	<0.05	0.00004	37	0.00040	0.00007	0.0003	0.04	0.0005	0.0018	6.2	0.006
3/22/2011	0.27		0.007	0.50	0.030	0.00024	0.0010	0.052	<0.00001	<0.000005	<0.05	0.00005	40	0.00050	0.00012	0.0005	0.07	0.0008	0.0017	6.9	0.012
4/19/2011	0.21		0.007	1.10	0.018	0.00023	0.0009	0.051	<0.00001	<0.000005	<0.05	0.00005	40	0.00040	0.00006	0.0004	0.03	0.0005	0.0015	6.8	0.006
5/13/2011	0.23		0.003	2.10	0.039	0.00030	0.0010	0.048	<0.00001	<0.000005	<0.05	0.00007	36	0.00040	0.00005	0.0008	0.06	0.0008	0.0016	6.4	0.006
6/21/2011	<0.02		0.007	1.30	**0.890**	0.00032	**0.0036**	0.065	**0.000030**	<0.000020	<0.05	**0.00019**	21	**0.00240**	**0.00129**	**0.0060**	**1.48**	0.0051	0.0017	4.2	0.068
7/13/2011	0.03		0.011	1.70	**3.520**	0.00074	**0.0114**	**0.125**	**0.000120**	**0.00006**	<0.05	**0.00052**	23	**0.00700**	**0.00463**	**0.0253**	**6.31**	**0.0195**	**0.0055**	5.0	0.205
8/17/2011	<2.00		0.004	2.40	**0.294**	0.00032	0.0025	0.059	0.000010	<0.000005	<0.05	**0.00022**	25	0.00070	**0.00043**	0.0025	**0.56**	**0.0066**	0.0014	4.8	0.027
9/17/2011	0.11		**0.033**	1.70	**0.245**	0.00025	0.0025	0.064	0.000010	<0.000005	<0.05	**0.00019**	27	0.00040	**0.00059**	0.0025	0.30	0.0033	0.0017	5.0	0.036
9/23/2011	0.10		**0.136**	1.00	**1.060**	0.00032	**0.0042**	**0.084**	**0.000060**	**0.000019**	<0.05	**0.00028**	27	**0.00220**	**0.00185**	**0.0090**	**1.50**	**0.0078**	0.0028	5.2	0.072
10/30/2011	<0.2	0.30	0.006	1.10	0.050	0.00029	0.0014	0.052	<0.00001	<0.000005	<0.05	0.00007	30	0.00020	0.00008	0.0005	0.06	0.0010	0.0016	5.5	0.006
11/20/2011	0.25	0.21	0.005	1.10	0.018	0.00028	0.0010	0.045	<0.00001	<0.000005	<0.05	0.00001	34	0.00010	0.00002	0.0004	0.02	0.0000	0.0018	6.3	0.002
12/18/2011	0.25		0.006	0.54	0.047	<0.00050	0.0009	0.047	<0.0001	<0.001000	<0.05	0.00006	34	**0.00100**	<0.000500	0.0006	0.07	0.0003	<0.0050	6.2	0.004
12/18/2011	0.26	0.04	0.006	<0.50	0.021	0.00022	0.0010	0.048	<0.00001	<0.000005	<0.05	0.00006	32	0.00010	0.00004	0.0004	0.03	0.0003	0.0015	5.7	0.003
1/17/2012	0.30	0.03	0.010	0.72	0.018	0.00023	0.0010	0.050	<0.00001	<0.000005	<0.05	0.00006	34	<0.00010	0.00005	0.0004	0.03	0.0005	0.0015	5.8	0.005
2/13/2012	0.25	0.10	0.007	0.50	0.024	0.00023	0.0009	0.050	<0.00001	<0.000005	<0.05	0.00004	34	0.00010	0.00004	0.0009	0.03	0.0004	0.0016	5.9	0.004
3/9/2012	**0.33**	<0.20	0.009	<0.50	0.023	0.00022	0.0009	0.051	<0.00001	<0.000005	<0.05	0.00005	36	0.00010	0.00006	0.0008	0.04	0.0005	0.0017	6.3	0.006
4/7/2012	0.31	0.04	0.003	<0.50	0.011	0.00027	0.0008	0.049	<0.00001	<0.000005	<0.05	0.00005	36	<0.00010	0.00002	0.0003	0.02	0.0005	0.0016	6.6	0.003
5/1/2012	**2.63**	0.17	**0.065**	2.12	**0.344**	0.00053	0.0027	0.071	**0.000025**	0.0000060	<0.05	**0.00023**	38	0.00073	**0.00060**	**0.0036**	**0.75**	**0.0099**	0.0020	6.9	0.047
5/31/2012	<0.20	**0.44**	**0.250**	3.63	**1.000**	0.00036	**0.0043**	**0.109**	**0.000082**	0.0000059	<0.05	**0.00061**	17	**0.00198**	**0.00212**	**0.0094**	**2.91**	**0.0114**	0.0022	4.1	0.158
7/2/2012	**0.39**	<0.20	**0.652**	2.21	**2.330**	0.00047	**0.0091**	**0.202**	**0.000175**	**0.0000595**	<0.05	**0.00113**	28	**0.00463**	**0.00523**	**0.0247**	**7.54**	**0.0296**	0.0032	6.5	**0.414**
7/8/2012	<0.20		**0.302**	0.57	**0.723**	0.00037	**0.0045**	**0.111**	**0.000062**	**0.0000262**	<0.05	**0.00051**	26	**0.00140**	**0.00180**	**0.0088**	**2.34**	**0.0114**	0.0019	4.9	0.180
8/1/2012	<0.20	0.34	**0.181**	0.94	**0.715**	0.00038	**0.0036**	**0.107**	**0.000058**	**0.0000140**	<0.05	**0.00040**	30	**0.00132**	**0.00161**	**0.0076**	**1.94**	**0.0095**	0.0023	6.0	0.108
9/21/2012	<0.20	<0.20	0.018	0.97	0.100	0.00026	0.0018	0.055	<0.00001	<0.000005	<0.05	0.00012	26	0.00015	0.00014	0.0009	0.11	0.0013	0.0013	4.8	0.009
10/16/2012	<0.20	0.22	0.008	0.58	0.033	0.00025	0.0015	0.055	<0.00001	<0.000005	<0.05	0.00008	30	0.00014	0.00006	0.0007	0.06	0.0008	0.0015	4.9	0.007
11/18/2012	<0.20	**0.66**	0.014	0.62	0.053	0.00026	0.0013	0.055	<0.00001	<0.000005	<0.05	0.00009	34	0.00041	0.00010	0.0010	0.11	0.0028	0.0015	6.0	0.010
11/18/2012	**0.42**		0.013	<0.50	0.042	0.00025	0.0012	0.052	<0.00001	<0.000005	<0.05	0.00007	34	0.00044	0.00009	0.0010	0.09	0.0016	0.0015	6.1	0.008
12/6/2012	0.27	**0.65**	0.018	3.06	0.071	0.00030	0.0014	0.058	<0.00001	<0.000005	<0.05	0.00016	34	0.00030	0.00016	0.0025	0.15	**0.0091**	0.0016	6.3	0.014
guideline	3.00				0.10		0.0050				1.50	0.00016		0.00890	0.0025	0.0024	1.00	0.0032			1.0
background	0.31	0.44	0.027	9.26	0.15	0.00096	0.0034	0.082	0.000015	0.000007	0.05	0.00016	126	0.00088	0.00029	0.0028	0.41	0.0058	0.0054	18	0.243
n	28	15	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
median	0.25	0.20	0.0090	0.96	0.048	0.00030	0.0013	0.053	0.00001	0.000005	< 0.05	0.000081	33.7	0.00041	0.000110	0.00091	0.082	0.00145	0.0017	6.0	0.0097
mean	0.38	0.25	0.0662	1.20	0.420	0.00032	0.0024	0.068	0.00003	0.000047	< 0.05	0.000196	31.4	0.00102	0.000781	0.00401	0.953	0.00492	0.0020	5.8	0.0514
standard deviation	0.56	0.20	0.1413	0.85	0.796	0.00012	0.0025	0.034	0.00004	0.000187	0.00	0.000244	5.7	0.00154	0.001338	0.00661	1.870	0.00686	0.0010	0.8	0.0910
minimum	< 0.02	0.03	0.0030	0.50	0.011	0.00022	0.0008	0.045	< 0.00001	< 0.000005	< 0.05	0.000007	17.4	< 0.00010	0.000019	0.00025	0.016	0.00005	0.0013	4.1	0.0020
maximum	2.63	0.66	0.6520	3.63	3.520	0.00074	0.0114	0.202	0.00018	0.001000	< 0.05	0.001130	39.7	0.00700	0.005230	0.02530	7.540	0.02960	0.0055	6.9	0.4140
# < detection limit	9	3	0	4	0	1	0	0	18	21	28	0	0	2	1	0	0	0	1	0	0
% < detection limit	32%	20%	0%	14%	0%	4%	0%	0%	64%	75%	100%	0%	0%	7%	4%	0%	0%	0%	4%	0%	0%
# > background	6	3	7	0	10	0	7	6	9	7	0	10	0	8	11	8	9	9	1	0	1
% > background	21%	20%	26%	0%	36%	0%	25%	21%	32%	25%	0%	36%	0%	29%	39%	29%	32%	32%	4%	0%	4%
# > guideline	0				10		2				0	10		0		11	7	11			0
% > guideline	0%				36%		7%				0%	36%		0%		39%	25%	39%			0%

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.18: Water quality concentrations for KV-41, 2011-2012.

Analytes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
Sample Date	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1/12/2011	<0.00001	0.0003	0.0005	0.019	0.22	0.00093	3.63	0.000040	1.11	0.096	21	0.000003	0.00019	0.0007	0.0007	0.0003	0.011	**0.0003**
2/8/2011	<0.00001	0.0002	0.0004	0.007	0.20	0.00089	3.16	<0.000005	1.02	0.094	19	<0.000002	<0.00001	0.0008	0.0006	<0.0002	0.008	<0.0001
3/22/2011	<0.00001	0.0003	0.0004	0.007	0.20	0.00100	3.47	0.000010	1.10	0.097	23	<0.000002	<0.00001	0.0007	0.0007	<0.0002	0.008	<0.0001
4/19/2011	<0.00001	0.0003	0.0004	0.006	0.20	0.00107	3.45	<0.000005	1.09	0.102	20	<0.000002	<0.00001	<0.0005	0.0007	<0.0002	0.007	<0.0001
5/13/2011	<0.00001	0.0003	0.0005	0.005	0.23	0.00081	3.38	0.000011	1.10	0.088	22	0.000002	0.00001	0.0014	0.0007	<0.0002	0.009	<0.0001
6/21/2011	<0.00001	0.0002	**0.0036**	**0.064**	<0.30	0.00047	3.03	**0.000105**	0.50	0.061	<50	0.000021	<0.00020	**0.0250**	0.0003	**0.0025**	**0.017**	**0.0003**
7/13/2011	0.00003	**0.0005**	**0.0121**	**0.165**	0.50	0.00053	**6.86**	**0.000520**	0.60	0.072	<50	**0.000048**	<0.00020	**0.1000**	0.0007	**0.0089**	**0.047**	**0.0007**
8/17/2011	<0.00001	0.0002	0.0014	**0.041**	0.14	0.00056	2.80	**0.000060**	0.62	0.071	18	0.000005	<0.00001	**0.0087**	0.0002	**0.0009**	**0.019**	<0.0001
9/17/2011	<0.00001	0.0002	0.0013	**0.029**	0.18	0.00072	3.00	**0.000093**	0.74	0.080	17	0.000006	0.00004	**0.0065**	0.0004	**0.0008**	**0.017**	0.0001
9/23/2011	<0.00001	0.0002	**0.0042**	**0.077**	0.28	0.00063	**4.20**	**0.000261**	0.76	0.082	16	0.000016	0.00011	**0.0320**	0.0004	**0.0032**	**0.023**	**0.0009**
10/30/2011	<0.00001	0.0002	0.0004	0.007	0.20	0.00084	3.10	0.000012	0.95	0.089	19	<0.000002	0.00007	0.0013	0.0004	<0.0002	0.006	<0.0001
11/20/2011	<0.00001	0.0003	0.0002	0.004	0.20	**0.00112**	3.70	<0.000005	1.12	0.085	21	<0.000002	0.00005	<0.0005	0.0000	<0.0002	0.003	<0.0001
12/18/2011	<0.00005	<0.00100	**0.0020**	<0.01	0.17	0.00090	3.31	<0.00002	1.04	0.091	17	<0.00005	<0.00500	<0.005	0.0005	<0.005	0.007	<0.0005
12/18/2011	<0.00001	0.0002	0.0003	0.005	0.17	0.00103	3.00	0.000008	0.97	0.089	18	<0.000002	0.00002	0.0008	0.0004	<0.0002	0.005	<0.0001
1/17/2012	<0.00001	0.0002	0.0002	0.007	0.19	**0.00117**	3.50	0.000006	1.02	0.090	22	<0.000002	<0.00020	<0.0005	0.0005	<0.0002	0.006	<0.0001
2/13/2012	<0.00001	0.0002	0.0004	0.006	0.19	0.00103	3.00	<0.000005	1.07	0.092	18	<0.000002	<0.00020	<0.0005	0.0006	<0.0002	0.005	<0.0001
3/9/2012	<0.00001	0.0002	0.0004	0.008	0.22	**0.00117**	3.40	0.000006	1.82	0.089	21	<0.000002	<0.00020	<0.0005	0.0005	<0.0002	0.007	<0.0001
4/7/2012	<0.00001	0.0003	0.0003	<0.002	0.21	0.00108	3.10	<0.000005	1.37	0.095	21	<0.000002	<0.00020	<0.0005	0.0006	<0.0002	0.006	<0.0001
5/1/2012	<0.00001	0.0003	**0.0016**	**0.041**	0.36	**0.00109**	3.55	0.000035	1.50	0.097	22	0.000010	<0.00020	**0.0077**	0.0009	**0.0015**	**0.018**	**0.0011**
5/31/2012	<0.00001	0.0002	**0.0059**	**0.243**	0.35	0.00046	3.00	0.000022	0.62	0.061	<10	0.000027	<0.00020	**0.0213**	0.0004	**0.0038**	**0.042**	**0.0004**
7/2/2012	<0.00001	0.0003	**0.0137**	**0.681**	0.39	0.00059	**5.38**	**0.000312**	0.71	0.081	14	**0.000050**	<0.00020	**0.0480**	0.0008	**0.0096**	**0.080**	**0.0006**
7/8/2012	<0.00001	0.0002	**0.0044**	**0.226**	0.26	0.00061	3.42	**0.000200**	0.64	0.076	14	0.000021	<0.00020	**0.0212**	0.0004	**0.0029**	**0.036**	**0.0003**
8/1/2012	<0.00001	0.0001	**0.0042**	**0.172**	0.24	0.00068	3.91	**0.000162**	0.94	0.089	18	0.000018	<0.00020	**0.0171**	0.0004	**0.0026**	**0.029**	0.0002
9/21/2012	<0.00001	0.0002	0.0005	0.011	0.15	0.00084	2.54	0.000006	0.78	0.083	18	<0.000002	<0.00020	0.0023	0.0002	<0.0002	0.011	<0.0001
10/16/2012	<0.00001	0.0002	0.0004	0.010	0.17	0.00087	3.23	0.000007	0.80	0.086	20	<0.000002	**0.00082**	0.0014	0.0003	<0.0002	0.008	<0.0001
11/18/2012	<0.00001	0.0002	0.0006	0.010	0.20	0.00091	3.18	0.000005	1.09	0.093	20	0.000004	<0.00020	0.0016	0.0004	<0.0002	0.012	<0.0001
11/18/2012	<0.00001	0.0002	0.0005	0.015	0.19	**0.00111**	3.51	0.000005	1.09	0.088	20	0.000002	<0.00020	0.0014	0.0004	<0.0002	**0.014**	<0.0001
12/6/2012	<0.00001	0.0002	0.0007	0.019	0.54	0.00096	3.07	0.000027	1.35	0.096	23	<0.000002	<0.00020	0.0021	0.0005	0.0002	**0.018**	<0.0001
guideline	0.00026	0.0730	0.0960			0.00100		0.000100				0.000800			0.0150		0.017	
background	0.00001	0.0004	0.0015	0.020	0.66	0.00109	4.10	0.000047	1.95	0.35	89	0.000034	0.00033	0.0048	0.0033	0.0005	0.014	0.0003
n	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
median	0.00001	0.00023	0.00053	0.010	0.20	0.00090	3.35	0.000012	1.02	0.0890	20	0.000002	0.00020	0.0015	0.00044	0.0002	0.0107	0.0001
mean	0.00001	0.00026	0.00219	0.068	0.24	0.00086	3.50	0.000070	0.98	0.0861	21	0.000011	0.00033	0.0111	0.00049	0.0016	0.0170	0.0003
standard deviation	0.00001	0.00016	0.00342	0.139	0.10	0.00022	0.84	0.000121	0.30	0.0103	9	0.000015	0.00093	0.0210	0.00020	0.0025	0.0168	0.0003
minimum	< 0.00001	0.00014	0.00016	< 0.002	0.14	0.00046	2.54	< 0.000005	0.50	0.0606	10	< 0.000002	< 0.00001	< 0.0005	0.00004	< 0.0002	0.0025	< 0.0001
maximum	0.00005	0.00100	0.01370	0.681	0.54	0.00117	6.86	0.000520	1.82	0.1020	50	0.000050	0.00500	0.1000	0.00090	0.0096	0.0801	0.0011
# < detection limit	27	1	0	2	1	0	0	6	0	0	3	14	20	7	0	16	0	18
% < detection limit	96%	4%	0%	7%	4%	0%	0%	21%	0%	0%	11%	50%	71%	25%	0%	57%	0%	64%
# > background	2	2	9	10	0	5	3	8	0	0	0	3	2	11	0	11	12	9
% > background	7%	7%	32%	36%	0%	18%	11%	29%	0%	0%	0%	11%	7%	39%	0%	39%	43%	32%
# > guideline	0	0	0			9		6				0			0		9	
% > guideline	0%	0%	0%			32%		21%				0%			0%		32%	

Bold - value greater than background, or less than background for dissolved oxygen and pH.
light grey - value greater than guideline, or less than guideline for dissolved oxygen and pH.
dark grey - value greater than 2x guideline, or less than 2x guideline for dissolved oxygen and pH.

Table A.19: Comparison of 95th percentile for reference stations with and without KV-60.

Parameter	95th with KV-60	95th without KV-60
Laboratory Measures		
Non-Metals and Nutrients		
Hardness (from total)	378.1	383.5
Hardness (from dissolved)	379.2	388.5
Dissolved Sulphate	220.05	220.85
Total Suspended Solids	23.3	20.7
Nitrite (N)	0.050	0.056
Nitrate (N)	0.3151	0.3133
Total Kjeldahl Nitrogen	0.450	0.435
Dissolved Organic Carbon	9.674	9.255
Total Phosphate	0.0278	0.0271
Total Alkalinity	92.6	93.0
Alkalinity bicarbonate HCO3	112.8	113.3
Ammonia (N)	0.0305	0.0308
Specific Conductance (lab)	704	714
Chloride	1.26	1.32
pH (lab)	8.35	8.30
Total Metals		
Total Aluminum (Al)	0.182	0.153
Total Antimony (Sb)	0.00096	0.00096
Total Arsenic (As)	0.00397	0.00342
Total Barium (Ba)	0.099	0.082
Total Beryllium (Be)	0.000017	0.000015
Total Bismuth (Bi)	0.000008	0.000007
Total Boron (B)	0.05	0.05
Total Cadmium (Cd)	0.00039	0.00016
Total Calcium (Ca)	123.7	125.5
Total Chromium (Cr)	0.000878	0.000875
Total Cobalt (Co)	0.00050	0.00029
Total Copper (Cu)	0.00363	0.00280
Total Iron (Fe)	0.4412	0.4085
Total Lead (Pb)	0.00821	0.00579
Total Lithium (Li)	0.00521	0.00537
Total Magnesium (Mg)	21.79	18.40
Total Manganese (Mn)	0.201	0.243
Total Mercury (Hg)	0.00001	0.00001
Total Molybdenum (Mo)	0.00155	0.00035
Total Nickel (Ni)	0.0029	0.0015
Total Phosphorus (P)	0.0203	0.0202
Total Potassium (K)	0.719	0.660
Total Selenium (Se)	0.00118	0.00109
Total Silicon (Si)	4.10	4.10
Total Silver (Ag)	0.000092	0.000047
Total Sodium (Na)	1.92	1.95
Total Strontium (Sr)	0.348	0.354
Total Sulphur (S)	85.3	89.1
Total Thallium (Tl)	0.000038	0.000034
Total Tin (Sn)	0.00031	0.00033
Total Titanium (Ti)	0.0050	0.0048
Total Uranium (U)	0.00315	0.00326
Total Vanadium (V)	0.00062	0.00052
Total Zinc (Zn)	0.0208	0.0138
Total Zirconium (Zr)	0.00031	0.00027
Field Measures		
Discharge (Flow)	662	711
Temperature (field)	5.7	5.2
Dissolved Oxygen (field) mg/L	15.63	15.72
Dissolved Oxygen (field) %	109	109
Conductivity (field)	256	275
Specific Conductance (field)	680	699
pH (field)	8.49	8.49
ORP (field)	349.1	349.4

Table A.20: Ammonia guidelines determined by pH and temperature, based on table within CCME guideline. Shading denotes concentration greate than guideline.

Station	Date	Temperature	pH	Ammonia	Guideline
KV-6	1/12/2011	0.0	7.85	0.046	2.33
	2/8/2011	0.0	8.11	0.14	2.33
	3/22/2011	0.5	7.73	0.1	2.33
	4/19/2011	0.8	-	0.089	-
	5/25/2011	12.1	7.84	-	-
	6/22/2011	10.5	8.23	0.018	1.04
	7/13/2011	12.8	7.88	0.043	0.715
	8/17/2011	8.1	7.78	-	-
	9/24/2011	4.4	7.52	0.009	4.84
	10/29/2011	0.4	7.66	0.063	7.32
	11/21/2011	0.1	7.49	0.035	7.32
	12/14/2011	-0.1	7.36	0.18	7.32
	1/15/2012	0.0	7.30	0.11	7.32
	2/13/2012	-0.1	7.21	0.13	23.1
	3/11/2012	-0.1	7.10	0.12	23.1
	4/8/2012	0.1	7.69	0.12	7.32
	5/1/2012	1.9	7.67	0.036	7.32
	5/7/2012	2.3	7.93	0.032	2.33
	6/3/2012	11	7.92	0.025	1.04
	7/4/2012	13.1	7.93	0.059	0.715
	8/1/2012	12.9	7.82	0.028	0.715
	9/23/2012	5.6	7.75	0.012	1.54
	10/15/2012	0.6	7.56	0.036	7.32
	11/21/2012	0.1	8.00	0.057	2.33
KV-7	1/13/2011	0.1	8.40	0.24	0.749
	2/9/2011	0	8.21	0.033	2.33
	3/22/2011	0.1	8.02	0.016	2.33
	4/19/2011	0.9	-	0.026	-
	5/13/2011	0.5	7.66	0.016	7.32
	6/22/2011	8.1	8.47	0.037	0.343
	7/20/2011	4.1	8.40	-	-
	8/18/2011	5.3	7.30	0.026	4.84
	9/23/2011	2.7	8.18	0.13	1.54
	10/24/2011	0.3	8.20	0.038	2.33
	11/26/2011	-0.1	8.19	0.037	2.33
	12/14/2011	-0.1	8.14	0.088	2.33
	1/13/2012	0	7.80	0.042	2.33
	2/10/2012	-0.1	7.88	0.053	2.33
	3/10/2012	-0.1	7.82	0.043	2.33
	3/11/2012	-0.1	7.83	-	2.33
	4/6/2012	0	7.86	0.031	2.33
	5/1/2012	0.2	8.05	0.027	2.33
	5/7/2012	0.7	8.17	0.0092	2.33
	6/1/2012	6.8	7.73	-	1.54
	7/5/2012	7.2	8.20	0.024	1.54
	8/2/2012	6.7	8.06	0.03	1.54
	9/21/2012	3.8	8.01	0.0074	1.54
	10/15/2012	-0.1	7.80	0.024	2.33
	11/19/2012	0	8.12	0.034	2.33
	12/7/2012	0.05	7.08	0.052	23.1
KV-41	1/12/2011	0.2	7.98	< 0.005	2.33
	2/8/2011	0	7.97	0.014	2.33
	3/22/2011	1.2	8.11	0.013	2.33
	4/19/2011	0.6	-	0.007	-
	5/13/2011	0.8	7.92	0.008	2.33
	6/21/2011	5.3	8.52	0.032	0.502
	7/13/2011	7.8	7.92	0.037	1.04
	8/17/2011	5.2	8.29	0.022	0.502
	9/17/2011	2.6	7.03	0.012	15.3
	9/23/2011	4	8.04	0.023	1.54
	10/30/2011	0.8	7.89	0.043	2.33
	11/20/2011	0.1	7.87	-	-
	12/18/2011	-	-	< 0.005	-
	12/18/2011	0	7.66	0.048	7.32
	1/17/2012	0	8.48	0.022	0.749
	2/13/2012	0.1	7.53	0.017	7.32
	3/9/2012	0	7.46	0.014	7.32
	4/7/2012	0.1	7.69	0.012	7.32
	5/1/2012	1.4	8.20	0.01	2.33
	5/31/2012	4.1	7.78	0.053	1.54
	7/2/2012	5.2	7.79	0.034	1.54
	7/8/2012	6	7.90	0.016	1.54
	8/1/2012	6.4	7.51	0.034	4.84
	9/21/2012	3.7	7.73	0.014	4.84
	10/16/2012	1.1	7.67	0.015	7.32
	11/18/2012	0.3	6.84	0.013	23.1
	11/18/2012	0.3	6.84	0.017	23.1
	12/6/2012	0.02	6.76	0.071	23.1

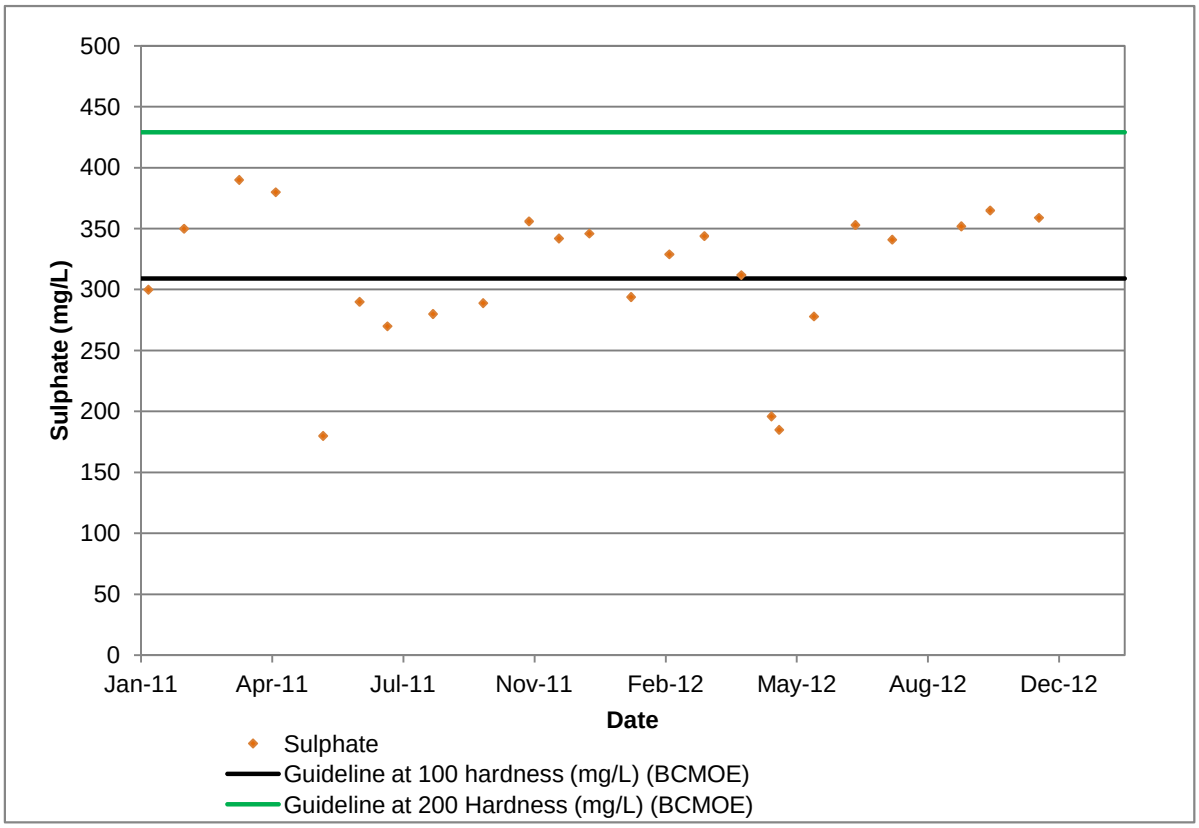


Figure A.1: Sulphate values for station KV-6, UKHM 2011-2012.

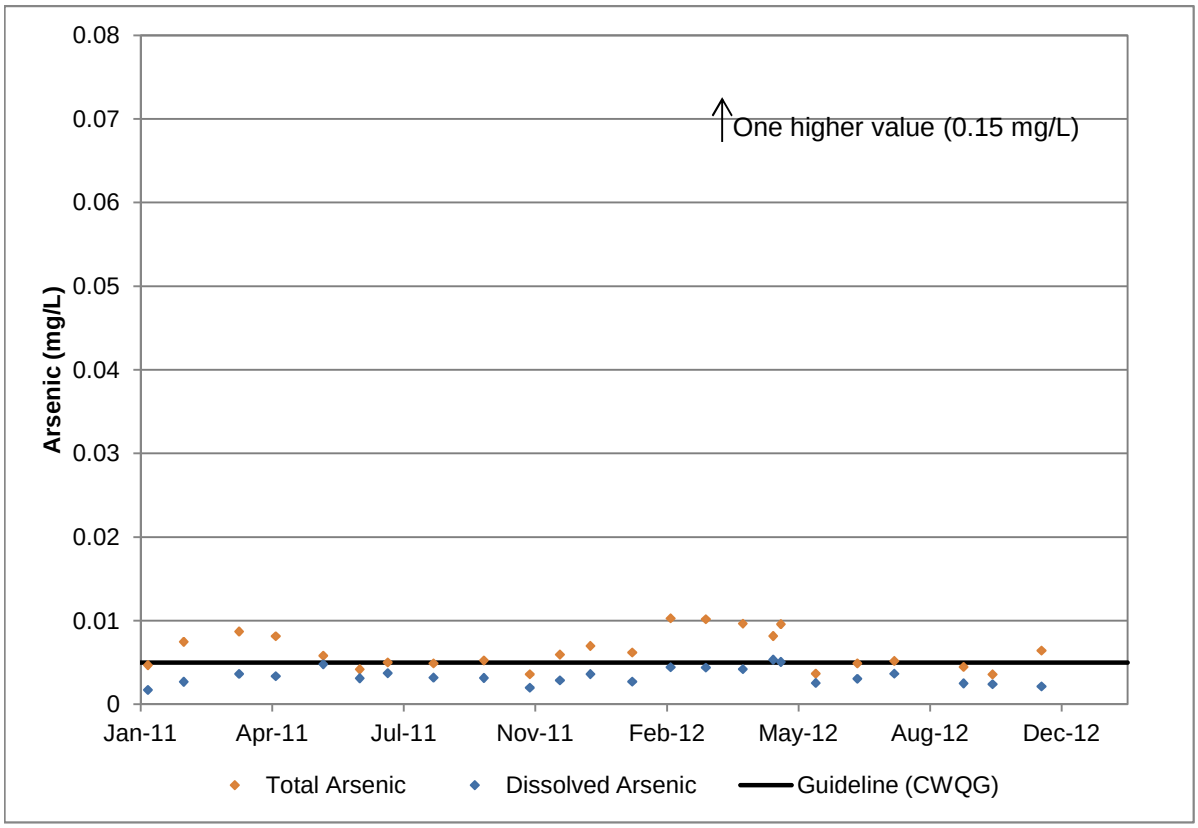


Figure A.2: Arsenic values for station KV-6, UKHM 2011-2012.

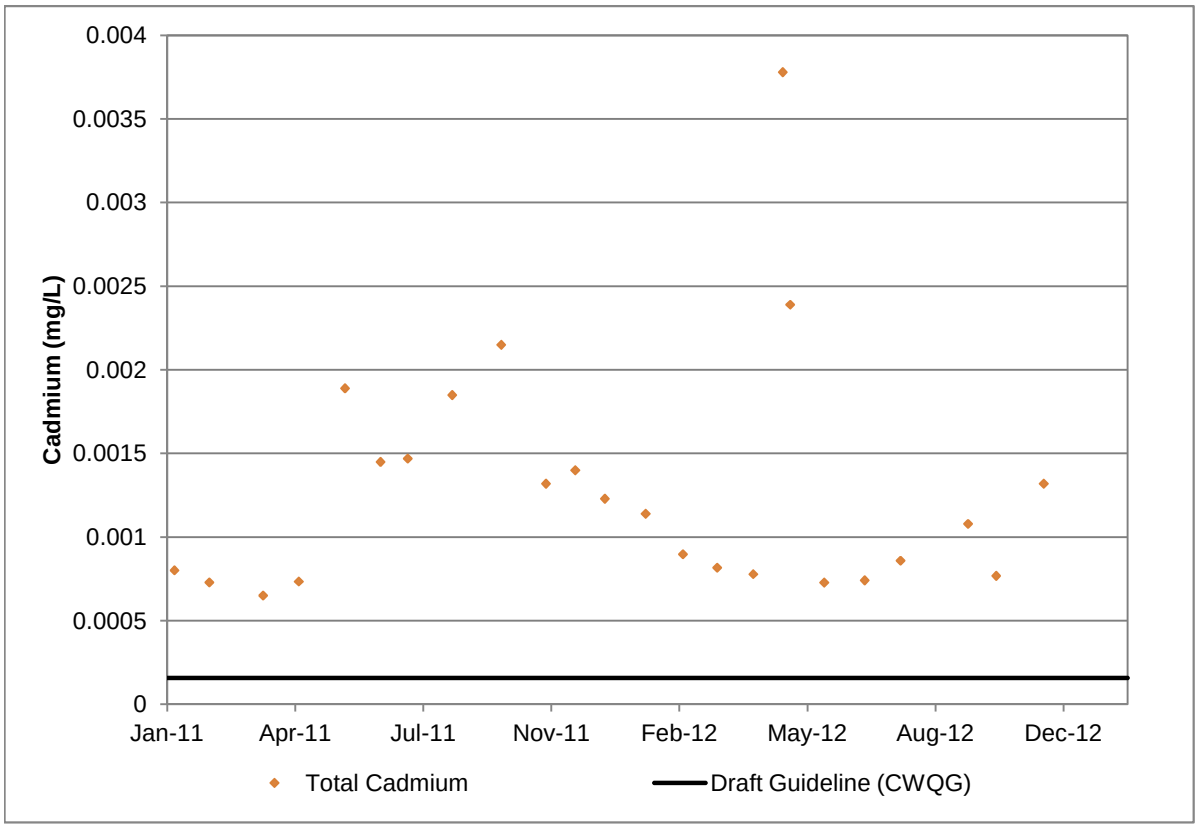


Figure A.3: Cadmium values for station KV-6, UKHM 2011-2012.

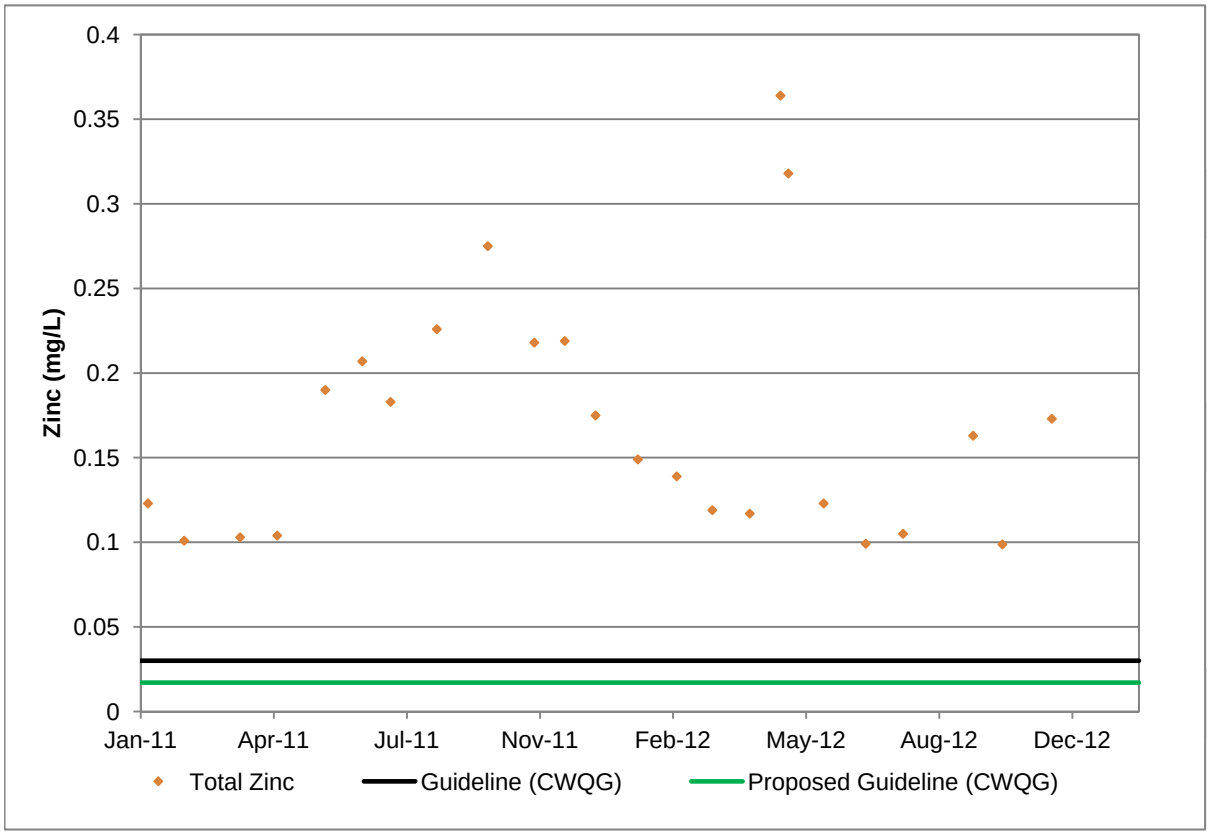


Figure A.4: Zinc values for station KV-6, UKHM 2011-2012.

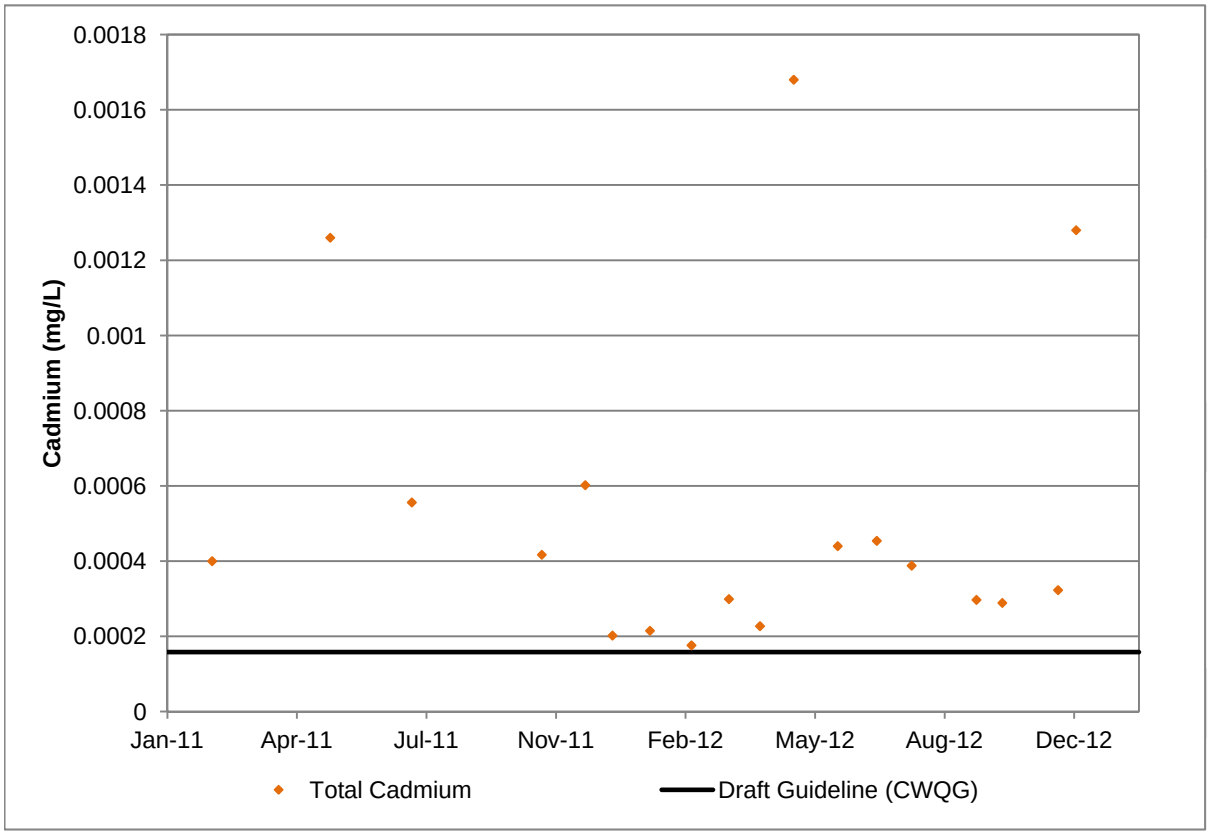


Figure A.5: Cadmium values for station KV-9, UKHM 2011-2012.

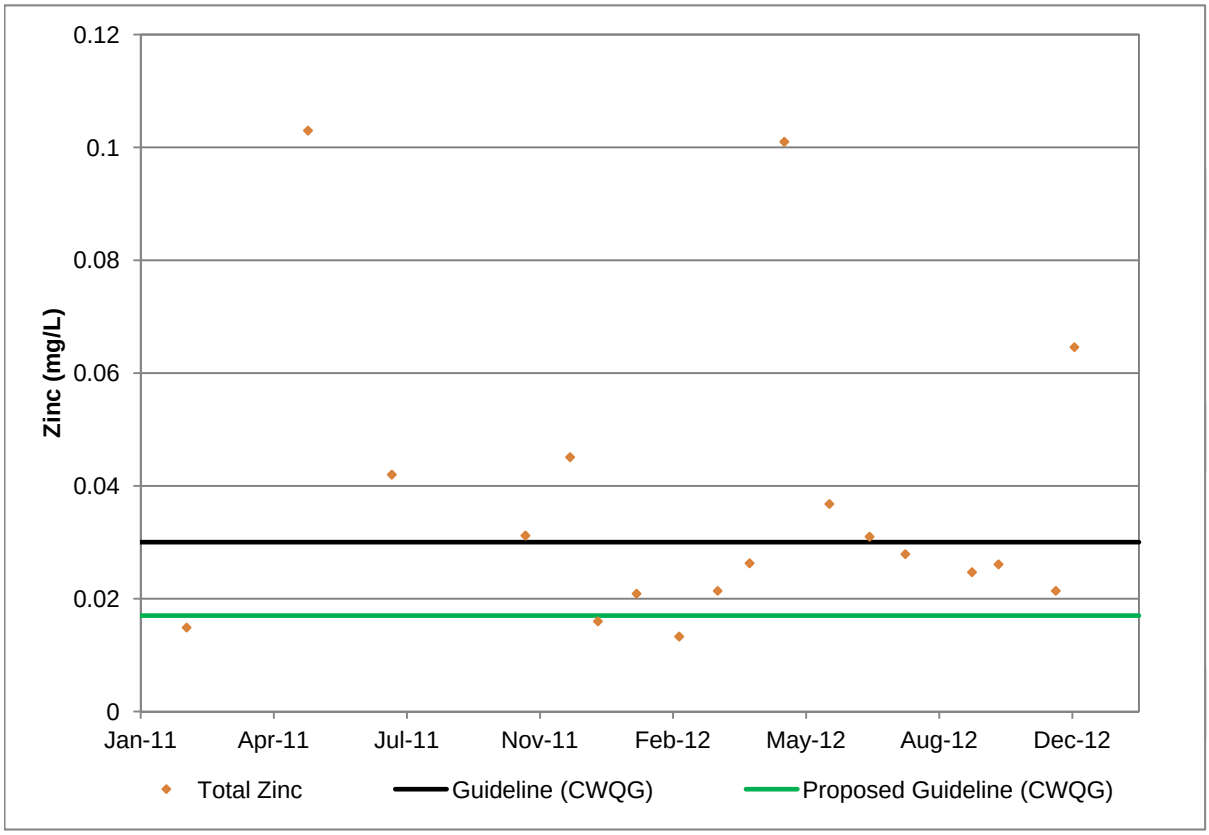


Figure A.6: Zinc values for station KV-9, UKHM 2011-2012.

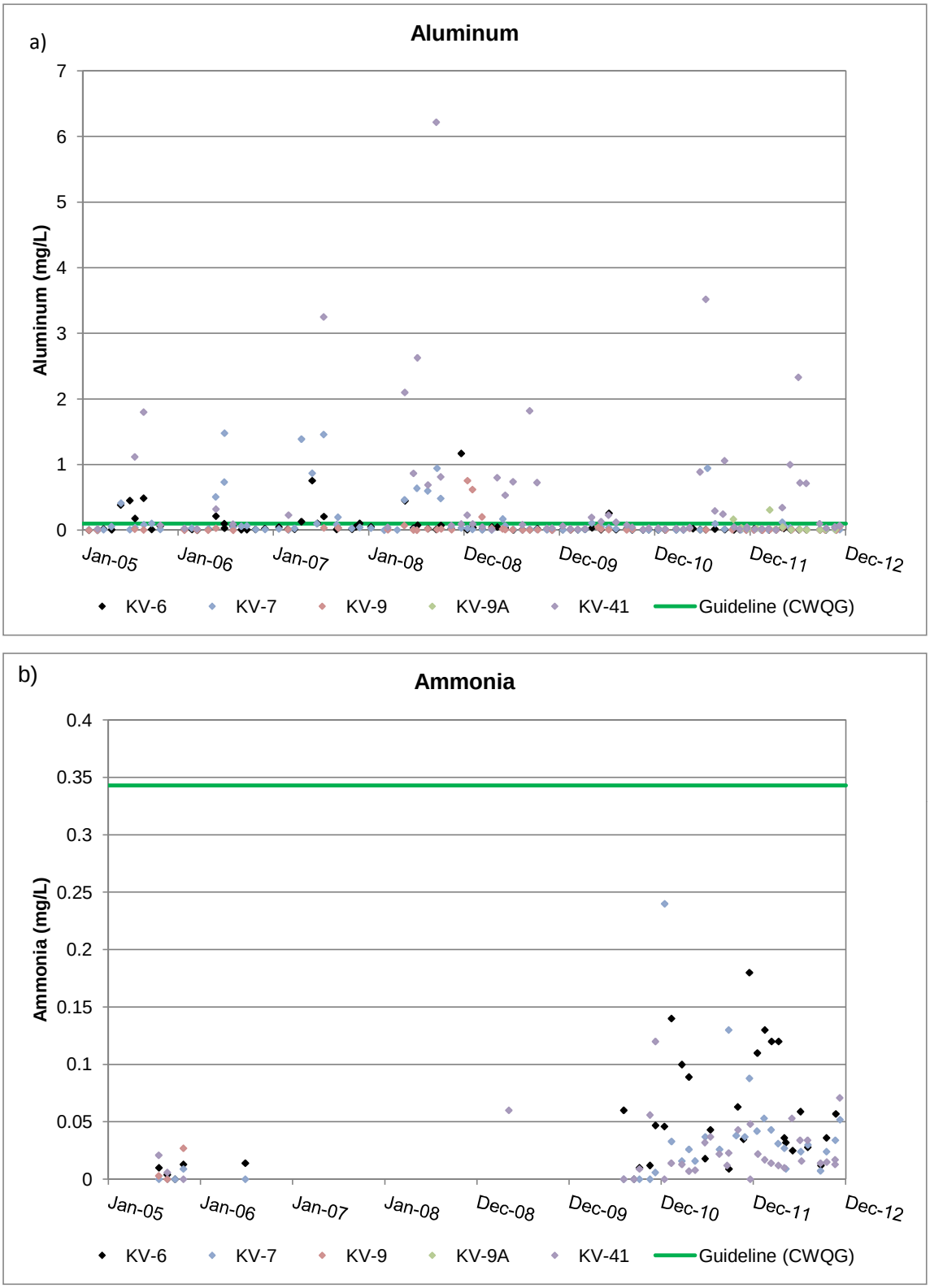
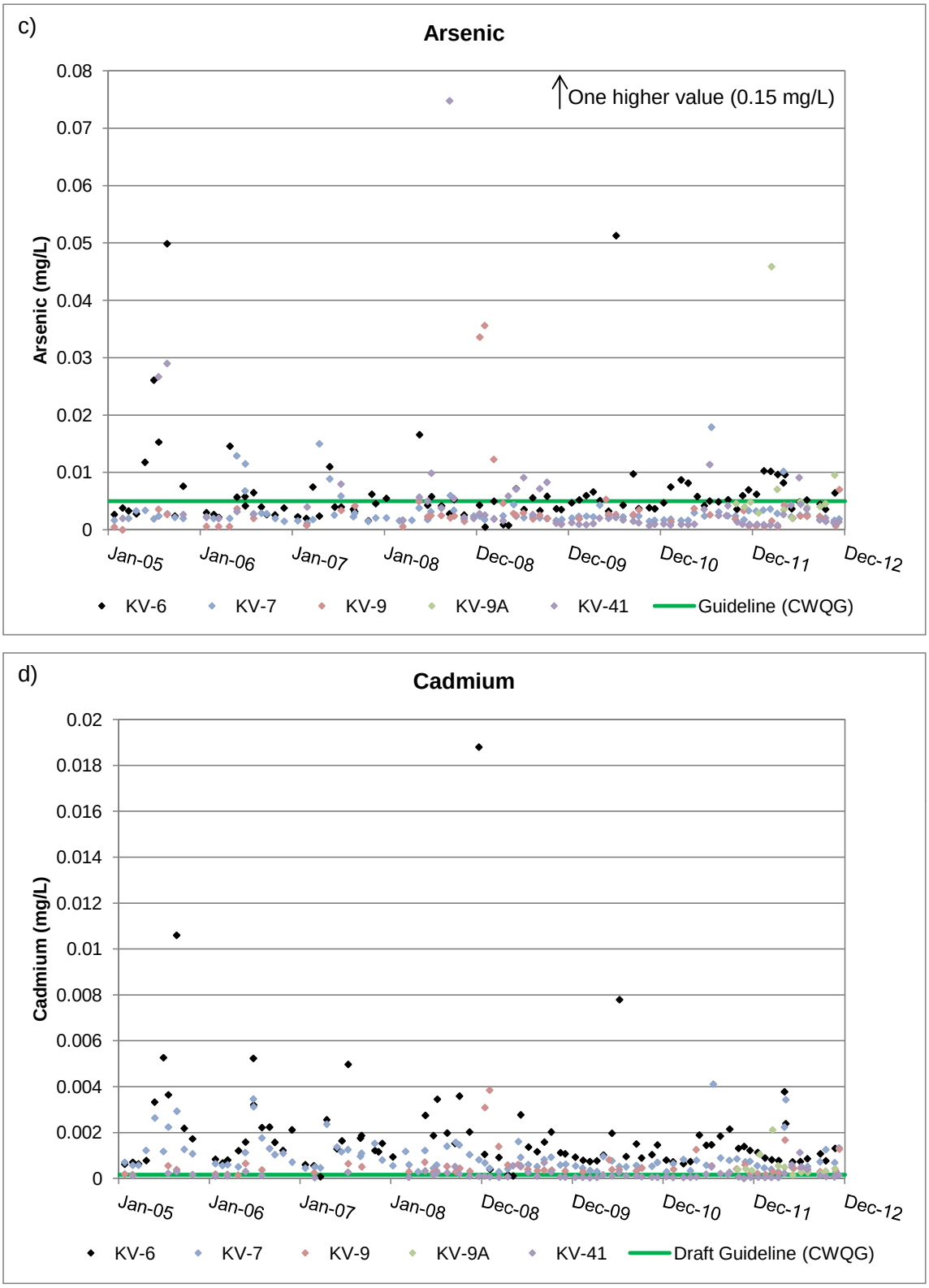


Figure A.7: Concentrations of analytes greater than background but less than guidelines ove time (2005-2011) at UKHM mine-exposed stations.



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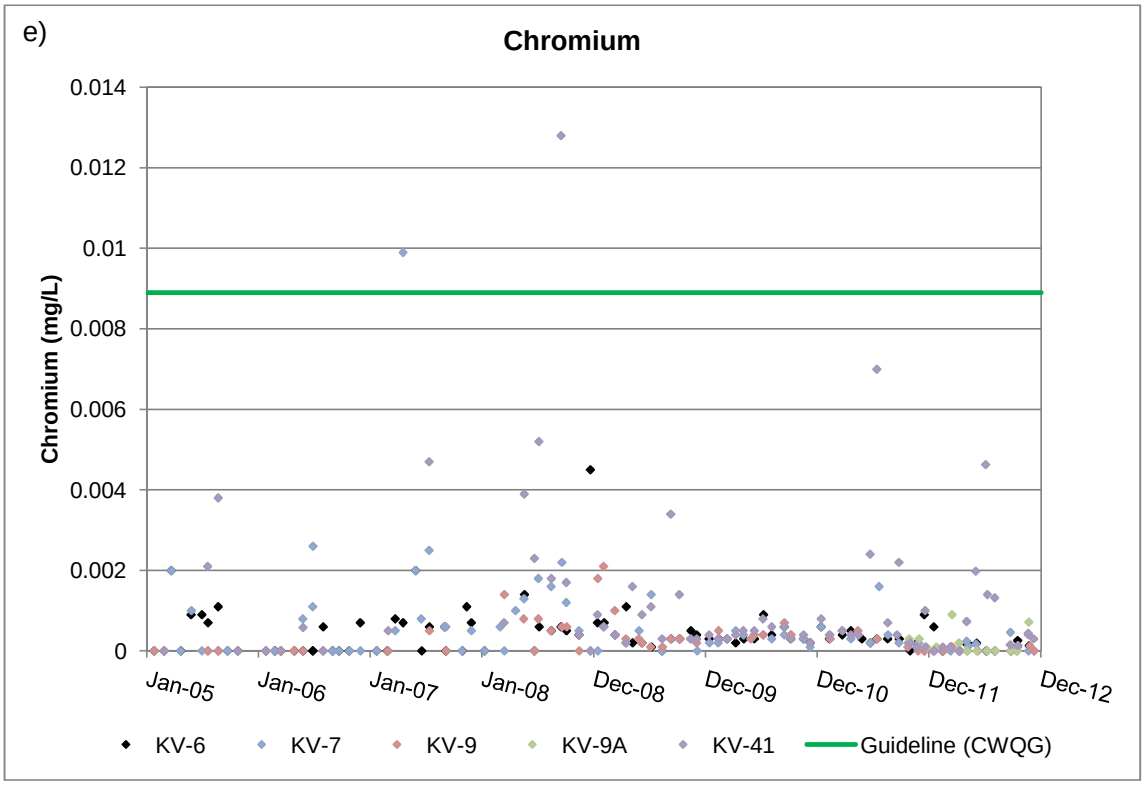

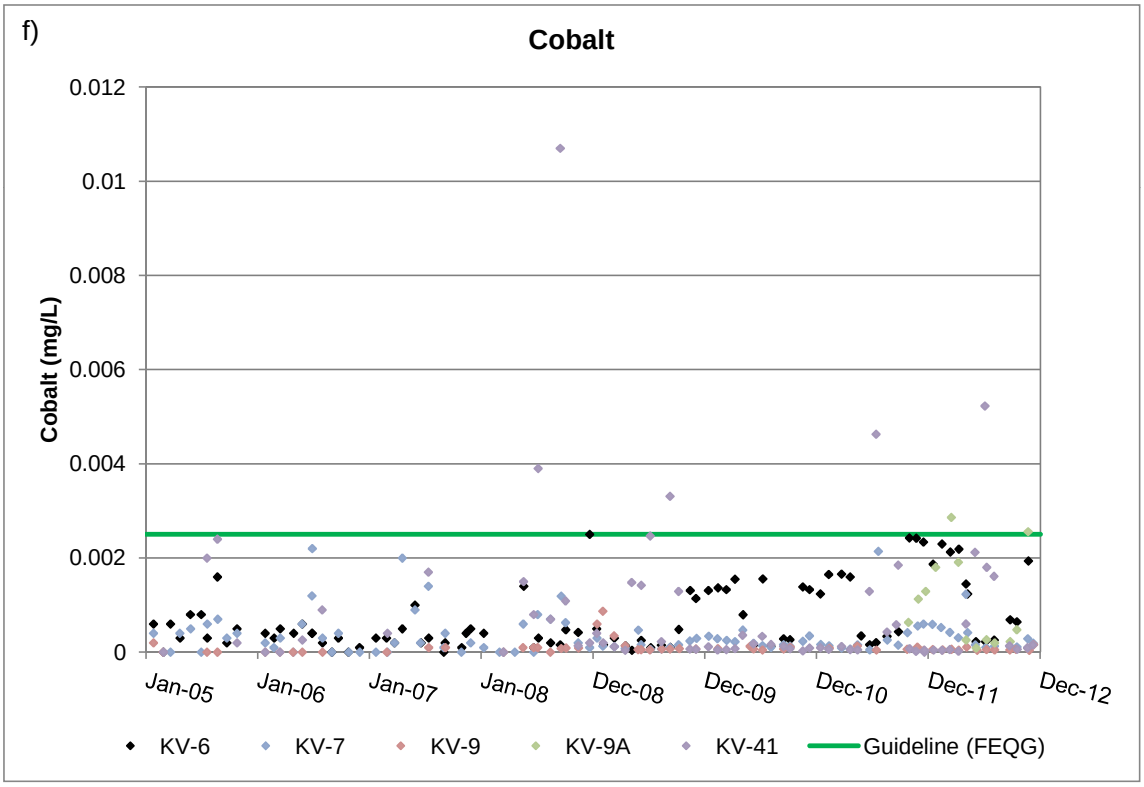

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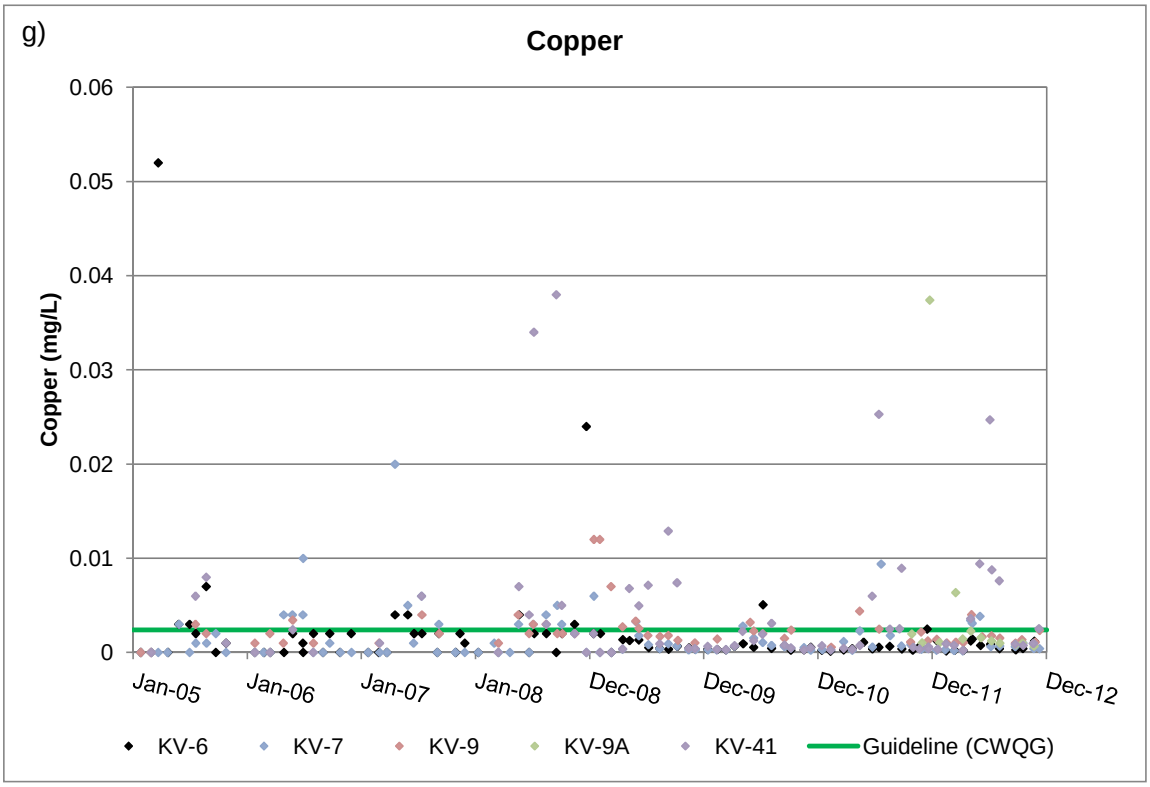

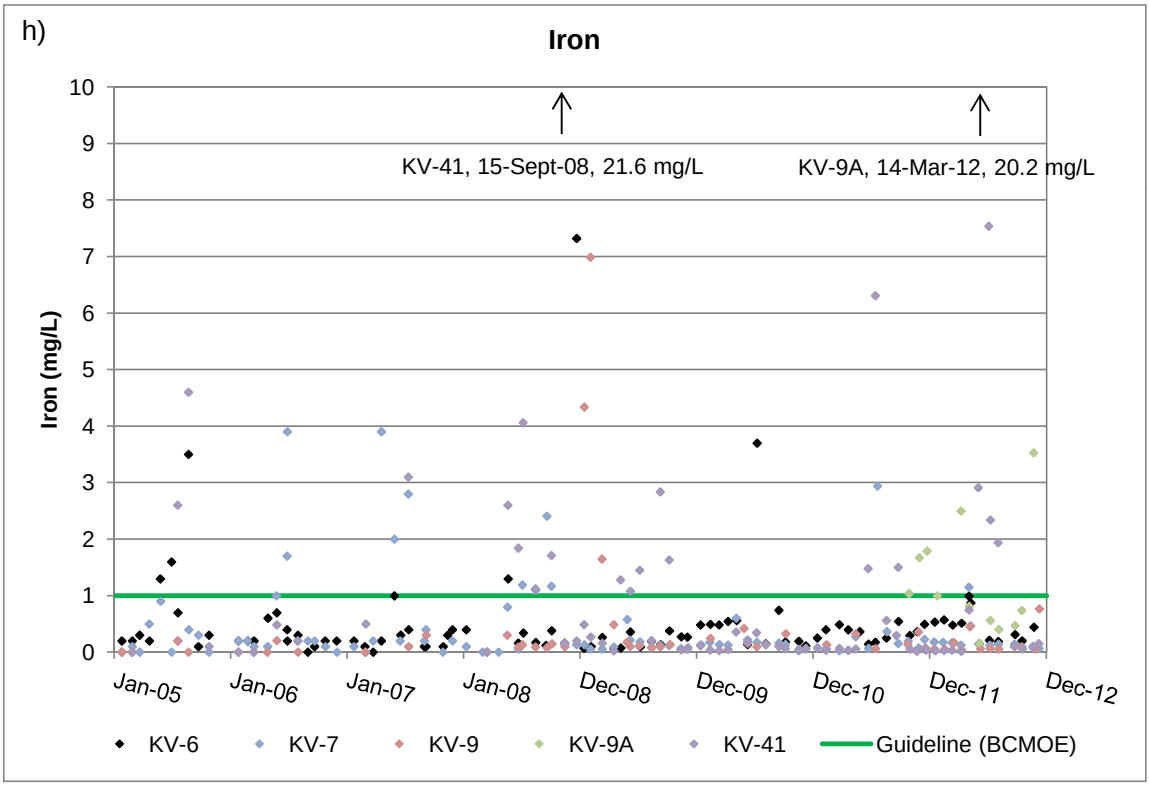

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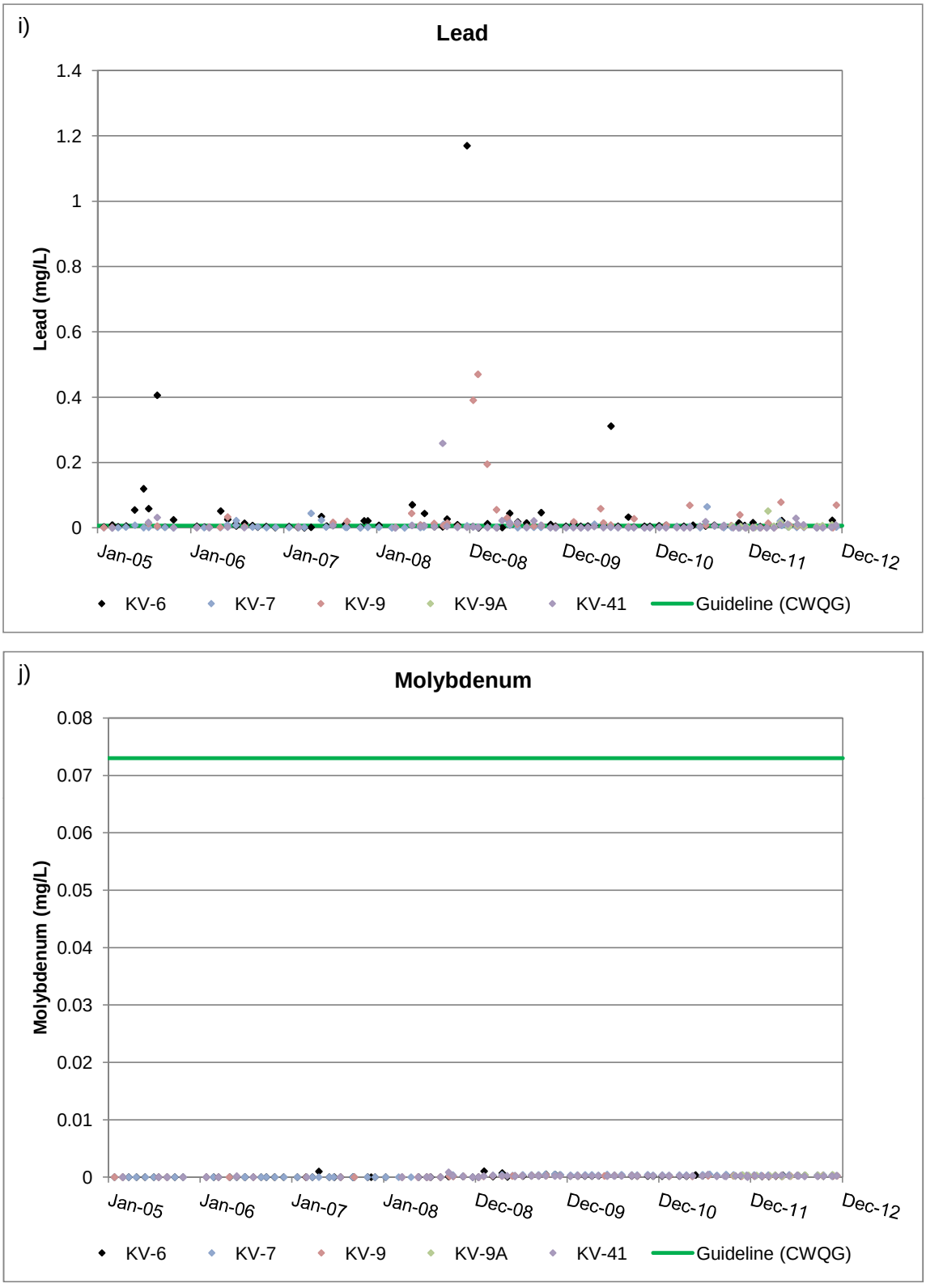

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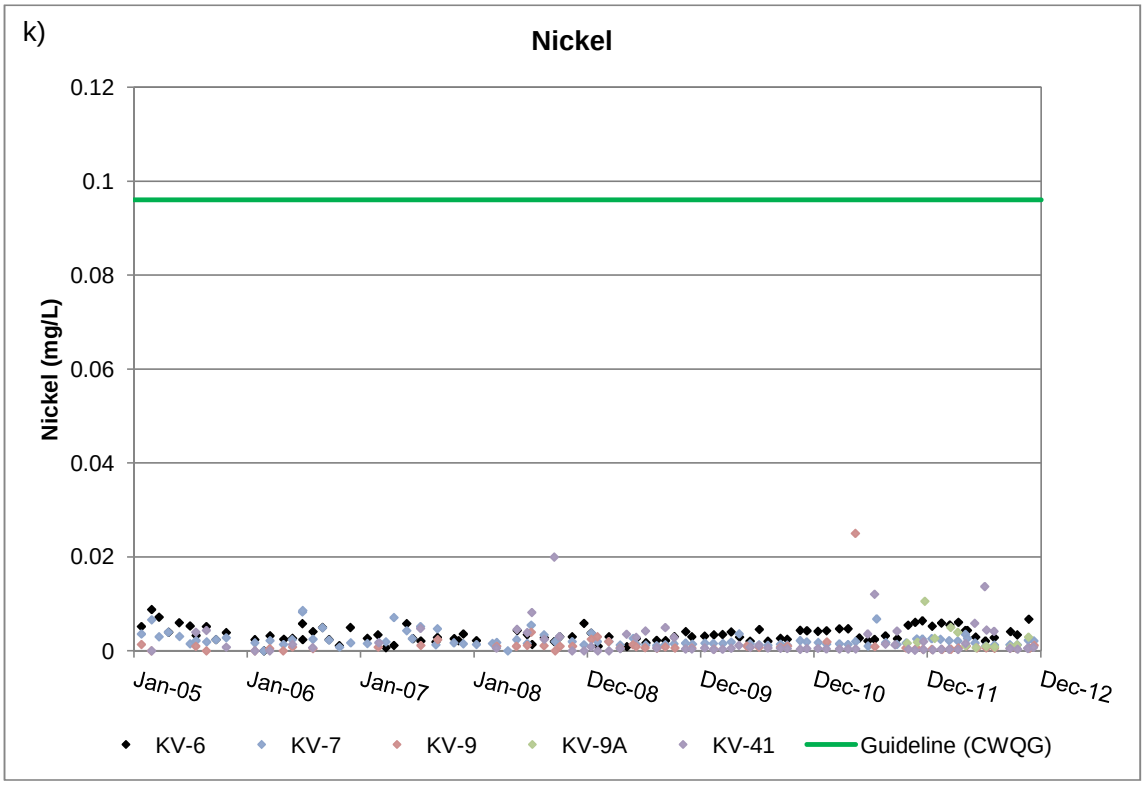

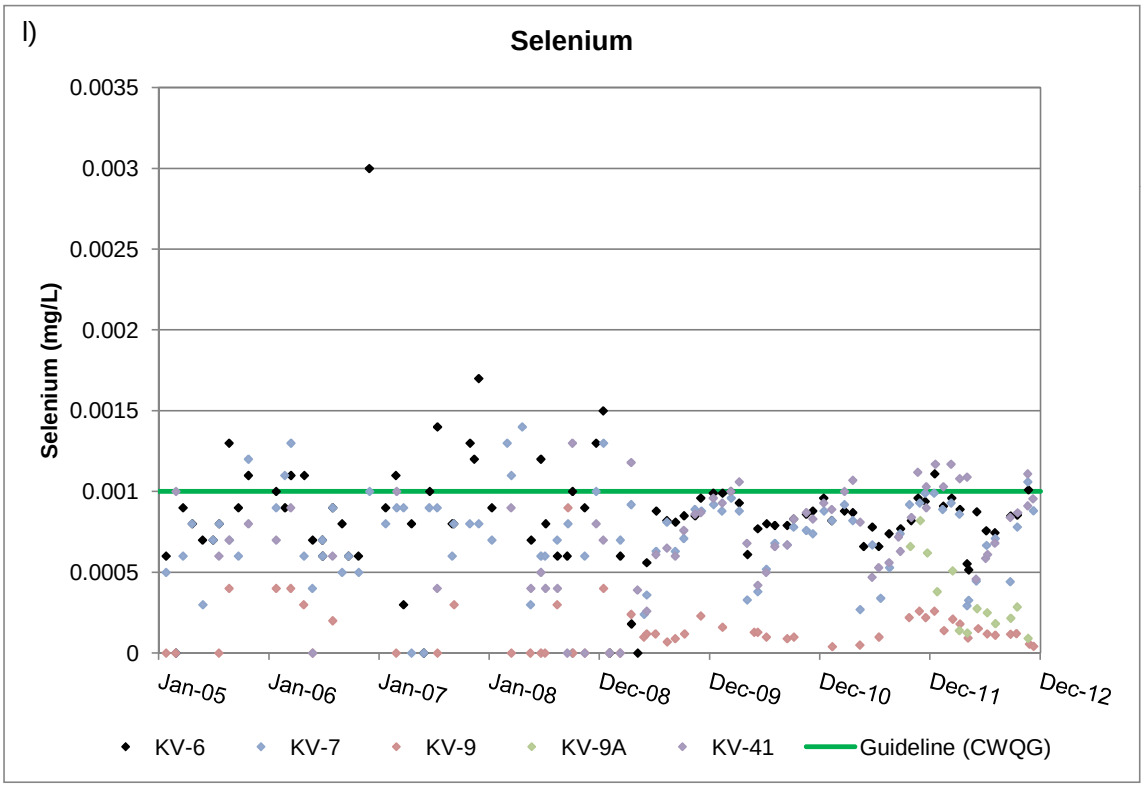

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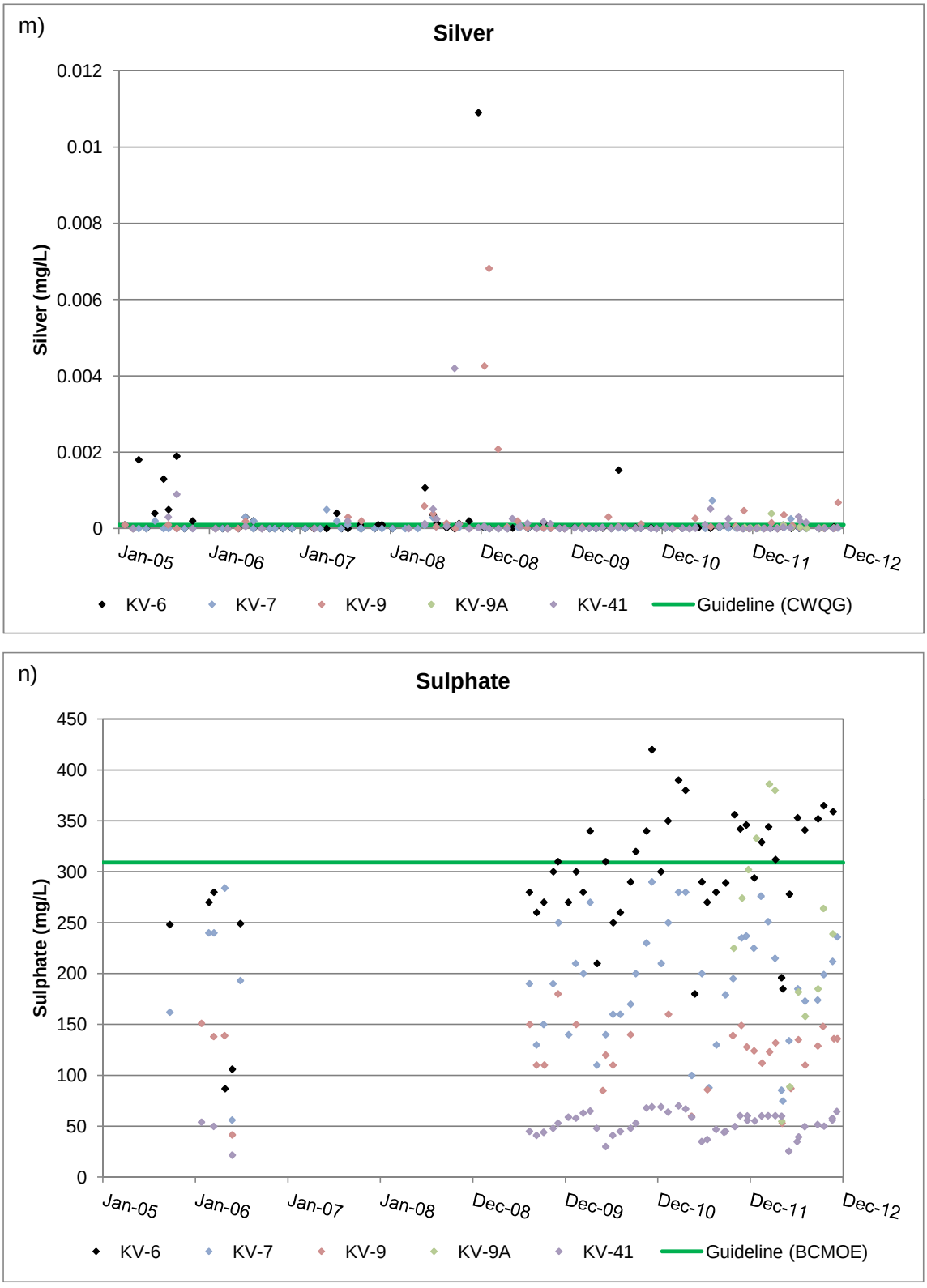

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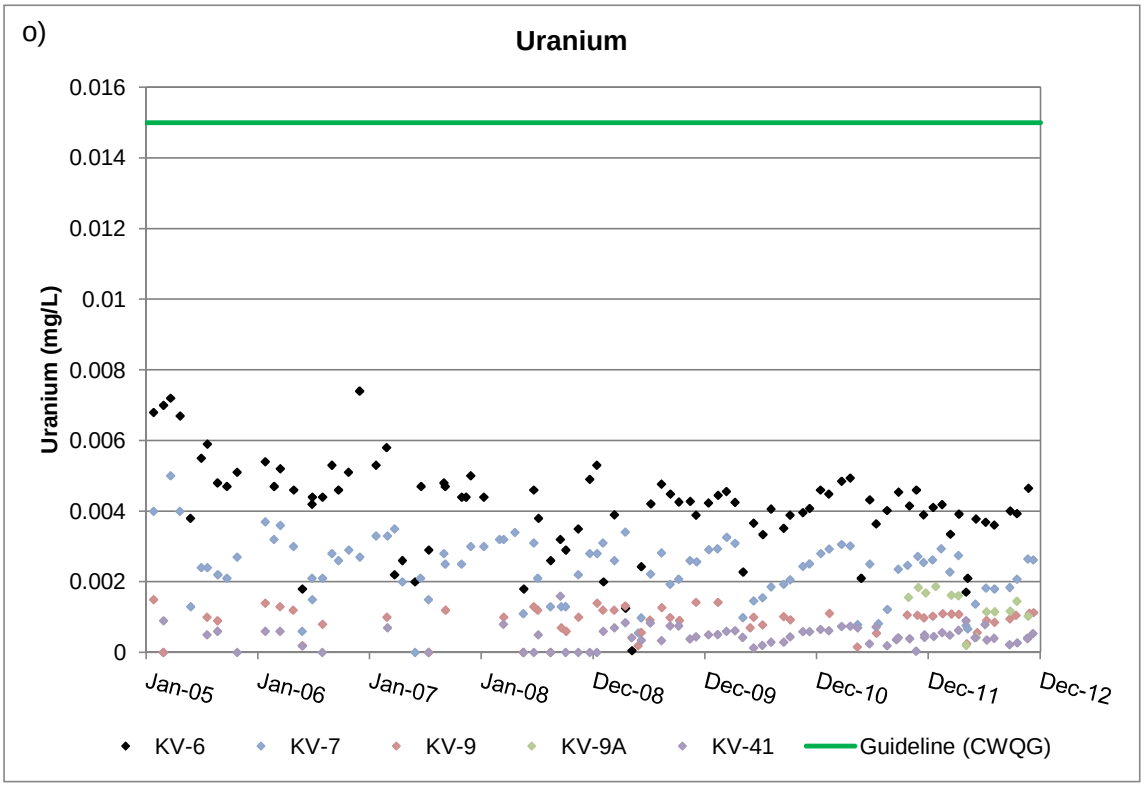

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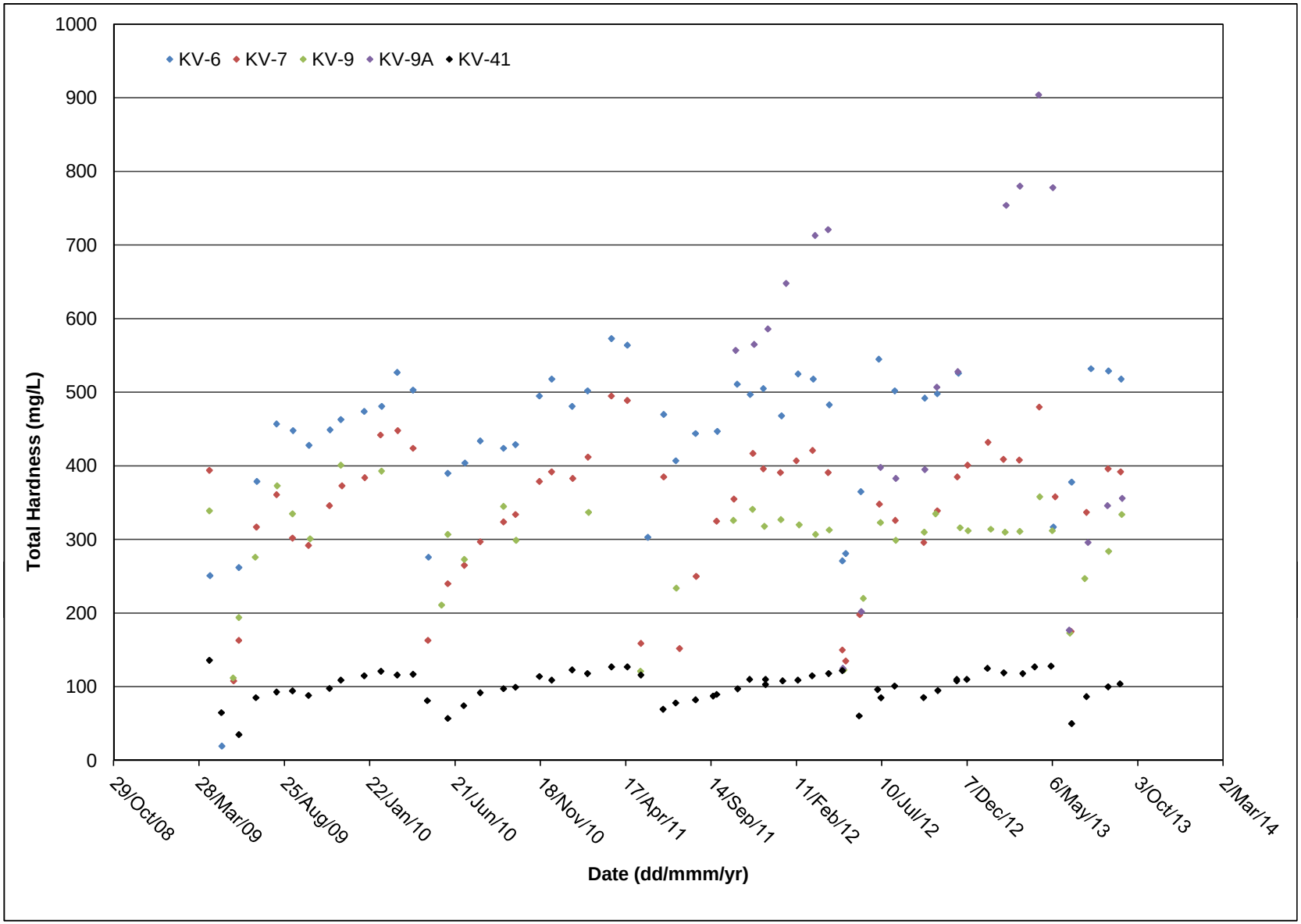

Figure A.8: Hardness concentrations at mine-exposed stations overtime, UKHM 2009-2013.

NOISE MANAGEMENT PLAN

KENO HILL SILVER DISTRICT MINING OPERATIONS

November 2013

ALEXCO KENO HILL MINING CORP.

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APPENDIX B NOISE DISTURBANCE NOTIFICATION FORM

1 INTRODUCTION

Alexco Keno Hill Mining Corp (AKHM) operates the Bellekeno Mine and Keno District Mill in the vicinity of Keno City, Yukon. In addition to the Bellekeno Mine, the Lucky Queen and Onek mines are permitted and developed and additional mines including Flame and Moth will be put into production as the Keno Hill Silver District is developed and advanced. All related mining activities in the foreseeable future will occur in the vicinity of Keno City and as such, a Noise Management Plan has been developed to address any potential noise affects that may occur with the operations of the mine(s) and Keno District Mill..

Part of the Noise Management Plan is based on a Noise Impact Assessment (NIA) completed by Patching Associates Acoustical Engineering Ltd (PAAE). and conducted during the *Yukon Environmental and Socio-Economic Assessment Act* (YESAA) process (Project 2011-0315). The NIA identified the noise sources from the Bellekeno, Lucky Queen and Onek mining-related activities, noise receptors, and predicted the anticipated noise level from all existing sources and those associated with Lucky Queen and Onek mining operations.

Section 2 of this Plan outlines noise sources from the operating Bellekeno and Keno District Mill operations and the Lucky Queen and Onek mining development and operations, and Section 3 identifies noise receptors within Keno City. Section 4 summarizes the anticipated project noise predicted by the NIA and measures to mitigate potential noise-related impacts are presented in Section 5. AKHM's approach to noise management, through monitoring, creating a Noise Disturbance Registry, and reporting protocols, is described in Section 6.

2 POTENTIAL NOISE SOURCES

The NIA identifies potential noise generators for the operating Bellekeno mine and developed Onek and Lucky Queen operations for the Keno Hill Silver District. At the time of the YESAA assessment the Onek mine location option and corresponding bypass roads had not been finalized, so the assessment considered both the Sign Post Portal Option with North Bypass road and the Onek 990 Portal Option with Keno City Bypass Road. The Onek 990 Portal Option was selected and the following summary does not include any of the components of the Sign Post Portal Option. The Keno City Bypass Road evaluated with the Onek 990 option in the NIA has since been rerouted further away from the Keno City residential area, but all noise impact results presented for the Onek 990 portal consider the older route that was closer to the community.

The following are the potential noise sources identified in the NIA, shown on Figure 1.

- Bellekeno mine operations,
- Lucky Queen mine operations,

- Onek mine operations,
- Keno District Mill,
- Onek 400 Level Adit Water Treatment Plant[1].
- Trucking activity and traffic noise (up to 2 km away from Keno City centre)
    - Wernecke Road,
    - Christal Lake Road,
    - Silver Trail Highway,
    - Keno City Bypass Road, and
    - Bellekeno Haul Road.

2.1 TRAFFIC ROUTING AND VOLUMES

AKHM has in place a Traffic Management Plan that addresses operations and development activities around Keno City. The Keno City Bypass Road diverts project traffic around the community, was developed from the Wernecke Road, crossing Sign Post Road, over the historic Onek waste dumps, to the Onek 990 Portal, crossing Lightning Creek Road and the Onek Access Bridge across Lightning Creek to the Bellekeno Haul Road (Figure 1). The Bypass Road is approximately 2.1 km long and 6 – 9 m wide to safely accommodate passing vehicles. The road maybe restricted to one-way travel where conditions prevent construction to 9 m wide.

There are stop signs to stop mine traffic at the intersections with Wernecke Road, Sign Post Road and Lightning Creek Road. Signage warning of crossing mine traffic were installed in both directions from the intersection, in accordance with regulatory requirements. Appropriate line-of-sight distances are maintained to ensure crossing trucks and approaching traffic on the Wernecke Road are able to see each other. The line-of-sight distance requirements of YG Highways & Public Works Transportation Branch and the Highway Access/ Works within a Right-of-Way permits are adhered to in order to ensure public and worker safety.

Signage warning of crossing/turning mine dump trucks (over the highway dump trucks) were installed along Sign Post Road, Lightning Creek Road, Bellekeno Haul Road and Wernecke Road in accordance with the requirements and direction of YG Highways & Public Works Transport Branch officials. Table 1 presents traffic volumes during development and operations of Lucky Queen and Onek.

[1] *The Onek 400 Water Treatment Plan is not a component of the new Onek mine operations plan, but it is included in the Noise Management Plan to ensure all potential noise sources related to the Keno Hill Mining District are incorporated, including care and maintenance activities associated with the Onek 400 Water Treatment Plant. The Onek 400 WTP has not yet been constructed or operational.*

483,500 484,000 484,500 485,000 485,500 486,000

7,087,500

7,087,000

7,086,500

CHRISTAL LAKE

CHRISTAL LAKE ROAD

SILVER TRAIL

ONEK 400 ADIT

R04

ONEK 990 ADIT

FAN

COMPRESSOR

SUBSTATION

R03

R02

KENO CITY

R05

R01

Keno Campground

DSTF (CURRENT)

MILL

FAN

DSTF EXPANSION

N-AML TOE BERM

CRUSHER

ORE STOCKPILE

VENT RAISE

Lightning Creek

BELLEKENO HAUL ROAD

1:6,500

(when printed on 11 x17 inch paper)

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Noise Monitoring Station
- Roads
- Watercourse
- Watershed Boundaries
- Mill Site Footprint
- DSTF Cover and Revegetation Phase I
- Land Disposition Garbage Dump
- Proposed Features
- Buildings/Structures
- DSTF 322,000 Tonnes Design
- As Built, Tailing Stockpile

AKHM

ACCESS

KENO HILL SILVER DISTRICT MINING OPERATIONS

FIGURE 1

FLAME AND MOTH NOISE MONITORING STATIONS

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\NoiseMonitoring\FM_NoiseMon_20131127.mxd
(Last edited by: jpan;2013-11-28/09:10 AM)

1 - Through Keno <-> 990 Portal
2 - Through Keno <-> Lucky Queen
3 - Ore Haul Lucky Queen <-> Mill
4 - Ore Haul 990 Portal <-> Mill
5 - 990 Portal <-> Bellekeno Access Road (N-AML Waste Rock Disposal Area)
6 - Proposed Re-routing of Bellekeno Haul Road

CHRISTAL LAKE ROAD
Christal Lake
SILVER TRAIL HIGHWAY
IVERNECKE ROAD
SIGN POST ROAD
HISTORIC ONEK 400 LEVEL ADIT
LICENCED P-AML WASTE ROCK STORAGE FACILITY
HISTORIC UNDERGROUND WORKINGS
KENO CITY BYPASS ROAD
ONEK 990 PORTAL
Lightning Creek
LICENSED BELLEKENO MINE N-AML WASTE ROCK DISPOSAL AREA (TO BE CONSTRUCTED)
KENO CITY
LIGHTNING CREEK ROAD
BELLEKENO HAUL ROAD
EXISTING CULVERT
EXISTING BRIDGE (MS10-029)
KENO DISTRICT MILL SITE
PROPOSED ORE STOCKPILE PAD
FLAME AND MOTH ADIT

1:10,000 *(when printed on 11 x17 inch paper)*
Meters
0 100 200 300 400

483500 484000 484500 485000 485500 486000 486500 487000
7088500 7088000 7087500 7087000 7086500

Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13th and 14th 2006.

Site contours and hydrography derived from 2006 aerial imagery obtained from Aero Geometrics, Calgary Alberta.

Datum: NAD 83; Projection: UTM Zone 8N

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As Built, Tailing Stockpile, Sept 2013
Mill Site Footprint
Existing Features
Building/Structure
Highway
Secondary
Contour (5 m interval)
Contour (1 m interval)

AKHM
ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 2

LUCKY QUEEN, ONEK 990 AND BELLEKENO ACCESS ROUTES

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\Traffic\TrafficManagement_20131120.mxd
(Last edited by: jpan;2013-11-22/12:38 PM)

Table 1 Estimated Traffic through Keno City during Development and Operations of Lucky Queen and Onek Mines

Vehicle Type	Average Traffic Volume (roundtrips/week)
Lucky Queen	
Light Truck	45
Water truck	2
Sewage truck	2
Semi-trailer loads (mining equipment, building supplies, construction equipment, etc.)	3
Grader/Sander Truck	2
Onek	
Light Truck	50
Water truck	1
Sewage truck	1
Semi-trailer loads (mining equipment, building supplies, construction equipment, etc.)	3
Grader/Sand Truck	2
Dump truck (hauling P-AML waste rock to Onek WRSF)	5
Total	**116**

During mine production, heavy truck traffic from Lucky Queen and Onek will be routed along the Keno City Bypass Road to/from the Bellekeno Haul Road. Light truck traffic to/from Lucky Queen and Onek will continue to be routed through Keno City during mine operations. Table 2 presents traffic volumes during operations on different sections of the access routing shown on Figure 2.

It is anticipated that 16 roundtrips per day of ore haul truck traffic will travel along the Bellekeno Haul Road with Lucky Queen and Onek Mines operating, representing a 60 % increase in haul traffic from current levels. This increase is due to an anticipated increase in production to 400 tpd as currently permitted.

The Keno City Bypass Road will be a radio controlled road accessible to mine traffic only. Signs will be installed at the road access points prohibiting public traffic from traveling on it. The maximum speed limit will be 40 km/h, reduced to 20 km/h at blind corners and road crossings.

Table 2 Estimated Traffic Volumes along Key Traffic Management Routes (roundtrips/week)

	Route				
Vehicle Type	**1**	**2**	**3**	**4**	**5[1]**
Light truck	7	28	10	10	80-100
Water truck	-	2	-	-	1
Sewage truck	-	2	-	-	1
Grader/Sand Truck	1	1	-	-	2
Semi-trailer loads	-	7	-	-	-
Ore haul truck	-	-	25	-	-
Dump truck	-	-	-	49	28
Total	**8**	**40**	**35**	**59**	**112-132**

Note: [1] Some of this traffic will also have to travel the Silver Trail Highway (Route 1).

3 NOISE RECEPTORS

Five locations were selected in the NIA as being potential noise receptors within the 2 km radius study area around Keno City, listed in Table 3.

Table 3 Representative Locations Assessed in Keno City from the Noise Impact Assessment

Residence	GPS Location	Description
R01	N63.90827 W135.29599	East end Residence, north side of Lightning Creek Road
R02	N63.91019 W135.29968	Residence, east side of Sign Post Road
R03	N63.91023 W135.30205	Town Center, north from the Snack Bar
R04	N63.91239 W135.30376	Residence, west side of Wernecke Road
R05	N63.90851 W135.30993	Residence, about 850m east from the Mill

The background noise levels experienced by these locations vary considerably, depending on location and local activities, currently and proposed Lucky Queen and Onek mining operations will be in addition to normal fluctuations in background levels. Climate parameters, such as relative humidity, temperature, and temperature inversions impact the sound level and propagation experienced by each of these receptors.

4 ANTICIPATED PROJECT NOISE

The intent of the NIA was to predict the combined noise level of the current and proposed Lucky Queen and Onek mining operations at the receptor locations and to determine whether there is likely to be an increase compared to the current noise level.

Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is just perceptible,

- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

Tables 4 and 5 summarize the results presented within the NIA for daytime and nighttime periods. Results were based on predictive modelling using the noise modelling software package CadnaA developed by Datakustik. The complete set of assumptions, data, and results can be found in the NIA in Appendix A.

Table 4 Comparison of Predicted Noise Levels between Current and Proposed Mining Operations - Daytime

Residence	Current Mining Operations Predicted Noise Levels plus Ambient Sound Levels	Current and Proposed Mining Operations Predicted Noise Levels plus Ambient Sound Levels	Predicted Noise Level Increase due to Addition of New Mining Activities
	(dBA)	(dBA)	(dBA)
R01	39	39	0
R02	36	36	0
R03	32	32	0
R04	36	36	0
R05	34	35	1

Table 5 Comparison of Predicted Noise Levels between Current and Proposed Mining Operations - Nighttime

Residence	Current Mining Operations Predicted Noise Levels plus Ambient Sound Levels	Current and Proposed Mining Operations Predicted Noise Levels plus Ambient Sound Levels	Predicted Noise Level Increase due to Addition of New Mining Activities
	(dBA)	(dBA)	(dBA)
R01	38	38	0
R02	28	28	0
R03	28	28	0
R04	31	32	0
R05	-	-	-

The results of the NIA indicate that the AKHM mine operations including the concurrent operation of Bellekeno, Lucky Queen and Onek and mill operations is expected to have a minor noise level increase under downwind conditions compared with the existing conditions. This assumed all of the AKHM equipment running simultaneously and proposed noise control measures AKHM will implement (see Section 5.1). Both the current and proposed mining operations will have only minor noise impacts on Keno City. The total noise level with the current and /or proposed activities is low.

5 NOISE MITIGATION MEASURES

5.1 MITIGATIONS COMMITTED TO BY AKHM

AKHM has committed to the following measures that mitigate potential impacts associated with noise:

- Mine traffic will be routed around Keno City via the Keno City Bypass Road, rather than through the community.
- Under normal operating conditions, there will be no ore haulage to/from Onek between the hours of 1900 and 0700.
- The compressor at Onek will be housed in a sound dampening enclosure. The vent fan will have inlet and exhaust sound dampeners.
- The cone crushing plant will be covered with a sprung cover structure similar to the fine ore stockpile cover, or similar enclosure

6 NOISE MANAGEMENT

Noise management consists of noise monitoring, a Noise Disturbance Notification and Registry process, and a reporting process.

6.1 NOISE MONITORING

AKHM will continue to monitor noise levels within the community at various locations to assess the actual versus predicted noise levels and to determine if the noise abatement measures are effective. This is consistent with the recommendation of the *Health Impact Assessment of Mining Activities near Keno City, Yukon*[2], commissioned by Yukon Government.

The noise monitoring stations include the most impacted residence (R04), the Keno City Campground, as well as two other locations that have been previously monitored.

[2] *Habitat Health Impact Consulting, September 30, 2012, Health Impact Assessment of Mining Activities near Keno City, Yukon, Prepared for the Yukon Department of Health and Social Services.*

AKHM proposes to monitor locations R01, R03, RO4, R05 and the Keno City campground, which provides adequate coverage of the receptors likely to be affected in the community[3]. R03, R04 and R05 are also very close to the location previously monitored by AKHM by the Bellekeno project. The Keno City Campground was also previously monitored.

AKHM proposes to conduct monitoring at these locations twice per month during regular operations and at increased frequencies during construction or other significant noise generating events that may be heard within the community.

The wind speed, wind direction, temperature and humidity data from the Keno District Mill weather station associated with a noise monitoring event will be reported. Any notable noise sources associated with the monitoring event will also be documented.

Additionally, AKHM will conduct instantaneous monitoring at specific locations, if it is warranted by a noise complaint.

6.2 NOISE DISTURBANCE NOTIFICATION

In accordance with term and condition #47 of the Decision Document, AKHM must provide Keno City residents with a means to formally complain of noise disturbance. AKHM has created a Noise Disturbance Register to track noise disturbance claims. Appendix B presents a Noise Disturbance Notification Form for residents. Copies of the Noise Disturbance Notification Form are available at the Elsa Camp Administration Building, or will be sent to Keno City residents upon request. Residents can request a form by calling (867) 996-2330 or emailing campservice@alexcoresource.com. Forms will be sent to Keno City residents either by direct delivery, email or fax.

Noise disturbance incidents will be investigated on a case-by-case basis. Responses to a noise disturbance claim will be based on the nature of the claim and may include (but are not limited to):

- AKHM will record the noise disturbance claim in the Noise Disturbance Register and will notify the complainant that the claim has been recorded.
- If warranted, AKHM personnel will conduct an onsite visit to further investigate the noise disturbance.
- AKHM personnel will attempt to link the identified noise disturbance with a source (a specific event or activity conducted as part of mining or construction), and will determine what measures may be taken to lessen the noise generation.

[3] *AKHM will consult Keno City residents on this monitoring regime.*

- If warranted, AKHM will conduct a follow-up visit over the duration of the noise generating event to determine whether the noise levels have been sufficiently decreased.

6.3 REPORTING

Noise monitoring results will be summarized and reported on a quarterly basis and provided to Keno City residents, YG Energy Mines and Resources and YG Tourism and Culture Branch. A summary of the noise complaints recorded over the same time period in the Noise Complaint Registry will be included with the monitoring results.

Based on the results of the monitoring and in discussion with the above-listed parties, additional mitigation measures, or adaptive management strategies will be identified and implemented as required.

6.4 EFFECTS MONITORING

Decision Document term and condition #45 stipulates effects monitoring of noise emissions in relation to impacts to local businesses. As detailed in Section 6.1 and 6.3, ongoing noise monitoring within Keno City will be undertaken and results submitted to stakeholders on a quarterly basis. The proposed noise monitoring stations are located throughout Keno City and in proximity to local businesses, providing sufficient coverage to effectively monitor noise within the community. Furthermore, the Noise Disturbance Notification form includes a field for the complainant to describe any effect on his/her business deriving from a specific noise event. Section 6.2 above describes the measures that will be undertaken to address a noise disturbance claim. Based on the results of the monitoring and in discussion with the above-listed parties, additional mitigation measures, or adaptive management strategies will be identified and implemented as required.

APPENDIX A

NOISE IMPACT ASSESSMENT – KENO HILL SILVER DISTRICT OPERATIONS (PATCHING ASSOCIATES ACOUSTICAL ENGINEERING, 2012)

Noise Impact Assessment
Alexco Keno Hill Mining Corp.
Keno Hill Silver District Operations
Yukon Territory

Rev 1

Prepared for:
Jennifer Anthony
Yukon Environmental and Socio-Economic Assessment Board

Prepared by:

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Sheying Sun, Ph.D.
Leslie Noble McCleave, Technician

Patching Associates Acoustical Engineering Ltd.

Consultants in Acoustics, Noise Control and Vibrations

July 26, 2012

File: 2012-3379

Notice

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Executive Summary

Patching Associates Acoustical Engineering Ltd. was retained by the Yukon Environmental and Socio-Economic Assessment Board (YESAB) to evaluate and predict the noise level from the existing and proposed Alexco Keno Hill Silver District Operations to be located around the Keno City, 354 km north of Whitehorse, Yukon. Alexco Keno Hill Mining Corp (AKHM) currently operates the Bellekeno mine and Keno District Mill, and proposes to strengthen its operation by incorporating production of Lucky Queen and Onek ore deposits in the Keno Hill Silver District.

The study was conducted in order to:

- Assess the sound data of typical equipment that are currently existing and proposed for AKHM mining operations, which include Bellekeno, Lucky Queen, Onek, the mill operations and the associated trucking activity and traffic noise;
- Predict the noise level from the existing and proposed facilities during mining and mill operations at the potentially most affected receiver locations.

The sound power levels emitted from the existing and proposed facilities were determined through the use of field measurements and theoretical calculations. These values were then used to model the installation and the surrounding area to determine the expected noise level at the Keno City residences and nearby area. The modeling was performed using the CadnaA noise-modeling package.

The following tables summarise the predicted noise levels based on the daytime and nighttime normal operations of the project in the Keno City district mining area.

Summary of Predicted Noise Levels Generated by AKHM Current Mining Operations under Downwind Conditions (Daytime)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	29	39	**39**
R02	30	35	**36**
R03	30	27	**32**
R04	31	34	**36**
R05	31	32	**34**

Summary of Predicted Noise Levels Generated by AKHM Current Mining Operations under Downwind Conditions (Nighttime)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	19	38	**38**
R02	15	28	**28**
R03	23	26	**28**
R04	24	30	**31**
R05	13	--	**--**

Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Daytime)

--(Onek Sign Post Portal Option and Proposed North Bypass Road)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	29	39	**39 (0)***
R02	30	35	**36 (0)**
R03	32	27	**33 (1)**
R04	35	34	**38 (2)**
R05	32	32	**35 (1)**

* The number in bracket is the predicted noise level increase based on current noise level

Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Nighttime)

--(Onek Sign Post Portal Option and Proposed North Bypass Road)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	20	38	**38 (0)**
R02	17	28	**28 (0)**
R03	25	26	**28 (0)**
R04	30	30	**33 (2)**
R05	23	--	**--**

* The number in bracket is the predicted noise level increase based on current noise level

Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Daytime)

--(Onek 990 Portal Option and Proposed Keno City Bypass Road)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	30	39	**39 (0)***
R02	30	35	**36 (0)**
R03	31	27	**32 (0)**
R04	32	34	**36 (0)**
R05	31	32	**35 (1)**

* The number in bracket is the predicted noise level increase based on current noise level

Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Nighttime)

--(Onek 990 Portal Option and Proposed Keno City Bypass Road)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	21	38	**38 (0)**
R02	18	28	**28 (0)**
R03	24	26	**28 (0)**
R04	27	30	**32 (1)**
R05	19	--	**--**

* The number in bracket is the predicted noise level increase based on current noise level

The results of this assessment indicate that the AKHM current with proposed future mining and mill operations is expected to have minor noise level increase under downwind conditions compared with current situation. This assumed all of the equipment running simultaneously and proposed noise control measures AKHM will implement in the Onek Sign Post portal site. Both the current and future mining operations will have only minor noise impacts on the Keno City residences. The most impacted residence assessed R04, which is also the closest residence to Onek portal site, will have 3-4 dBA increase of sound level based on measured ambient sound pressure level and 2 dBA increase based on current noise level. The total noise level with the current and /or future facility is low.

The proposed Onek 990 portal and Keno City bypass road will have less noise emission and almost the same noise emission with or without the surface transfer from 990 portal site to the mill.

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Introduction and Scope-of-Work

Patching Associates Acoustical Engineering Ltd. was retained by the Yukon Environmental and Socio-Economic Assessment Board to evaluate and predict the noise level from the existing and proposed Alexco Keno Hill Silver District Operations to be located around the Keno City, 354 km north of Whitehorse, Yukon. Alexco Keno Hill Mining Corp (AKHM) currently operates the Bellekeno mine and Keno District Mill and proposes to strengthen its operation by incorporating production of Lucky Queen and Onek ore deposits in the Keno Hill Silver District.

The study was conducted in order to:

- Assess the sound data of typical equipment that are currently existing and proposed for AKHM mining operations, which include Bellekeno, Lucky Queen, Onek, the mill operations and the associated trucking activity and traffic noise;
- Predict the noise level from the existing and proposed facilities during mining and mill operations at the potentially most affected receiver locations.

Noise Criteria

Relative noise Level Increase

A variety of sources in natural, industrial, and community settings generate sound/noise. In general, noise is defined as unwanted sound. Hearing damage is the most serious effect of noise, but the nuisance of particular sound characteristics may diminish the quality of life for those affected by the noise.

Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is just perceptible,
- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

A doubling or halving of acoustic energy will change the resulting sound level by 3 dB, which corresponds to a change that is just perceptible. In practice, this means that a doubling of traffic volume on a roadway, doubling the number of people in a stadium, or doubling the number of wind turbines in a wind farm will, as a general rule, only result in a 3 dB, or just perceptible, increase in noise.

In order to facilitate design and discuss the potential impact for this project and in recognition of the suburban (semirural) nature of the immediate area near the existing and proposed mining operation, all the typical equipment for the current and future mining operations need to be considered, which include Bellekeno, Lucky Queen, Onek, the mill operations and the associated trucking activity and traffic noise. The sound level increase from current mining operations will be quantified to evaluate

the noise impact to the Keno City residents. The total sound level experienced in the Keno City residential area will be mining facility level combined with measured ambient noise level. The future mining operations should not cause significant noise level increase.

Transient vs. Continuous Noise (L_{eq} average)

The Sound Level is a L_{eq} value, which is the equivalent-continuous sound level. This index is an energy average of the varying sound levels over a specified period. The use of this index permits the description of a varying sound level environment as a single number. As the L_{eq} is an "average" level, the measured sound level may exceed the criterion level for a short period, provided that the duration is limited. Transient factors such as equipment start-ups, shut-downs, back-up beeping or unstable environmental propagation may cause the sound level to fluctuate and potentially exceed the criterion level for short periods. The L_{eq} value considers both the sound level and the length of time that the sound level occurs and higher level periods are acceptable as long as the duration is short. All of the sound levels discussed in this study are L_{eq} sound levels and the values presented and the "average" sound level a receiver would experience from day to day, night to night, and month to month. Appendix A provides a detailed explanation of the L_{eq} index.

Project Study Area

The project study area is located around Keno City, 354 km north of Whitehorse, Yukon. The terrain cover around the facility is mainly forested. Alexco Keno Hill Mining Corp (AKHM) currently operates the Bellekeno mine and Keno District Mill and proposes to strengthen its operation by incorporating production of two new (Lucky Queen and Onek) ore deposits in the Keno Hill Silver District. These mining operations are located around the Keno City residential area. There is Lightning Creek running along the south side of the Keno City.

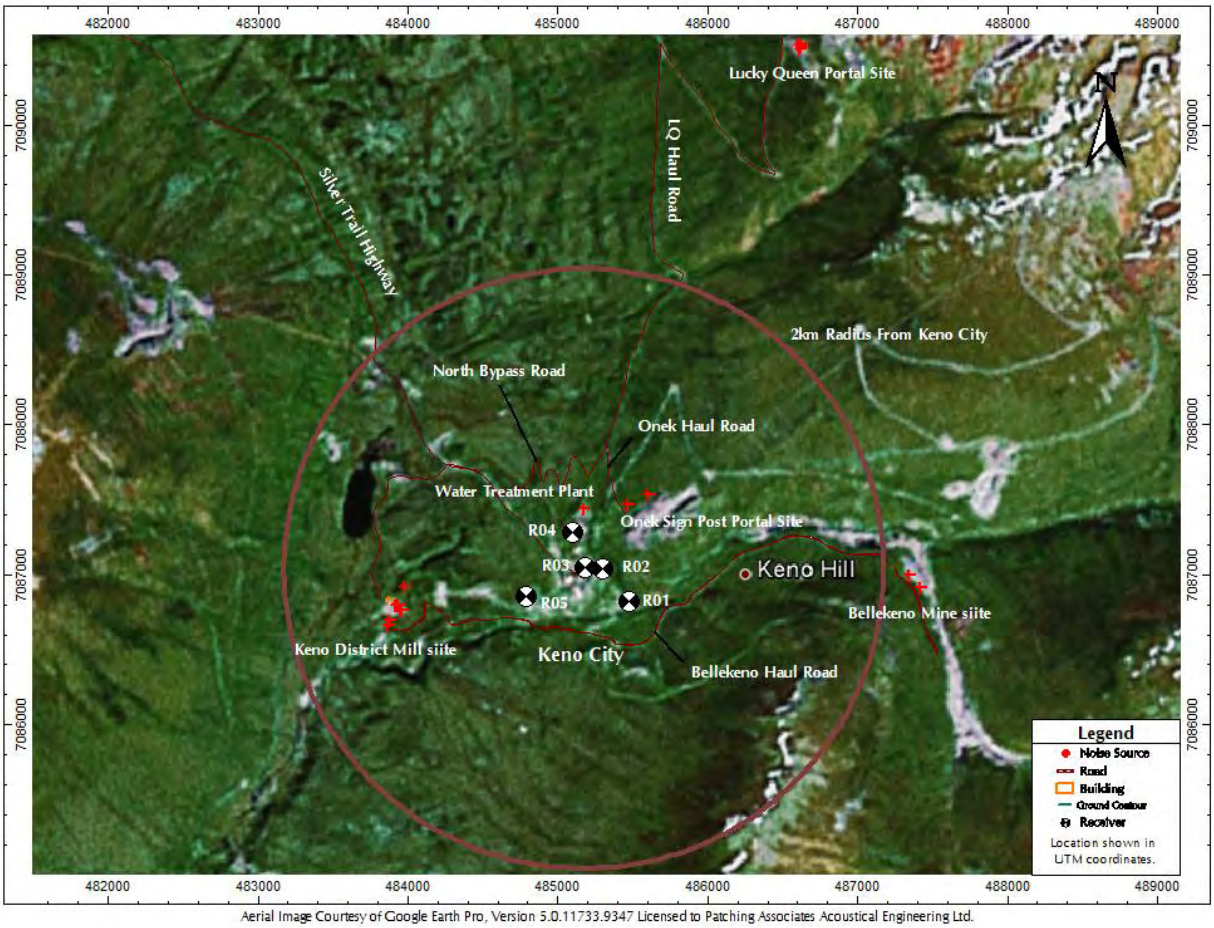
This study assesses the noise levels of the current and future facility at five receivers representing potential noise sensitive areas in the Keno City residential area, which are listed in table 1.

Table 1 – Representative Residence Locations Assessed in the Keno City

Residence	GPS Location	Description
R01	N63.90827 W135.29599	East end Residence, north side of Lightning Creek Road
R02	N63.91019 W135.29968	Residence, east side of Sign Post Road
R03	N63.91023 W135.30205	Town Center, north from the Snack Bar
R04	N63.91239 W135.30376	Residence, west side of Wernecke Road, closest to the proposed Onek Sign Post portal location
R05	N63.90851 W135.30993	Residence, about 850m east from the Mill

Figure 1 presents an overview of the project study area.

Figure 1: Overview of the project study area.



Aerial Image Courtesy of Google Earth Pro, Version 5.0.11733.9347 Licensed to Patching Associates Acoustical Engineering Ltd.

Current and Proposed Major Operations

The existing and proposed AKHM mining operations include three major operations, which are existing and proposed mine site operations, mill site operation, and transportation along haul roads. The facility equipment details are shown in Table 2.

Table 2: Major Equipment Details

Equipment Description	Equipment Details
Existing and proposed Bellekeno Mine Site Facility and transportation	• Existing Sullair LS-25S compressor unit • Existing fresh Air Intake • Currently Total 44 round trips along Bellekeno haul road daytime (0700-1900), 30kph, which include 22 light trucks and 22 heavy trucks (ore trucks, heavy trucks and buses), no transportation nighttime • Future Proposed Total 62 round trips daytime, 30kph, which include 22 light trucks and 40 heavy trucks (ore trucks, heavy trucks and buses),no transportation nighttime • Noise emission from the light truck and heavy truck assumed equal to current light truck and haul truck, measured by PAAE staff between June 25th and 29th ,2012
Existing and Proposed Mill site Operation	• Crusher, full load operation, currently running every other day, daytime operation • Cat 930G front-end Loader Loading rock for crusher, daytime operation • Mill Building, Internal equipment running day and night • Dry stack tailings facility (DSTF) area (one Packer Cat CS543E and one Backhoe daytime operation) • Noise emission from the above equipment measured by PAAE staff between June 25th and 29th ,2012
Existing and Proposed Lucky Queen Portal Facility and Transportation	• Existing 500 kW Cummins genset • Existing Gardner-Denver D800 compressor unit • Existing fresh air intake • Noise emission from the above equipment measured by PAAE staff between June 25th and 29th ,2012 • Proposed Cat 930G front-end Loader, 40% usage, daytime operation • Proposed Tandem axle dump truck (12 yard truck) , 40% usage, daytime operation • Proposed 15-ton underground haul truck, 40% usage, daytime operation • Total 27 Round trips daytime, 40 kph, which include 6 light trucks and 21 heavy trucks (ore trucks, heavy trucks and buses), no transportation nighttime. The route will follow Wernecke road and proposed updated north bypass road.

Table 2 (Cont.): Major Equipment Details

Equipment Description	Equipment Details
Proposed Onek Facility and Transportation –– Sign Post Portal	• Proposed 200 Hp electric driven Ingersoll Rand R150IU rotary screw compressor, housed in sound dampening enclosure, assumed open area less than 1.5% • Proposed ventilation fan, 30 Hp, 36" Diameter, assumed 1274rpm, less than 12000 fpm tip speed. There will be inlet and exhaust sound dampeners, will decrease noise by about 10 dBA • Proposed Cat 930G front-end Loader, 40% acoustical usage, daytime operation • Proposed Tandem axle dump truck (12 yard truck) , 40% acoustical usage, daytime operation • Proposed 15-ton underground haul truck, 40% acoustical usage, daytime operation • Total 37 Round trips daytime, 40 kph, which include 6 light trucks and 31 heavy trucks (ore trucks, heavy trucks and buses), no transportation nighttime • A 80m long x 4m high x 5m wide sound berm will be constructed along the west side of Sign Post Portal Pad to deflect noise, or an equivalent sound curtain will be installed. The route will cross the Sign Post Road and Wernecke Road, and follow the proposed updated north bypass road.
Proposed Water Treatment Plant	• 5Hp water pump, assumed 3600 RPM • 3 Hp compressor, assumed 1800 RPM • Both equipment run continuously, housed in insulated sea cans, assumed open area less than 1.5%.
Proposed Onek Facility and Surface Transportation –990 Portal	• Proposed compressor, ventilation fan, Cat 930G front-end Loader, Tandem axle dump truck (12 yard truck) , 15-ton underground haul truck, keep the same running situation as Sign Post portal option. • Total 37 Round trips daytime, 40 kph, which include 6 light trucks and 31 heavy trucks (ore trucks, heavy trucks and buses), no transportation nighttime • The haul route will be developed from Onek 990 Portal, crossing Lightning Creek Road and the Onek Access Bridge across Lightning Creek to the Bellekeno Haul Road.

Table 2 (Cont.): Major Equipment Details (990 Portal Option)

Equipment Description	Equipment Details
Proposed Onek Facility and Underground Transportation –990 Portal	• Proposed compressor, ventilation fan, Cat 930G front-end Loader, Tandem axle dump truck (12 yard truck) , 15-ton underground haul truck, keep the same running situation as Sign Post portal option. • Total 37 Round trips daytime, 40 kph, which include 6 light trucks and 31 heavy trucks (ore trucks, heavy trucks and buses), no transportation nighttime • Ore haul trucks will transport ore directly from underground to mill (no surface ore transfer)

Proposed Operations Schedule

AKHM will run the mining and mill operations with the equipment shown in table 1. There will be no loader and truck operation at the portal site and no transportation during the nighttime (1900-0700).

The background noise levels for the Keno City residential area will vary considerably depending on location and local activities. Mining project operations will be in addition to the normal fluctuations in background noise levels. Relative humidity, temperature, temperature inversions, the number and varied noise sources are some of the factors that affect sound level and sound propagation.

Method

The distance to the residences and facility physical layout information were obtained from the YESAB, satellite photos and field reconnaissance performed by Patching Associates Acoustical Engineering Ltd. staff. Sound power levels were determined for all of the major noise sources at the existing and proposed facility. Sound propagation calculations were then undertaken to determine the sound pressure level that will exist at the most impacted residences from the mining and mill facility. All calculations were undertaken in octave bands.

The octave band sound power level for each source that will exist at the facility was obtained or calculated field measurements, from manufacturer's data, acoustical reference literature or previous studies. The results of the sound propagation calculations were compared to the recommended permissible sound level to determine if the current and future facility will cause higher noise level to the Keno City residential area.

Sound Power Level Calculations

Octave band sound power levels were calculated for all of the major noise sources that are present at the current and future facility. These octave band sound power levels and the source of the data are presented in Table 3.

Table 3 – Source Octave Band Sound Power Levels

Source Description	Data Source	Linear Octave Band Centre Frequency (dB, ref 1 pW)									Total (dBA)	Total (dBC)
		31.5	63	125	250	500	1k	2k	4k	8k		
Bellekeno Mine Fresh Air Intake	Field Measurements	86	92	98	103	110	110	102	97	83	**112**	**114**
Mill Crusher in full operation	Field Measurements	118	113	111	110	110	107	105	98	89	**112**	**120**
Lucky Queen Portal Genset Exhaust	Field Measurements	107	113	118	112	112	105	101	87	71	**112**	**120**
Lucky Queen Portal Genset wall	Field Measurements	109	114	119	114	108	103	99	90	87	**110**	**121**
Lucky Queen Portal Genset Open Door	Field Measurements	107	107	111	111	107	105	103	95	86	**110**	**116**
Mill DSTF Track Excavator	Field Measurements	131	108	116	107	105	105	95	96	88	**109**	**128**
Lucky Queen Portal Genset Exhaust Muffler	Field Measurements	104	106	111	110	109	100	98	86	71	**109**	**116**
Bellekeno Mine Compressor Unit	Field Measurements	90	90	105	107	105	105	98	90	83	**108**	**112**
Lucky Queen Portal Air Inlet	Field Measurements	79	94	87	92	103	104	101	95	85	**108**	**108**
Lucky Queen Portal Genset Air Outlet	Field Measurements	96	102	108	107	104	102	100	92	83	**107**	**112**
Lucky Queen Portal Compressor Wall	Field Measurements	98	107	106	105	102	99	101	93	87	**106**	**112**

Table 3 (Cont.) – Source Octave Band Sound Power Levels

Source Description	Data Source	Linear Octave Band Centre Frequency (dB, ref 1 pW)									Total (dBA)	Total (dBC)
		31.5	63	125	250	500	1k	2k	4k	8k		
Lucky Queen Portal Compressor Open Door	Field Measurements	86	97	93	96	94	98	99	93	88	**103**	**104**
Mill DSTF Packer	Field Measurements	129	113	105	100	100	99	95	87	81	**103**	**126**
Lucky Queen Portal Gen doors closed	Field Measurements	95	106	110	103	99	96	93	88	80	**102**	**112**
Bellekeno Haul Volvo Truck	Field Measurements	103	101	99	100	96	95	93	87	80	**100**	**107**
Mill Cat 930G Wheel Loader	Field Measurements	106	110	99	92	95	98	91	79	8	**100**	**111**
Mill Building wall	Field Measurements	111	111	104	98	93	94	5	5	5	**97**	**113**
Onek Comp Bldg. Open Area (Doors Closed)	Theoretical	85	83	87	87	89	90	91	87	80	**96**	**97**
Onek Portal Haul Truck	Field Measurements	99	97	95	96	92	91	89	83	76	**96**	**103**
Onek Dump Truck	Field Measurements	99	97	95	96	92	91	89	83	76	**96**	**103**
LQ Portal Haul Truck	Field Measurements	99	97	95	96	92	91	89	83	76	**96**	**103**
LQ Dump Truck	Field Measurements	99	97	95	96	92	91	89	83	76	**96**	**103**
Onek Fan Package	Theoretical	101	102	101	98	93	90	83	79	73	**96**	**106**
Onek Cat 930G Wheel Loader	Field Measurements	102	106	95	88	91	94	87	75	4	**96**	**107**
LQ Cat 930G Wheel Loader	Field Measurements	102	106	95	88	91	94	87	75	4	**96**	**107**
Mill Air Bag Exhaust	Field Measurements	91	98	88	88	89	88	88	89	88	**95**	**100**
Mill South Open Door	Field Measurements	96	92	86	82	81	85	83	82	76	**90**	**97**
Mill Bldg Open Doors	Field Measurements	94	87	84	83	83	81	84	82	73	**89**	**94**
Onek Comp Bldg. Wall	Field Measurements	103	95	93	90	90	77	77	67	59	**89**	**102**
Light truck	Field Measurements	92	92	91	87	84	81	80	70	5	**87**	**96**
East End Bldg	Field Measurements	104	97	89	84	84	79	74	5	5	**85**	**102**
Mill Bldg Louvers	Field Measurements	85	84	81	80	76	77	76	72	65	**82**	**89**

Table 3 (Cont.) – Source Octave Band Sound Power Levels

Source Description	Data Source	Linear Octave Band Centre Frequency (dB, ref 1 pW)									Total (dBA)	Total (dBC)
		31.5	63	125	250	500	1k	2k	4k	8k		
WTP Facility Bldg. Open Area (Doors Closed)	Theoretical	68	66	70	71	72	73	74	70	63	**79**	**80**
WTP Facility Bldg. Wall	Theoretical	86	79	76	73	72	60	60	49	42	**72**	**85**
Bellekeno Proposed Total Daytime (12h),1m	Field Measurements/ Theoretical	52	50	49	49	45	44	42	36	28	**49**	**56**
Onek Proposed Total Daytime (12h),1m	Field Measurements/ Theoretical	50	49	47	48	43	42	40	35	27	**47**	**54**
Bellekeno Current Total Daytime (12h),1m	Field Measurements/ Theoretical	50	48	47	46	42	41	39	34	26	**46**	**54**
LQ Proposed Total Daytime (12h),1m	Field Measurements/ Theoretical	48	47	45	46	42	41	39	33	26	**46**	**53**

Sound Propagation Calculations

The sound propagation calculations were undertaken using the noise modeling software package CadnaA by Datakustik. CadnaA bases its calculation algorithms on ISO 9613 and the ground cover was modeled as mixed ground between the operations and residential areas, with consideration of some deciduous trees in the area. Octave-band sound power level information was used for the major noise sources for the proposed project. The frequency dependency of sound propagation calculations such as ground absorption, air absorption and elevation relative to the sound source, and barrier effects are considered in the model. The weather condition modeled was 10º C temperature and 80% relative humidity; the temperature and humidity values are conditions with a minimum value of air absorption, and so constitute a "worst case" condition. The CadnaA model calculates the contribution level of each noise source at each receiver location in octave bands as well as the overall dBA level.

Modeling Results

The objective of this study was to predict the noise level from the existing and proposed mining and mill operations at the potentially most affected receiver locations. The predictions based on the CadnaA model for this facility are summarized in Tables 4-9 along with the PSL.

Table 4 - Summary of Predicted Noise Levels Generated by AKHM Current Mining Operations under Downwind Conditions (Daytime)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	29	39	**39**
R02	30	35	**36**
R03	30	27	**32**
R04	31	34	**36**
R05	31	32	**34**

Table 5 - Summary of Predicted Noise Levels Generated by AKHM Current Mining Operations under Downwind Conditions (Nighttime)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	19	38	**38**
R02	15	28	**28**
R03	23	26	**28**
R04	24	30	**31**
R05	13	--	**--**

Table 6 - Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Daytime)

--(Onek Sign Post Portal Option and Proposed North Bypass Road)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	29	39	**39 (0)***
R02	30	35	**36 (0)**
R03	32	27	**33 (1)**
R04	35	34	**38 (2)**
R05	32	32	**35 (1)**

* The number in bracket is the predicted noise level increase based on current noise level

Table 7 - Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Nighttime)

--(Onek Sign Post Portal Option and Proposed North Bypass Road)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	20	38	**38 (0)**
R02	17	28	**28 (0)**
R03	25	26	**28 (0)**
R04	30	30	**33 (2)**
R05	23	--	**--**

* The number in bracket is the predicted noise level increase based on current noise level

Table 8 - Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Daytime)

--(Onek 990 Portal Option and Proposed Keno City Bypass Road)

Residence	Predicted Facility Noise Levels Day-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Day-Time plus Ambient Sound Levels (dBA)
R01	30	39	**39 (0)***
R02	30	35	**36 (0)**
R03	31	27	**32 (0)**
R04	32	34	**36 (0)**
R05	31	32	**35 (1)**

* The number in bracket is the predicted noise level increase based on current noise level

Table 9 - Summary of Predicted Noise Levels Generated by AKHM Current and Proposed Mining Operations under Downwind Conditions (Nighttime)

--(Onek 990 Portal Option and Proposed Keno City Bypass Road)

Residence	Predicted Facility Noise Levels Night-Time (dBA)	Measured Ambient Sound Levels (dBA)	Predicted Noise Levels Night-Time plus Ambient Sound Levels (dBA)
R01	21	38	**38 (0)**
R02	18	28	**28 (0)**
R03	24	26	**28 (0)**
R04	27	30	**32 (1)**
R05	19	--	**--**

* The number in bracket is the predicted noise level increase based on current noise level

The results of this assessment indicate that the AKHM existing and proposed facilities during mining and mill operations is expected to have minor noise level increase under downwind conditions. This assumed the equipment running simultaneously and proposed noise control measures AKHM will implement in the Onek Sign Post portal site. Both the current and future

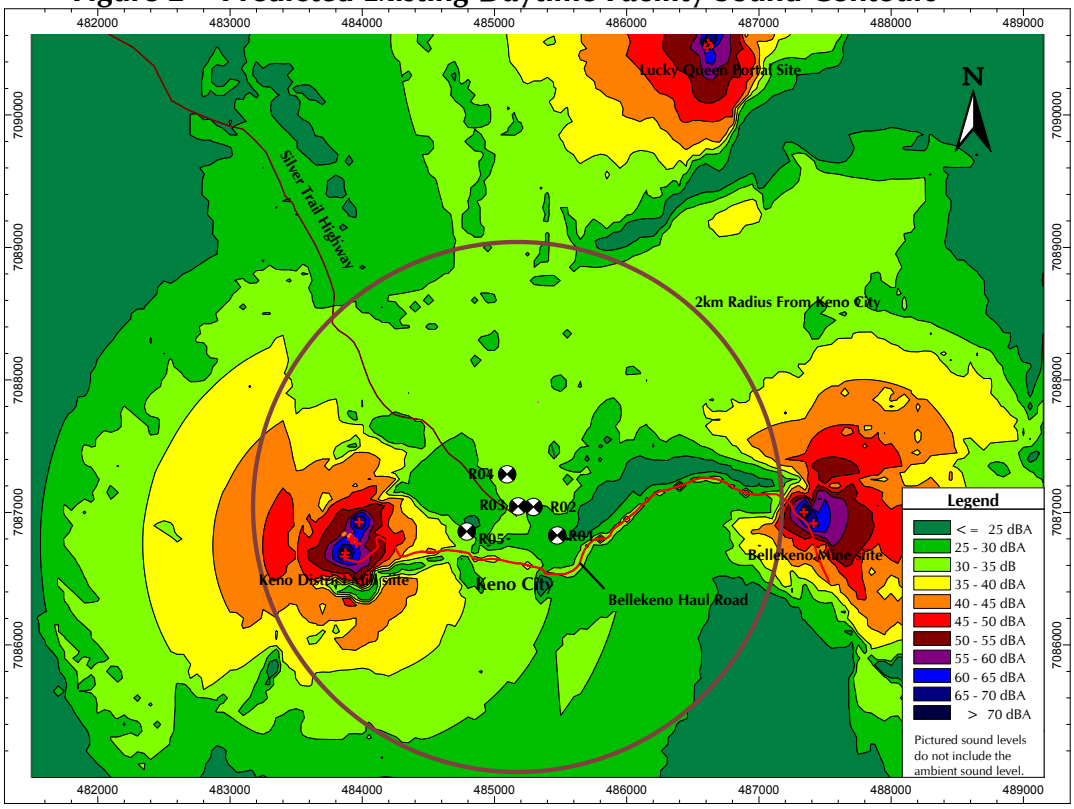
mining operations will have only minor noise impacts on the Keno City residences. The most impacted residence assessed, R4, which is also the closest residence to Onek portal site, will have 3-4 dBA increase of sound level based on measured ambient sound pressure level and 2 dBA increase based on current noise level. The total noise level with the current and /or future facility is low.

The proposed Onek 990 portal and Keno City bypass road will have less noise emission and almost the same noise emission with or without the surface transfer from 990 portal site to the mill.

During the field diagnosis study on the mill facility, the working Cat 930G Wheel Loader, STF Packer and DSTF Track Excavator were fitted with back up beepers, which contribute a high frequency noise signal. Even though the beeper noise didn't cause annoyance for the community due to the short duration of the beeper's signals and the significant distance from the residential area, considering that more similar equipment will be used on Lucky Queeen and Onek mining operation, broadband alarms are recommended to be an effective option to reduce potential noise complaints from the community.

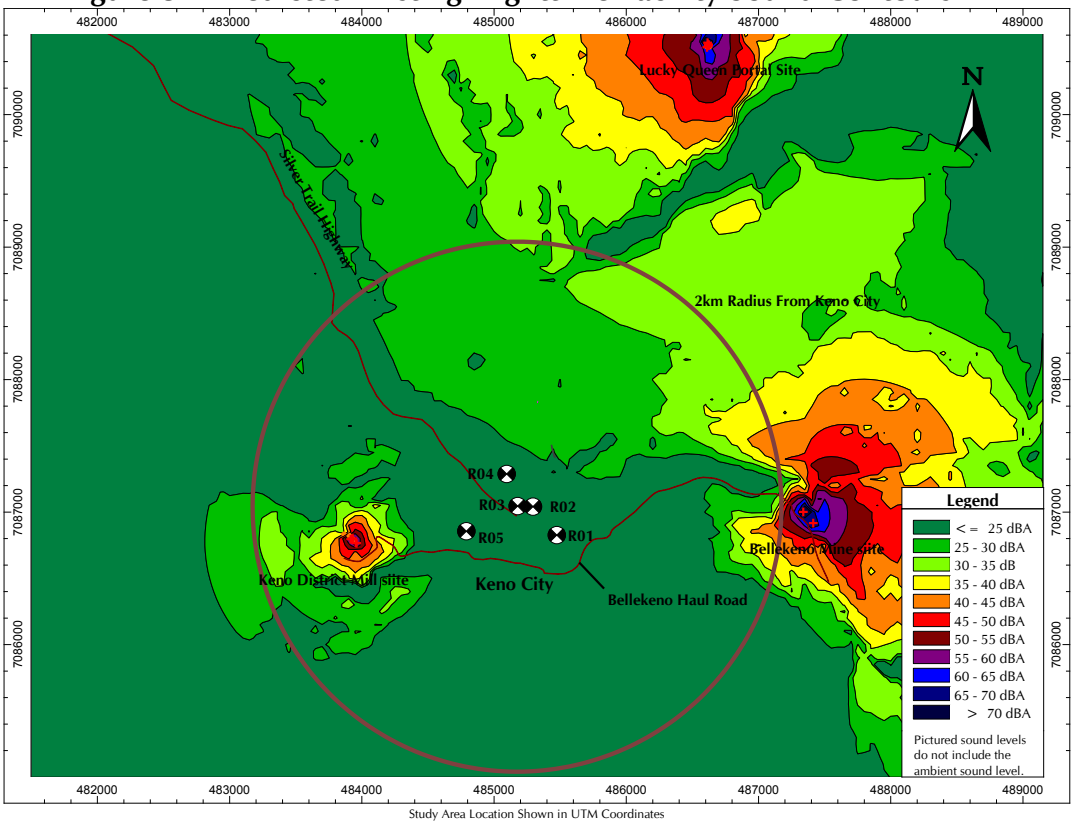
Figures 2 and 7 show the predicted sound levels for the area during mining and mill operations. The labeled sound levels are the predicted sound levels from only the facility (ambient sound level is not included). The scales on the figures are the Universal Transverse Mercator (UTM) coordinates in zone 11U.

Figure 2 – Predicted Existing Daytime Facility Sound Contours



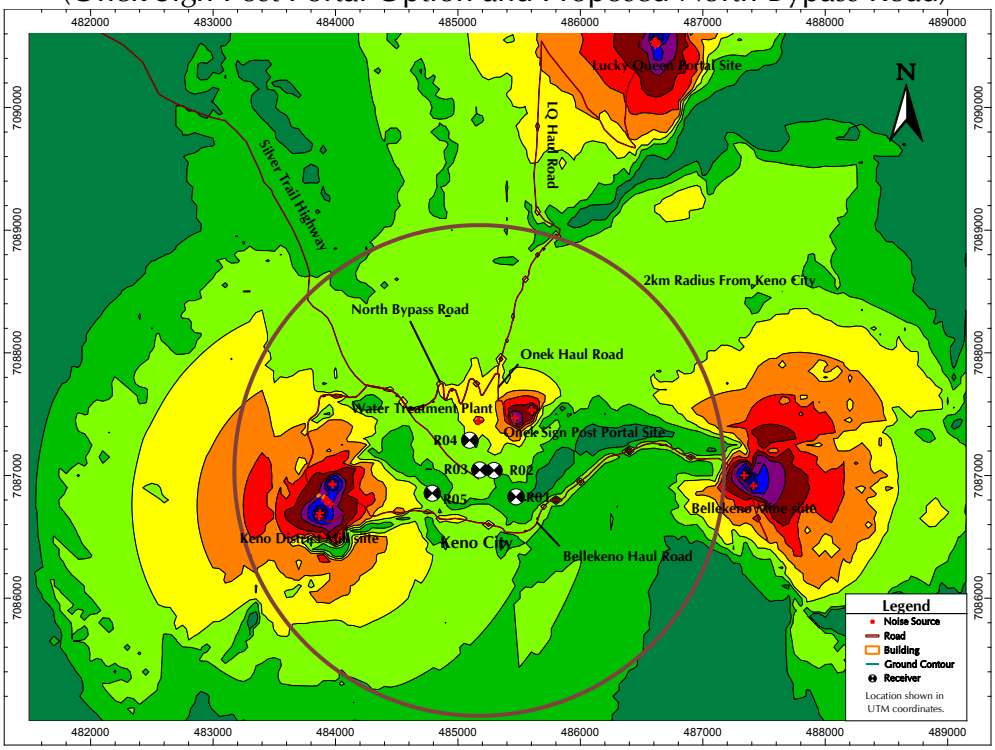
Study Area Location Shown in UTM Coordinates

Figure 3 – Predicted Existing Nighttime Facility Sound Contours



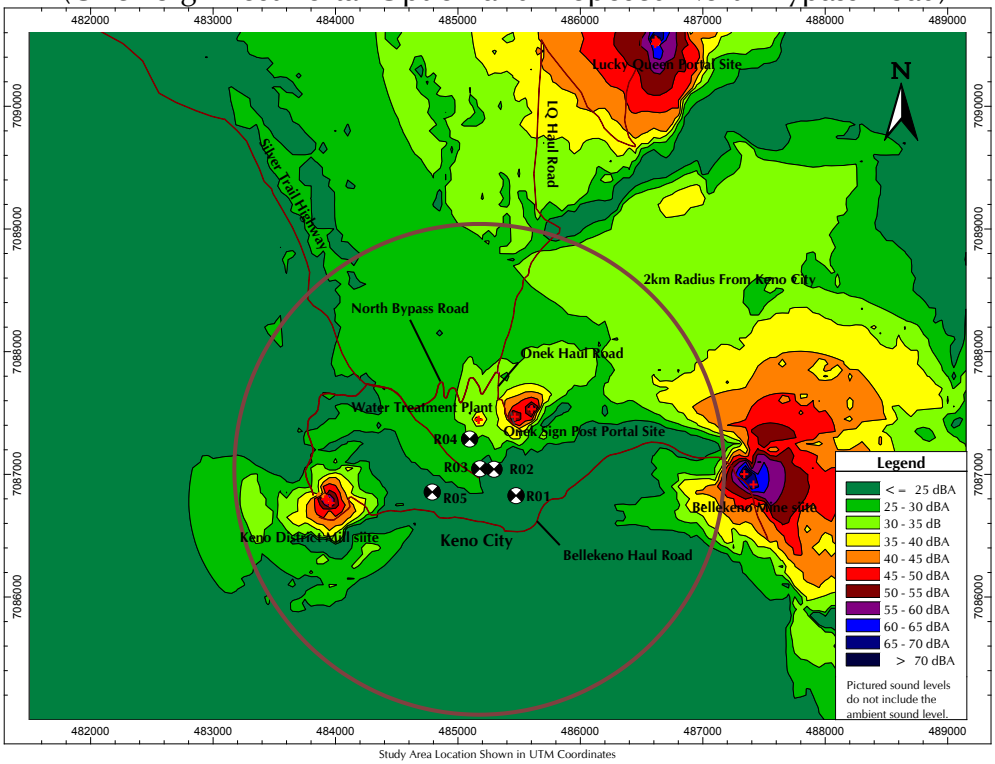
Study Area Location Shown in UTM Coordinates

Figure 4 – Predicted Existing and Proposed Daytime Facility Sound Contours
–(Onek Sign Post Portal Option and Proposed North Bypass Road)



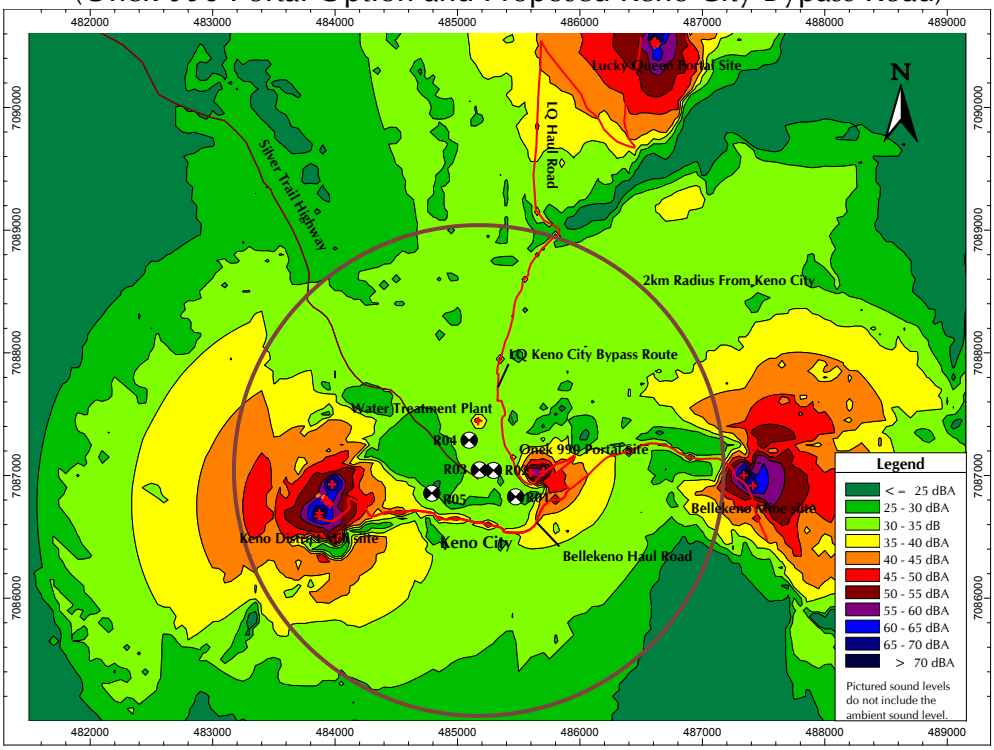
Aerial Image Courtesy of Google Earth Pro, Version 5.0.11733.9347 Licensed to Patching Associates Acoustical Engineering Ltd.

Figure 5 – Predicted Existing and Proposed Nighttime Facility Sound Contours
–(Onek Sign Post Portal Option and Proposed North Bypass Road)



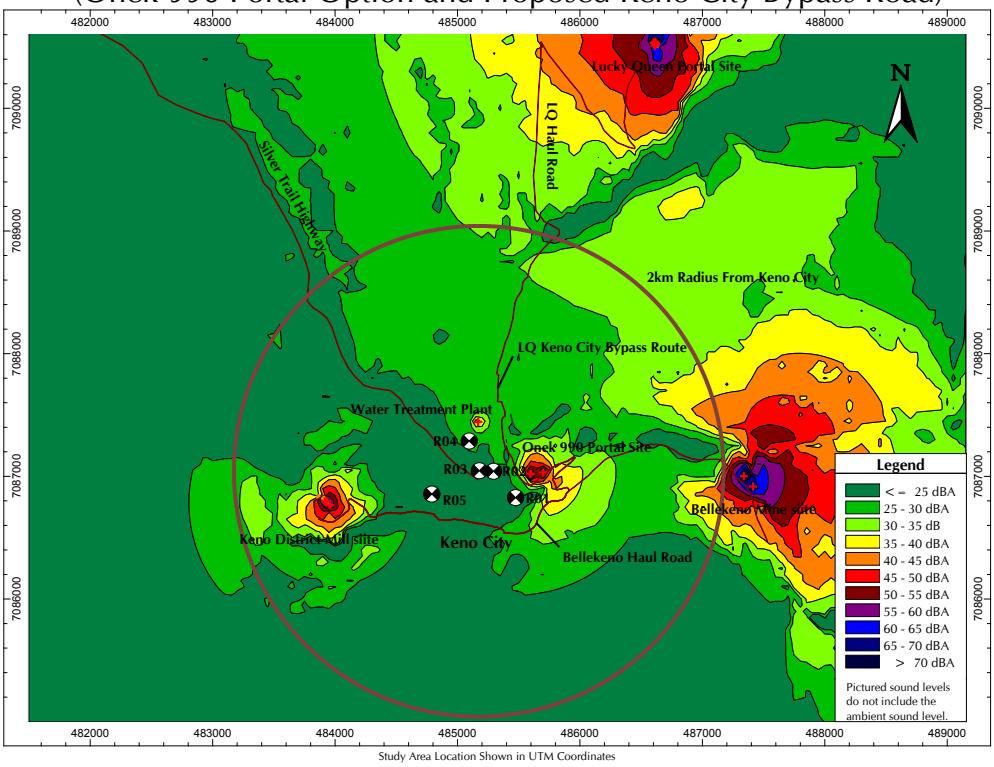
Study Area Location Shown in UTM Coordinates

Figure 6 – Predicted Existing and Proposed Daytime Facility Sound Contours
--(Onek 990 Portal Option and Proposed Keno City Bypass Road)



Study Area Location Shown in UTM Coordinates

Figure 7 – Predicted Existing and Proposed Nighttime Facility Sound Contours
--(Onek 990 Portal Option and Proposed Keno City Bypass Road)



Study Area Location Shown in UTM Coordinates

Source Order Rankings

Based on the CadnaA model, the sound sources can be ranked by the sound levels at the receivers. The source order ranking for the daytime and nighttime scenarios are shown in Tables 10 and 13 for conditions with a wind from the operational areas to the most impacted residence from the current and proposed facility, which is residence R04 located about 384 meters from the proposed Onek Sign Post Portal facility.

Table 8 – Source Order Ranking for Current and Proposed Mining and Mill Operations

– Onek Sign Post Portal, Receiver R04, Downwind Condition (Daytime)

Source	Levels (dBA)
Crusher in full operation	29
Onek Cat 930G Wheel Loader	26
Onek Portal Haul Truck	26
Onek Dump Truck	26
Onek Fan Package	26
Mill DSTF Track Excavator	25
WTP Facility Bldg. Open Area (Doors Closed)	22
Onek Comp Bldg. Open Area (Doors Closed)	21
Lucky Queen Portal Genset Exhaust	19
Mill DSTF Packer	18
Lucky Queen Portal Gen wall	18
Onek Comp Bldg. Wall	17
Mill Cat 930G Wheel Loader	16
Lucky Queen Portal Genset Exhaust Muffler	15
Lucky Queen Portal Genset Air Outlet	14
WTP Facility Bldg. Wall	14
Mill Building wall	13
Lucky Queen Portal Air Inlet	12
Onek Sign Post Haul Route	9
Lucky Queen Portal Gen doors closed	9
LQ Haul Route	8
Lucky Queen Portal Compressor Wall	7
Bellekeno Haul Road	6
Mill Air Bag Exhaust	5
Mill East End Bldg	0
Lucky Queen Portal Genset Open Door	0
LQ Portal Haul Truck	0
LQ Dump Truck	0
LQ Cat 930G Wheel Loader	-1
Lucky Queen Portal Compressor Open Door	-1
Bellekeno Mine Fresh Air Intake	-1
Bellekeno Mine Compressor Unit	-1
Mill Bldg Open Doors	-4
Mill Bldg Louvers	-9
Mill South Open Door	-15
Total Facility Sound Level	**35**
Average Ambient Level	34
Total Facility Plus Ambient	**38**

Table 9 – Source Order Ranking for Current and Proposed Mining and Mill Operations

– Onek Sign Post Portal, Receiver R04, Downwind Condition (Nighttime)

Source	Levels (dBA)
Onek Fan Package	26
WTP Facility Bldg. Open Area (Doors Closed)	22
Onek Comp Bldg. Open Area (Doors Closed)	21
Lucky Queen Portal Genset Exhaust	19
Lucky Queen Portal Gen wall	18
Onek Comp Bldg. Wall	17
Lucky Queen Portal Genset Exhaust Muffler	15
Lucky Queen Portal Genset Air Outlet	14
WTP Facility Bldg. Wall	14
Mill Building wall	13
Lucky Queen Portal Air Inlet	12
Lucky Queen Portal Gen doors closed	9
Lucky Queen Portal Compressor Wall	7
Mill Air Bag Exhaust	5
Mill East End Bldg	0
Lucky Queen Portal Genset Open Door	0
Lucky Queen Portal Compressor Open Door	-1
Bellekeno Mine Fresh Air Intake	-1
Bellekeno Mine Compressor Unit	-1
Mill Bldg Open Doors	-4
Mill Bldg Louvers	-9
Mill South Open Door	-15
Total Facility Sound Level	**30**
Average Ambient Level	30
Total Facility Plus Ambient	**33**

Table 10 – Source Order Ranking for Current and Proposed Mining and Mill Operations

– Onek 990 Portal, Receiver R04, Downwind Condition (Daytime)

Source	Levels (dBA)
Crusher in full operation	29
Mill DSTF Track Excavator	25
WTP Facility Bldg. Open Area (Doors Closed)	22
Lucky Queen Portal Genset Exhaust	19
Mill DSTF Packer	18
Lucky Queen Portal Gen wall	18
Mill Cat 930G Wheel Loader	16
Lucky Queen Portal Genset Exhaust Muffler	15
Lucky Queen Portal Genset Air Outlet	14
Onek Comp Bldg. Wall	14
WTP Facility Bldg. Wall	14
Mill Building wall	13
Lucky Queen Portal Air Inlet	12
Onek Comp Bldg. Open Area (Doors Closed)	11
LQ Keno City Bypass Route	11
Lucky Queen Portal Gen doors closed	9
Lucky Queen Portal Compressor Wall	7
Bellekeno Haul Road	6
Mill Air Bag Exhaust	5
Onek 990 Route	5
Onek Fan Package	4
Onek Cat 930G Wheel Loader	3
Onek Portal Haul Truck	3
Onek Dump Truck	3
Mill East End Bldg	0
Lucky Queen Portal Genset Open Door	0
LQ Portal Haul Truck	0
LQ Dump Truck	0
LQ Cat 930G Wheel Loader	-1
Lucky Queen Portal Compressor Open Door	-1
Bellekeno Mine Fresh Air Intake	-1
Bellekeno Mine Compressor Unit	-1
Mill Bldg Open Doors	-4
Mill Bldg Louvers	-9
Mill South Open Door	-15
Total Facility Sound Level	**32**
Average Ambient Level	34
Total Facility Plus Ambient	**36**

Table 11 – Source Order Ranking for Current and Proposed Mining and Mill Operations – Onek 990 Portal, Receiver R04, Downwind Condition (Nighttime)

Source	Levels (dBA)
WTP Facility Bldg. Open Area (Doors Closed)	22
Lucky Queen Portal Genset Exhaust	19
Lucky Queen Portal Gen wall	18
Lucky Queen Portal Genset Exhaust Muffler	15
Lucky Queen Portal Genset Air Outlet	14
Onek Comp Bldg. Wall	14
WTP Facility Bldg. Wall	14
Mill Building wall	13
Lucky Queen Portal Air Inlet	12
Onek Comp Bldg. Open Area (Doors Closed)	11
Lucky Queen Portal Gen doors closed	9
Lucky Queen Portal Compressor Wall	7
Mill Air Bag Exhaust	5
Onek Fan Package	4
Mill East End Bldg	0
Lucky Queen Portal Genset Open Door	0
Lucky Queen Portal Compressor Open Door	-1
Bellekeno Mine Fresh Air Intake	-1
Bellekeno Mine Compressor Unit	-1
Mill Bldg Open Doors	-4
Mill Bldg Louvers	-9
Mill South Open Door	-15
Total Facility Sound Level	**27**
Average Ambient Level	30
Total Facility Plus Ambient	**32**

Conclusion

The results of this assessment indicate that the AKHM current with proposed future mining and mill operations is expected to have minor noise level increase under downwind conditions compared with current situation. This assumed all of the equipment running simultaneously and proposed noise control measures AKHM will implement in the Onek Sign Post portal site. Both the current and future mining operations will have only minor noise impacts on the Keno City residences. The most impacted residence assessed R04, which is also the closest residence to Onek portal site, will have 3-4 dBA increase of sound level based on measured ambient sound pressure level and 2 dBA increase based on current noise level. The total noise level with the current and /or future facility is low.

The proposed Onek 990 portal and Keno City bypass road will have less noise emission and almost the same noise emission with or without the surface transfer from 990 portal site to the mill.

APPENDIX A

Explanation of Technical Details Regarding Sound Measurement and Analysis

Technical Details

Sound is the phenomena of vibrations transmitted through air, or other medium such as water or a building structure. The range of pressure amplitudes, intensities, and frequencies of the sound energy is very wide, and many specialized fields have developed using different ranges of these variables, such as room acoustics and medical ultrasound.

Due to the wide range of intensities, which are perceived as sound, standard engineering units become inconvenient. Sound levels are commonly measured on a logarithmic scale, with the level (in decibels, or dB) being proportional to ten times the common logarithm of the sound energy or intensity. Normal human hearing covers a range of about twelve to fourteen orders of magnitude in energy, from the threshold of hearing to the threshold of pain. On the decibel scale, the threshold of hearing is set as zero, written as 0 dB, while the threshold of pain varies between 120 to 140 dB. The most usual measure of sound is the sound pressure level (SPL), with 0 dB SPL set at 2.0×10^{-5} N/m^2 (also written 20 μPa), which corresponds to a sound intensity of 10^{-12} Watts/m^2 (or 1 picoWatt/m^2, written 1 pW/m^2).

Normal human hearing spans a frequency range from about 20 Hertz (Hz, or cycles per second) to about 20,000 Hz (written 20 KHz). However, the sensitivity of human hearing is not the same at all frequencies. To accommodate the variation in sensitivity, various frequency-weighting scales have been developed. The most common is the A-weighting scale, which is based on the sensitivity of human hearing at moderate levels; this scale reflects the low sensitivity to sounds of very high or very low frequencies. Sound levels measured on the A-weighted scale are written in A-weighted decibels, commonly shown as dBA or dB(A).

When sound is measured using the A-weighting scale, the reading is often called the "Noise level", to confirm that human sensitivity and reactions are being addressed. A table of some common noise sources and their associated noise levels are shown in Table A1.

When the A-weighting scale is not used, the measurement is said to have a "linear" weighting, or to be unweighted, and may be called a "linear" level. As the linear reading is an accurate measurement of the physical (sound) pressure, the term "Sound Pressure Level", or SPL, is usually (but not universally) reserved for unweighted measurements.

Noise is usually defined as "unwanted sound", which indicates that it is not just the physical sound that is important, but also the human reaction to the sound that leads to the perception of sound as noise. It implies a judgment of the quality or quantity of sound experienced. As a human reaction to sound is involved, noise levels are usually given in A-weighted decibels (dBA). An alternate definition of noise is "sound made by somebody else", which emphasizes that the ability to control the level of the sound alters the perception of noise.

Table B1- Noise Levels of Familiar Sources

Source Or Environment	Noise Level (dBA)
High Pressure Steam Venting To Atmosphere (3m)	121
Steam Boiler (2m)	90-95
Drilling Rig (10m)	80-90
Pneumatic Drill (15m)	85
Pump Jack (10m)	68-72
Truck (15m)	65-70
Business Office	65
Conversational Speech (1m)	60
Light Auto Traffic (30m)	50
Living Room	40
Library	35
Soft Whisper (5m)	20-35

The single number A-weighted level is often inadequate for engineering purposes, although it does supply a good estimate of people's reaction to a noise environment. As noise sources, control measures, and materials differ in the frequency dependence of their noise responses or production, sound is measured with a narrower frequency bandwidth; the specific methodology varies with the application. For most work, the acoustic frequency range is divided into frequency bands where the center frequency of each band is twice the frequency of the next lower band; these are called "Octave" bands, as their frequency relation is called an "Octave" in music, where the field of acoustics has its roots. For more detailed work, the octave bands, and certain standard octave and 1/3 octave bands have been specified by international agreements.

Where the noise at the receiver is steady, it is easy to assess the noise level. However, both the production of noise at the source and the transmission of noise can vary with time; most noise levels are not constant, either because of the motion of the noise source (as in traffic noise), because the noise source itself varies, or because the transmission of sound to the receiver location is not steady as over long distances. This is almost always the case for environmental noise studies. Several single number descriptors have been developed and are used to assess noise in these conditions.

The most common is the measurement of the "equivalent continuous" sound level, or L_{eq}, which is the level of a hypothetical source of a constant level which would give the same total sound energy as is measured during the sampling period. This is the "energy" average noise level. Typical sampling periods are one hour, nighttime (9 hours) or one day (24 hours); the sampling period used must be reported when using this unit.

The greatest value of the L_{eq} is that the contributions of different sources to the total noise level can be assessed, or in a case where a new noise source is to be added to a proposed environment, the total noise level from new and old sources can be easily calculated. It is also sensitive to short term high noise levels.

Statistical noise levels are sometimes used to assess an unsteady noise environment. They indicate the levels that are exceeded a fixed percentage of the measurement time period measured. For example, the 10%-ile level, written L_{10}, is the levels exceeded 10% of the time; this level is a good measure of frequent noisy occurrences such as steady road traffic. The 90% level, L_{90}, is the level exceeded 90% of the time, and is the background level, or noise floor. A steady noise source will modify the background level, while an intermittent noise source such as road or rail traffic will affect the short-term levels only.

One disadvantage with the L_{eq} measure, when used alone, is that nearby loud sources (e.g. dogs barking, or birds singing) can confuse the assessment of the situation when it is the noise from a distant plant that is the concern. For this reason, the equivalent level and the statistical levels can be used together to better understand the noise environment. One such indication is the difference between the L_{eq} and the L_{90} levels. A large difference between the L_{eq} and L_{90}, greater than 10 dB, indicates the intrusion of short-term noise events on the general background level. A small difference, less than 5 dB, indicates a very steady noise environment. If the L_{eq} value exceeds the L_{10} value this indicates the presence of significant short-term loud events.

For most noise measurement, instruments are adjusted so that the time response of the instrument is similar to the response of the human ear; this is the "Fast" setting. Measurement with the "Fast" setting therefore assesses the sound environment according to the way humans would hear it and react to it. Where the noise level varies substantially and an average level is wanted without the complexity of and L_{eq} or statistical measurement, the "Slow" setting is used on the sound level meter. The "Slow" setting is also typically used in industrial settings where hearing damage is a concern. Where the noise level changes very rapidly, for example due to impacts or detonations, the "Fast" and "Slow" settings do not respond quickly enough to assess the maximum levels, and the "Impulse" meter setting us used.

The Sound Power Level (abbreviated L_w, SWL or PWL) is the decibel equivalent of the total energy emitted from a source in the form of noise. The reference level for the sound power is 10^{-12} Watts, or 1 picoWatt (abbreviated pW). The sound power level is given by:

$$L_w, \text{SWL, PWL} = 10 \times \log_{10} (\text{Emitted Power} / 1\ \text{pW})\ \text{dB}$$

Therefore, a source emitting 1 Watt of power in the form of sound would have a sound power level of 120 dB. Sound power levels can be expressed in terms of frequency bands, an overall linear-weighted level or A-weighted, as is the case for sound pressure levels. However, sound power levels are inherent to the source of noise, whereas the sound pressure level is dependent on the source, but also on the distance from the source and other environmental factors.

APPENDIX B

NOISE DISTURBANCE NOTIFICATION FORM

NOISE DISTURBANCE NOTIFICATION FORM

ALEXCO KENO HILL MINING CORP. – KENO HILL SILVER DISTRICT MINING OPERATIONS

Name of Complainant:

Phone Number & Address of Complainant:

Date	**Start Time/ End Time**	**Location**	**Description of Noise (e.g. likely source, magnitude, duration, pitch, ongoing or isolated noise incident)**	**How did the noise disturbance disrupt your life and/or your business/livelihood?**

This form has been created for Keno Residents to formally complain of noise disturbance associated with Alexco Keno Hill Mining Corp.'s Keno Hill Silver District Operations. Please complete all fields. Return completed forms to campservice@alexcoresource.com, directly to the Elsa Camp Administration Building or call (867) 996-2330.

Signature: Date:

3 Calcite Business Centre, 151 Industrial Road
Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 Fax (867) 633-4882
www.accessconsulting.ca

Memorandum

To: Alexco Resource Corp.

From: Catherine Henry, Access Consulting Group

CC: Kai Woloshyn, Alexco Resource Corp.

Date: November 28, 2013

Re: Noise Monitoring Data Summary, Keno, YT

INTRODUCTION

As part of the Keno Hill Silver District Mining Operations Noise Management Plan (the Plan) Alexco Keno Hill Mining Corp. (AKHM) has been monitoring noise levels in Keno City. The Plan was initially developed to address any potential noise effects that might occur with the addition of the two new mines, Lucky Queen and Onek. In addition to noise mitigation measures and the creation of a Noise Disturbance Notification Form and Noise Disturbance Register to track noise disturbance claims, AKHM committed to monitor noise levels within the community at various locations to assess the actual versus predicted noise levels and to determine if the noise abatement measures are effective. These noise data can now be used in the context of the Flame and Moth mine development.

The predicted noise levels for the Bellekeno, Onek and Lucky Queen mines were presented in the Noise Impact Assessment (NIA) completed by Patching Associates Acoustical Engineering Ltd. (PAAE) conducted during the *Yukon Environmental and Socio-Economic Assessment Act* (YESAA) process (Project 2011-0315). The NIA identifies the noise sources from the current mining-related activities, noise receptors, and predicts the anticipated noise level from all existing sources and those associated with the addition of Lucky Queen and Onek mining operations.

This memo presents noise monitoring results from April to November 2013.

NOISE RECEPTORS

AKHM has monitored noise at the five locations selected in the NIA as being potential noise receptors within the 2 km radius study area around Keno City. These are listed in Table 1 and shown in Figure 1.

Table 1 Representative Locations Assessed in Keno City

Residence	GPS Location	Description
R01	N63.90827 W135.29599	East end Residence, north side of Lightning Creek Road
R02	N63.91019 W135.29968	Residence, east side of Sign Post Road
R03	N63.91023 W135.30205	Town Center, north from the Snack Bar
R04	N63.91239 W135.30376	Residence, west side of Wernecke Road
R05	N63.90851 W135.30993	Residence, about 850m east from the Mill

The background noise levels experienced by these locations vary considerably, depending on location and local activities. Past and proposed mining operations are in addition to normal fluctuations in background levels. Climate parameters, such as relative humidity, temperature, and temperature inversions impact the sound level and propagation experienced by each of these receptors.

MONITORING TIMING

For the period from April to November 2013, a total of eight monitoring events were conducted. Mining took place at Bellekeno, and milling at the Keno District Mill throughout 2013 and was suspended on September 3rd, while operations at Onek ceased at the end of May 2013. November 2013 data can be considered as baseline as no mining operations were taking place at that time.

RESULTS

The results from the 8 monitoring events from April to November 2013 are presented in Appendix A. All readings were taken using an Extech integrating sound level datalogger model 407780 to measure average dBA over 10 minutes. The wind speed, wind direction, temperature and precipitation data from the Keno District Mill weather station associated with each noise monitoring event have been collected as these can have a significant effect on measured noise levels. Any notable noise sources associated with the monitoring event was also documented.

Noise levels measured at all testing locations were well within or below the 50-90 dBA range deemed "what is socially acceptable for daytime noise limits" as defined in the past YESAB assessment for the Bellekeno Mine development (Project 2009-0030). Of the six measurements above 50 dBA, four occurred on April 8th (R01, R02, R03, and R04) and two on May 19th (R01 and R03), with all measurements below 70 dBA. While this corresponds to the period of operations at Onek, only one observation associated with the measurements appears to be linked with mining operations (May 19th measurement at R03: 'water truck went by'). In addition, observations for the May 19th event refer to creeks flowing, likely at their highest during spring freshet, and birds chirping, while wind conditions for the April 8th measurements were recorded as 'Windy SSE'. The crusher was operating during most of the April 8th, most of the May 19th and all of the June 18th noise measurements. No crushing took place during measurements on April 10th, May 6th, July 24th or in November, but preparation for mantle change out took place on July 24th. While the crusher could be a contributing noise source, other natural, anthropogenic or mine-related noise sources likely play an important role.

Figure 2 shows the noise levels measured compared to the predicted current and proposed mining operations noise levels plus ambient sound levels from the NIA. Most of the measurements exceed the predicted levels, which range from 32 to 39 dBA, both in the period of Onek operations and after operations had ceased. Noise levels measured in November, when no mining operations took place, generally fall within or below this range,

and can be considered as baseline during this time period. It is likely that during other time periods of the year, the baseline will be different, associated with different levels of activity in Keno City.

For R01, which is closest to Onek, all measurements except the May 6th and the November records exceed the predicted noise levels. The April events appear associated with wind, while all events after May 6th appear to have noises associated with Lightning Creek and/or other environmental sources (i.e. leaves, animals) and anthropogenic noise sources (i.e. tarps). The May 6th measurement of 35.1 dBA - below the predicted noise level – was taken while the backup alarm at Onek could be heard.

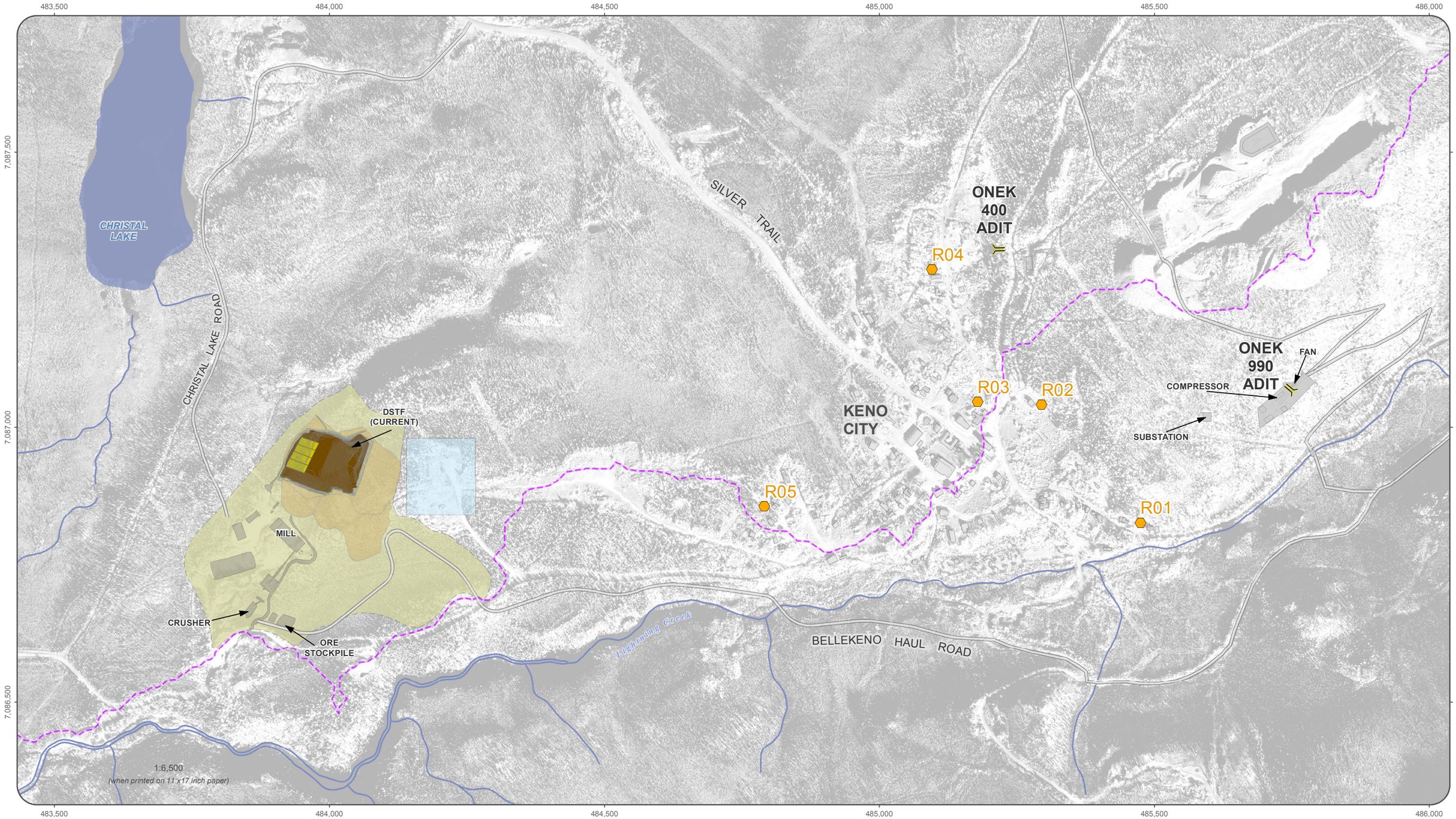
R02 also exhibits this same pattern, with May 6th and November as the only measurements that does not exceed the predicted noise levels. At R03 and R05 all measurements except on November 17th exceed the predictions, although it is not certain the primary source of noise during this period. Finally, R04 had several measurements below the predictions, both during and after Onek operations ceased, with the remaining measurements exceeding the predictions. These observations indicate that many of the notable noise sources are likely not linked to operations at Onek, although several sources may be associated with Keno mining operations, including backup alarms at the Mill, the Mill crusher, and the movement of trucks.

CONCLUSION

Noise levels measured at all noise receptors were well within or below the 50-90 dBA range deemed to be socially acceptable for daytime noise limits. Compared to the predicted current and proposed mining operations noise levels plus ambient sound levels from the NIA, most of the measurements exceed the predicted levels, which range from 32 to 39 dBA, both in the period of Onek operations and after operations had ceased. Measurements taken in November, when no mining operations were taking place, generally fall within or below the predicted range.

These measurements and observations from each of the noise receptors indicate that much of the noise measured is not likely linked to operations at Onek or mill operations, although some may be associated with Keno mining operations, but this can't be discerned at this time.

Given the short measurement interval of 10 minutes, measurements could have been influenced by fluctuations in background levels and climate parameters impacting noise levels and propagation. Thus, over a longer interval of measurement it is possible that lower noise levels might have been measured.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Noise Monitoring Station
- Roads
- Watercourse
- Watershed Boundaries
- Mill Site Footprint
- DSTF Cover and Revegetation Phase I
- Land Disposition Garbage Dump
- Buildings/Structures
- DSTF 322,000 Tonnes Design
- As Built, DSTF, Sept2013

ALEXCO

ACCESS

NOISE MONITORING DATA SUMMARY MEMORANDUM

FIGURE 1

KENO CITY NOISE MONITORING STATIONS

NOVEMBER 2013

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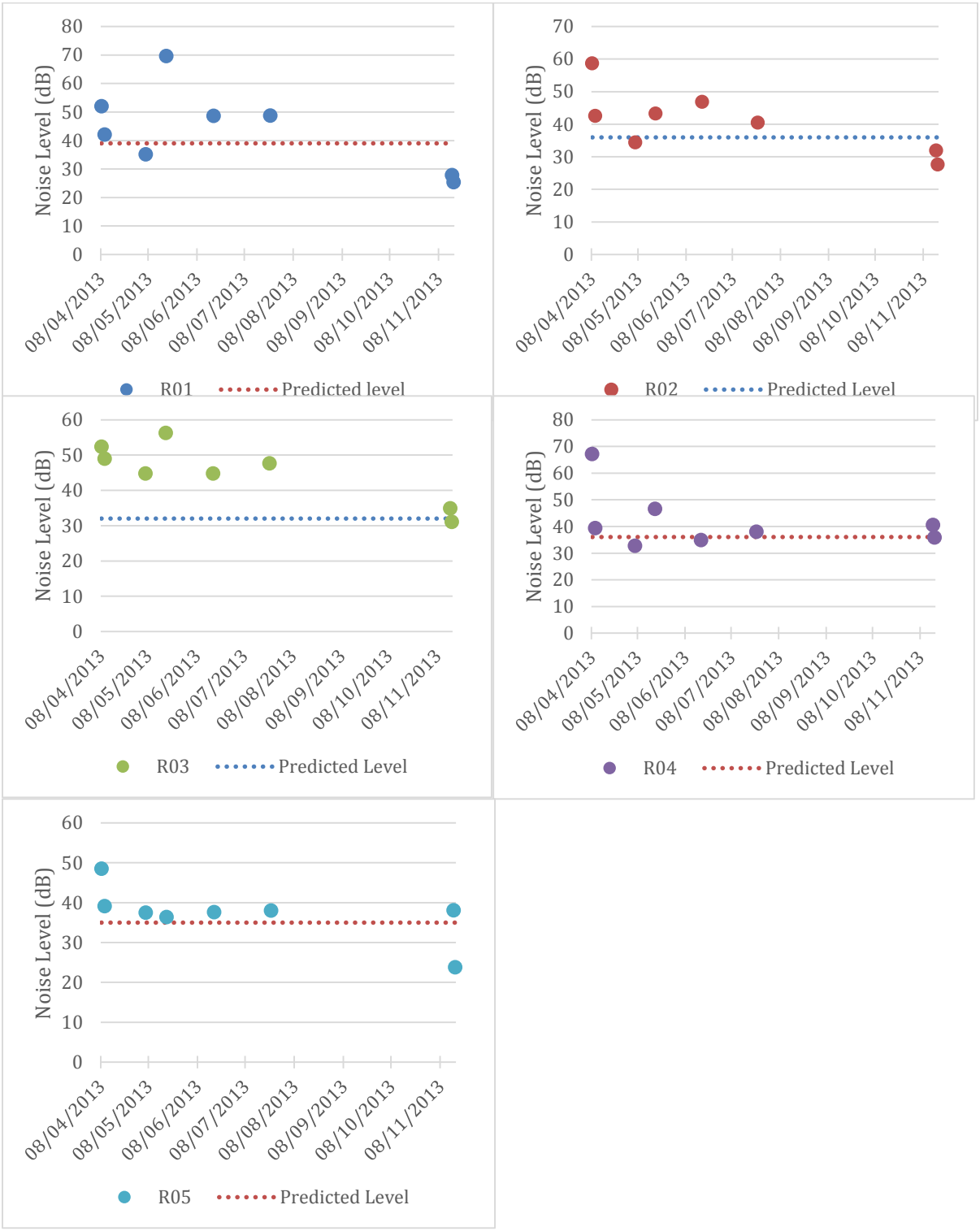

Figure 2 Keno Noise Monitoring Data

APPENDIX A

KENO NOISE MONITORING DATA

Keno Noise Monitoring Data

Date	Location	Time	Temp (°C)	Wind	Precipitation	DBA	Observations
08-04-2013	R01	12:26	2	Windy SSE	None	52.0	
08-04-2013	R02	12:05	2	Windy SSE	None	58.6	
08-04-2013	R03	11:45	2	Windy SSE	None	52.4	
08-04-2013	R04	11:25	2	Windy SSE	None	67.2	A dog barked 2 times
08-04-2013	R05	11:04	2	Windy SSE	None	48.5	
10-04-2013	R01	11:33	-6	Light SSW	None	42.1	
10-04-2013	R02	13:00	-6	Light SSW	None	42.5	
10-04-2013	R03	12:40	-6	Light SSW	None	49.0	Doors slamming. People talking
10-04-2013	R04	12:20	-6	Light SSW	None	39.4	
10-04-2013	R05	12:00	-6	Light SSW	None	39.1	
06-05-2013	R01	15:30	2	Wind West	None	35.1	Backup alarm at Onek. Tarps flapping in wind
06-05-2013	R02	15:30	2	Slight breeze	None	34.4	
06-05-2013	R03	15:30	2	Windy	None	44.8	Dog barking. Boart truck
06-05-2013	R04	15:30	2	Slight breeze	None	32.8	
06-05-2013	R05	15:30	2	Slight breeze	None	37.5	Dog barking
19-05-2013	R01	10:25	-2	Light (<10km/h) N	Light snow	69.6	Creek flowing loud. Squirrels making noise. Tarp flapping. Volvo going by on the BKR
19-05-2013	R02	10:10	-2	Light (<10km/h) E	Light snow	43.2	Creek flowing below. A few birds chirping. Boart pickup went by
19-05-2013	R03	9:55	-2	Light (<10km/h) E	Light snow	56.3	A few birds. Talking and trucks in town in the distance. Water truck went by
19-05-2013	R04	9:30	-2	Light (<10km/h) E	Light snow	46.6	Lots of birds calling and a woodpecker pecking close by
19-05-2013	R05	8:55	-2	Light (<10km/h) E	Light snow	36.4	A few birds and a squirrel chirping
18-06-2013	R01	16:25	22	Light (<10km/h) S	None	48.6	Creek flowing. Leaves rustling
18-06-2013	R02	16:10	22	Light (<10km/h) S	None	46.8	Volvo on BKR. 2 vehicles drove past. Gusts of wind rustling trees. Chainsaw nearby in town
18-06-2013	R03	15:55	22	Light (<10km/h) S	None	44.8	People talking and walking close by. 2 Vehicles driving through town and 1 driving by
18-06-2013	R04	15:40	21	Light (<10km/h) S	None	34.9	Wind rustling leaves. Birds calling
18-06-2013	R05	14:55	21	Light (<15km/h) S	None	37.6	Wind rustling leaves. Volvo on the BKR
24-07-2013	R01	11:07	23	light (<20km/h) S	None	48.7	Leaves rustling. Creek nearby. Birds chirping
24-07-2013	R02	10:55	23	light (<10km/h) S	None	40.4	Three vehicles driving nearby. Leaves rustling
24-07-2013	R03	10:43	23	light (<10km/h) S	None	47.7	Backup alarm at Mill. Leaves rustling. Someone in town hammering. Two vehicles drove by
24-07-2013	R04	10:30	23	light (<10km/h) SE	None	38.0	Backup alarm at Mill. Mill crusher. Leaves rustling. Car drove by twice. Car on Silver Trail
24-07-2013	R05	10:14	23	Calm	None	38.0	Backup alarm at Mill. Volve down BKR. Mill crusher
16-11-2013	R01	14:11	-20	Calm	None	27.8	Birds
16-11-2013	R02	13:51	-20	Calm	None	31.9	Squirrel, ravens, birds noise
16-11-2013	R03	13:35	-20	Calm	None	34.9	Squirrel, ravens, birds noise+ truck
16-11-2013	R04	13:20	-20	Calm	None	40.6	Lots of ravens activity, birds.
16-11-2013	R05	14:27	-20	Calm	None	38.1	Birds, truck plus door slaming + humain voive + dog barking. All at about 200 meters from sound mete
17-11-2013	R01	12:46	-30	Calm	None	25.4	Birds
17-11-2013	R02	12:25	-30	Calm	None	27.6	Birds, squirrel and vehicule.
17-11-2013	R03	12:07	-30	Calm	None	31.1	Ravens, squirrel and vehicule.
17-11-2013	R04	11:48	-30	Calm	None	35.9	Ravens
17-11-2013	R05	13:01	-30	Calm	None	23.8	Quiet

*All readings are taken using an Extech integrating sound level datalogger model 407780 to measure DBA for 10 min.Reading from 16/11/13 taken with an Casella CEL-63X model.(Laeq, Db.)

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Memorandum

To: Alexco Resource Corp.

From: Catherine Henry, Access Consulting Group

CC: Kai Woloshyn, Alexco Resource Corp.

Date: November 28, 2013

Re: Air Quality Data Summary, Keno, YT

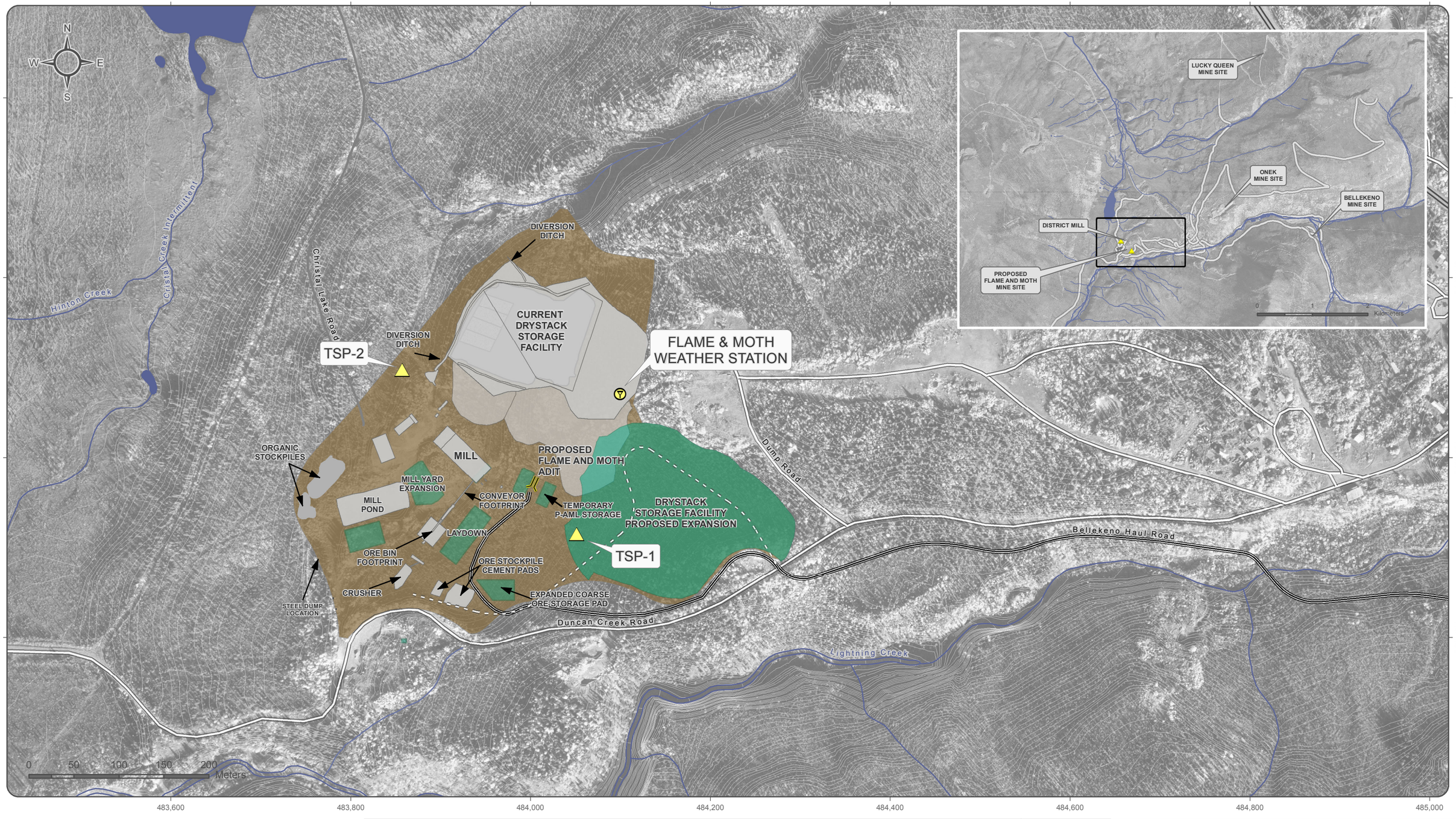
1. INTRODUCTION

In accordance with Clause 69 of the Decision Document for the assessment of the Bellekeno Mine Project (YESAB File Number 2009-0030), dustfall monitoring was installed at two initial locations near the Keno District Mill site in March 2011 and two additional sampling locations were established in August 2011. Bergerhoff dust monitoring gauges were initially selected as the appropriate instrumentation to carry out this program. In accordance with clauses 36 and 37 of the Decision Document for the assessment of the Onek and Lucky Queen Deposit production (YESAB File Number 2011-0315), total suspended particulates (TSP) monitoring was subsequently initiated in August 2012 and dustfall monitoring was discontinued in January 2013. This memorandum presents the results of the TSP monitoring to date.

2. INSTRUMENTATION AND METHODOLOGY

Two BGI Omni Ambient Air Quality Samplers (see Figure 1) were commissioned in August 2012, one to the East of the mill and crusher (TSP-1) and one at the toe of the dry stack tailings facility (TSP-2). The locations are shown on Figure 2. The BGI Omni samplers are set up with Total Suspended Particulates (TSP) inlets, and use the filter reference method. Samples are collected over 24-hour periods and sent to Maxxam Analytics laboratory for gravimetric analysis and ICP metals mass spectrometry. Four samples per location are collected every month, in order to capture the different weather conditions that may affect dust sources and transport. The BGI Omni Ambient Air Quality Samplers cannot collect samples below -20°C and therefore some winter months will have reduced data collected to date.

Figure 1 BGI Omni Ambient Air Quality Sampler



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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- Flame and Moth Adit
- Dust Monitoring Station
- Weather Station
- Highway,
- Local Road
- Proposed Haul Road
- Mill Road
- Former Haul Road
- District Mill Footprint
- DSTF Cover and Revegetation Phase I
- Proposed Features

ALEXCO

ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 2

DUST MONITORING AND WEATHER STATION LOCATIONS

NOVEMBER 2013

I:\Keno_Area_Mines\FM\Map\02_Permit\DustMonitoring\Dust_Monitoring_Stns_20131128.mxd
(Last edited by: jpan;2013-11-28/17:01 PM)

3. RESULTS

3.1. TOTAL SUSPENDED PARTICULATES

Results of the gravimetric analyses can be converted into 24-hour average ambient concentrations based on the flow rate of the instruments. This can then be compared with the Yukon Ambient Air Quality Standard (YAAQS) of 120 µg/m^3 for TSP (24-hour average). Table 1 below shows that all results are 5 to 20 times below the Yukon TSP standard. Note that 64% and 54% of samples were below detection limit for TSP-1 and TSP-2 respectively. Also note that the air quality monitors are located 160 (TSP-1) and 46 (TSP-2) meters away from the dry stack tailings storage facility (DSFTF) and 163 (TSP-1) and 240 (TSP-2) meters away from the crusher, while the nearest residence is at a distance of 710 meters from the DSTSF and 860 meters from the crusher. TSP levels experienced at the nearest residence would therefore be lower than what was measured at TSP-1 or TSP-2.

Table 1 24-Hour Average Total Suspended Particulate Results, 2012-2013

Sample Date	TSP-1 (µg/m^3)	TSP-2 (µg/m^3)
23/08/2012	10.1	12.8
27/09/2012	<5.6	<5.6
29/09/2012	<5.6	<5.6
16/10/2012	5.8	-
17/10/2012	<5.6	-
23/10/2012	53.2	-
15/12/2012	<5.6	13.6
14/01/2013	<5.6	-
16/01/2013	<5.6	<5.6
23/03/2013	<5.6	18.2
24/03/2013	<5.6	23.2
25/03/2013	<5.6	13.5
26/03/2013	9.6	11.1
07/04/2013	-	17.1
10/04/2013	5.7	7.2
13/04/2013	<5.6	6.9
15/04/2013	6.5	6.5
16/04/2013	7.2	6.4
28/05/2013	6.8	-
16/06/2013	8.2	-
17/06/2013	-	<5.6
18/06/2013	47.2	6.3
21/06/2013	7.2	<5.6

Sample Date	TSP-1 (µg/m³)	TSP-2 (µg/m³)
23/06/2013	-	<5.6
24/06/2013	<5.6	-
28/06/2013	-	62.2
19/07/2013	5.6	<5.6
20/07/2013	12.2	<5.6
21/07/2013	<5.6	<5.6
22/07/2013	<5.6	10.1
22/08/2013	<5.6	<5.6
23/08/2013	<5.6	-
24/08/2013	<5.6	-
25/08/2013	<5.6	<5.6
26/08/2013	-	<5.6
28/08/2013	-	7.2
31/08/2013	-	<5.6
21/09/2013	-	<5.6
24/09/2013	<5.6	<5.6
27/09/2013	<5.6	<5.6
28/09/2013	<5.6	<5.6
29/09/2013	<5.6	-
30/09/2013	-	6.0
24/10/2013	-	<5.6
25/10/2013	7.6	<5.6
26/10/2013	<5.6	<5.6
27/10/2013	6.8	<5.6
28/10/2013	<5.6	-

3.2. METAL SPECIATION

There are no ambient air quality standards for metals in Yukon, however the Ontario Ministry of Environment has developed a comprehensive list of Ambient Air Quality Criteria (AAQC) that includes 24-hour average concentrations for a number of metals. Tables 2 and 3 below present the 24-hour average concentrations measured at TSP-1 and TSP-2 respectively. For reference, the Ontario AAQCs are indicated in the first row where available and exceedences of these criteria are shown in red.

Very few exceedences of the Ontario AAQCs are observed overall, in fact samples are below the detection limit for most parameters. Parameters for which exceedences have occurred include lead (6% of samples) at TSP-1 and cadmium (3% of samples), lead (3% of samples) and manganese (8% of samples) at TSP-2. Note that the detection limit for beryllium and cadmium is greater than the Ontario AAQC and in many cases, it cannot be determined if exceedences of these parameters have occurred.

Table 2 24-Hour Average Metal Concentrations, TSP-1, 2012-2013

Sample Date	Aluminum (Al), total µg/m³	Antimony (Sb), total µg/m³	Arsenic (As), total µg/m³	Barium (Ba), total µg/m³	Beryllium (Be), total µg/m³	Boron (B), total µg/m³	Cadmium (Cd), total µg/m³	Calcium (Ca), total µg/m³	Chromium (Cr), total µg/m³	Cobalt (Co), total µg/m³	Copper (Cu), total µg/m³	Iron (Fe), total µg/m³	Lead (Pb), total µg/m³	Magnesium (Mg), total µg/m³	Manganese (Mn), total µg/m³	Molybdenum (Mo), total µg/m³	Nickel (Ni), total µg/m³	Phosphorus (P), total µg/m³	Potassium (K), total µg/m³	Selenium (Se), total µg/m³	Silver (Ag), total µg/m³	Sodium (Na), total µg/m³	Strontium (Sr), total µg/m³	Sulphur (S), total µg/m³	Tin (Sn), total µg/m³	Titanium (Ti), total µg/m³	Vanadium (V), total µg/m³	Zinc (Zn), total µg/m³	Zirconium (Zr), total µg/m³
Ontario AAQC (24-hr avg)		**25**	**0.3**	**10**	**0.01**	**120**	**0.025**		**0.5**	**0.1**	**50**	**4**	**0.5**		**0.4**	**120**	**0.2**			**10**	**1**		**120**		**10**	**120**	**2**	**120**	
23/08/12	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.486	<0.042	<0.069	<0.069	0.554	0.174	0.061	0.045	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.708	<0.111	<0.028	<0.042	0.118	<0.069
27/09/12	0.667	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	1.722	<0.042	<0.069	<0.069	<0.042	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.039	<0.069
23/10/12	0.653	<0.278	<0.111	0.022	<0.011	<0.042	<0.028	1.153	<0.042	<0.069	<0.069	2.528	1.083	0.308	0.301	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.569	<0.111	<0.028	<0.042	0.558	<0.069
15/12/12	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.194	0.139	<0.042	0.053	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.094	<0.069
14/01/13	0.403	<0.278	<0.111	0.010	<0.011	<0.042	<0.028	2.069	<0.042	<0.069	<0.069	0.815	<0.111	0.217	0.026	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.875	0.007	0.556	0.174	<0.028	<0.042	0.196	<0.069
16/01/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.444	<0.042	<0.069	<0.069	0.126	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.039	<0.069
23/03/13	0.292	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	1.347	<0.042	<0.069	<0.069	0.318	<0.111	0.072	0.034	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.347	<0.111	<0.028	<0.042	0.043	<0.069
24/03/13	<0.278	<0.278	<0.111	0.019	<0.011	<0.042	<0.028	0.597	<0.042	<0.069	<0.069	0.293	<0.111	0.094	0.066	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.067	<0.069
25/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.057	<0.069	<0.069	0.181	<0.111	0.058	0.021	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.039	<0.069
26/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.168	<0.111	0.057	0.019	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.050	<0.069
10/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.043	<0.069	<0.069	0.272	<0.111	0.082	0.017	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.292	<0.111	<0.028	<0.042	0.035	<0.069
13/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.306	0.053	<0.069	<0.069	0.465	<0.111	0.106	0.022	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.375	<0.111	<0.028	<0.042	0.038	<0.069
15/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.047	<0.069	<0.069	0.169	<0.111	0.061	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.333	<0.111	<0.028	<0.042	<0.028	<0.069
16/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.107	<0.111	0.046	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
28/05/13	5.292	<0.278	<0.111	0.009	<0.011	0.264	<0.028	8.722	0.049	<0.069	<0.069	0.313	<0.111	0.222	0.013	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.583	0.017	0.306	<0.111	<0.028	<0.042	0.079	<0.069
16/06/13	5.236	<0.278	<0.111	0.012	<0.011	0.264	<0.028	8.597	0.076	<0.069	<0.069	0.879	0.224	0.211	0.083	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.722	0.016	0.292	<0.111	<0.028	<0.042	0.164	<0.069
18/06/13	0.861	<0.278	<0.111	0.019	<0.011	<0.042	<0.028	1.417	0.075	<0.069	<0.069	2.153	0.794	0.318	0.218	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.569	0.005	0.681	<0.111	0.042	<0.042	0.382	<0.069
21/06/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.319	0.068	<0.069	<0.069	0.372	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.431	<0.004	<0.278	<0.111	<0.028	<0.042	0.058	<0.069
24/06/13	<0.278	<0.278	<0.111	0.018	<0.011	<0.042	<0.028	<0.278	0.103	<0.069	<0.069	0.450	<0.111	<0.042	0.018	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.444	<0.004	<0.278	<0.111	<0.028	<0.042	0.032	<0.069
19/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.128	<0.069	<0.069	0.419	<0.111	<0.042	0.017	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.032	<0.069
20/07/13	<0.278	<0.278	<0.111	0.005	<0.011	<0.042	<0.028	0.444	0.100	<0.069	<0.069	1.367	<0.111	0.096	0.175	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.096	<0.069
21/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.106	<0.069	<0.069	0.322	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
22/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.119	<0.069	<0.069	0.493	<0.111	<0.042	0.032	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.051	<0.069
22/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.078	<0.069	<0.069	0.383	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.029	<0.069
23/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.053	<0.069	<0.069	0.194	<0.111	0.054	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
24/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.088	<0.069	<0.069	0.388	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
25/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.046	<0.069	<0.069	0.208	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
24/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.096	<0.069	<0.069	0.319	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
27/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.086	<0.069	<0.069	0.435	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
28/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.083	<0.069	<0.069	0.351	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
29/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.088	<0.069	<0.069	0.672	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
25/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.096	<0.069	<0.069	0.360	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
26/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.115	<0.069	<0.069	0.269	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069

Sample Date	Aluminum (Al), total µg/m³	Antimony (Sb), total µg/m³	Arsenic (As), total µg/m³	Barium (Ba), total µg/m³	Beryllium (Be), total µg/m³	Boron (B), total µg/m³	Cadmium (Cd), total µg/m³	Calcium (Ca), total µg/m³	Chromium (Cr), total µg/m³	Cobalt (Co), total µg/m³	Copper (Cu), total µg/m³	Iron (Fe), total µg/m³	Lead (Pb), total µg/m³	Magnesium (Mg), total µg/m³	Manganese (Mn), total µg/m³	Molybdenum (Mo), total µg/m³	Nickel (Ni), total µg/m³	Phosphorus (P), total µg/m³	Potassium (K), total µg/m³	Selenium (Se), total µg/m³	Silver (Ag), total µg/m³	Sodium (Na), total µg/m³	Strontium (Sr), total µg/m³	Sulphur (S), total µg/m³	Tin (Sn), total µg/m³	Titanium (Ti), total µg/m³	Vanadium (V), total µg/m³	Zinc (Zn), total µg/m³	Zirconium (Zr), total µg/m³
27/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.103	<0.069	<0.069	0.331	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
28/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.097	<0.069	<0.069	0.308	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069

Table 3 24-Hour Average Metal Concentrations, TSP-2, 2012-2013

Sample Date	Aluminum (Al), total µg/m³	Antimony (Sb), total µg/m³	Arsenic (As), total µg/m³	Barium (Ba), total µg/m³	Beryllium (Be), total µg/m³	Boron (B), total µg/m³	Cadmium (Cd), total µg/m³	Calcium (Ca), total µg/m³	Chromium (Cr), total µg/m³	Cobalt (Co), total µg/m³	Copper (Cu), total µg/m³	Iron (Fe), total µg/m³	Lead (Pb), total µg/m³	Magnesium (Mg), total µg/m³	Manganese (Mn), total µg/m³	Molybdenum (Mo), total µg/m³	Nickel (Ni), total µg/m³	Phosphorus (P), total µg/m³	Potassium (K), total µg/m³	Selenium (Se), total µg/m³	Silver (Ag), total µg/m³	Sodium (Na), total µg/m³	Strontium (Sr), total µg/m³	Sulphur (S), total µg/m³	Tin (Sn), total µg/m³	Titanium (Ti), total µg/m³	Vanadium (V), total µg/m³	Zinc (Zn), total µg/m³	Zirconium (Zr), total µg/m³
Ontario AAQC (24-hr avg)		**25**	**0.3**	**10**	**0.01**	**120**	**0.025**		**0.5**	**0.1**	**50**	**4**	**0.5**		**0.4**	**120**	**0.2**			**10**	**1**		**120**		**10**	**120**	**2**	**120**	
23/08/12	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.439	0.736	0.047	0.033	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.736	<0.111	<0.028	<0.042	0.108	<0.069
27/09/12	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.375	<0.042	<0.069	<0.069	<0.042	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.039	<0.069
15/12/12	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.533	0.181	0.076	0.066	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.122	<0.069
16/01/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	<0.042	<0.069	<0.069	0.143	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
23/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.375	<0.042	<0.069	<0.069	1.431	0.321	0.089	0.407	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.389	<0.111	<0.028	<0.042	0.244	<0.069
24/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.486	<0.042	<0.069	<0.069	1.174	0.361	0.124	0.651	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.389	<0.111	<0.028	<0.042	0.278	<0.069
25/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.417	0.056	<0.069	<0.069	1.163	0.367	0.108	0.390	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.403	<0.111	<0.028	<0.042	0.264	<0.069
26/03/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.375	0.046	<0.069	<0.069	0.921	0.153	0.117	0.290	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.319	<0.111	<0.028	<0.042	0.142	<0.069
07/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.486	<0.042	<0.069	<0.069	1.161	0.417	0.119	0.471	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.333	<0.111	<0.028	<0.042	0.294	<0.069
10/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.043	<0.069	<0.069	0.439	<0.111	0.081	0.049	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.069	<0.069
13/04/13	0.306	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.044	<0.069	<0.069	0.199	<0.111	0.081	0.017	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.375	<0.111	<0.028	<0.042	<0.028	<0.069
15/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.047	<0.069	<0.069	0.268	<0.111	0.079	0.025	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.333	<0.111	<0.028	<0.042	<0.028	<0.069
16/04/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.043	<0.069	<0.069	0.165	<0.111	0.065	0.013	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.319	<0.111	<0.028	<0.042	<0.028	<0.069
17/06/13	0.361	<0.278	<0.111	0.009	<0.011	<0.042	<0.028	0.708	<0.042	<0.069	<0.069	0.232	<0.111	0.053	0.016	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
18/06/13	1.583	<0.278	<0.111	0.005	<0.011	0.071	<0.028	2.569	0.122	<0.069	<0.069	0.825	0.133	0.094	0.078	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.542	0.005	<0.278	<0.111	<0.028	<0.042	0.096	<0.069
21/06/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.089	<0.069	<0.069	0.432	<0.111	<0.042	0.014	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	0.472	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
23/06/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.361	0.054	<0.069	<0.069	0.282	<0.111	0.072	0.017	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.031	<0.069
28/06/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.500	0.054	<0.069	<0.069	0.414	<0.111	0.082	0.046	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	0.319	<0.111	<0.028	<0.042	0.071	<0.069
19/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.117	<0.069	<0.069	0.526	<0.111	<0.042	0.027	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.039	<0.069
20/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.065	<0.069	<0.069	0.381	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
21/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.096	<0.069	<0.069	0.500	<0.111	<0.042	0.052	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.029	<0.069
22/07/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.292	0.094	<0.069	<0.069	1.122	<0.111	0.071	0.134	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.092	<0.069
22/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.094	<0.069	<0.069	0.314	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
25/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.050	<0.069	<0.069	0.185	<0.111	0.047	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
26/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.074	<0.069	<0.069	0.496	<0.111	<0.042	0.012	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.046	<0.069
28/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.071	<0.069	<0.069	0.496	<0.111	<0.042	0.046	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.122	<0.069
31/08/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.057	<0.069	<0.069	0.200	<0.111	0.047	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
21/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.097	<0.069	<0.069	0.347	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069

Sample Date	Aluminum (Al), total µg/m³	Antimony (Sb), total µg/m³	Arsenic (As), total µg/m³	Barium (Ba), total µg/m³	Beryllium (Be), total µg/m³	Boron (B), total µg/m³	Cadmium (Cd), total µg/m³	Calcium (Ca), total µg/m³	Chromium (Cr), total µg/m³	Cobalt (Co), total µg/m³	Copper (Cu), total µg/m³	Iron (Fe), total µg/m³	Lead (Pb), total µg/m³	Magnesium (Mg), total µg/m³	Manganese (Mn), total µg/m³	Molybdenum (Mo), total µg/m³	Nickel (Ni), total µg/m³	Phosphorus (P), total µg/m³	Potassium (K), total µg/m³	Selenium (Se), total µg/m³	Silver (Ag), total µg/m³	Sodium (Na), total µg/m³	Strontium (Sr), total µg/m³	Sulphur (S), total µg/m³	Tin (Sn), total µg/m³	Titanium (Ti), total µg/m³	Vanadium (V), total µg/m³	Zinc (Zn), total µg/m³	Zirconium (Zr), total µg/m³
24/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.114	<0.069	<0.069	0.424	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
27/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.126	<0.069	<0.069	0.479	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
28/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	0.036	<0.278	0.086	<0.069	<0.069	0.338	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	0.047	<0.069
30/09/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.069	<0.069	<0.069	0.450	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
24/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.076	<0.069	<0.069	0.326	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
25/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.096	<0.069	<0.069	0.303	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
26/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	0.667	0.124	<0.069	<0.069	0.311	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069
27/10/13	<0.278	<0.278	<0.111	<0.004	<0.011	<0.042	<0.028	<0.278	0.075	<0.069	<0.069	0.268	<0.111	<0.042	<0.011	<0.069	<0.069	<0.417	<1.389	<0.069	<0.042	<0.417	<0.004	<0.278	<0.111	<0.028	<0.042	<0.028	<0.069

3.3. WIND ANALYSIS

An analysis of the hourly wind speed and direction collected since June 2011 at the Keno District Mill weather station (shown on Figure 2), at a height of 10 meters, indicates that dominant winds are blowing from the North and from the Southeast. The average wind speed is 1.27 m/s and winds are calm 17.72% of the time. The wind rose in Figure 3 depicts this information. Note that the wind sensor experienced occasional icing during the winter months and extended periods of zero wind speed were excluded from this analysis. Also, winter wind speeds may occasionally be underestimated due to the presence of ice on the sensor, but these occurrences cannot be detected in the data record.

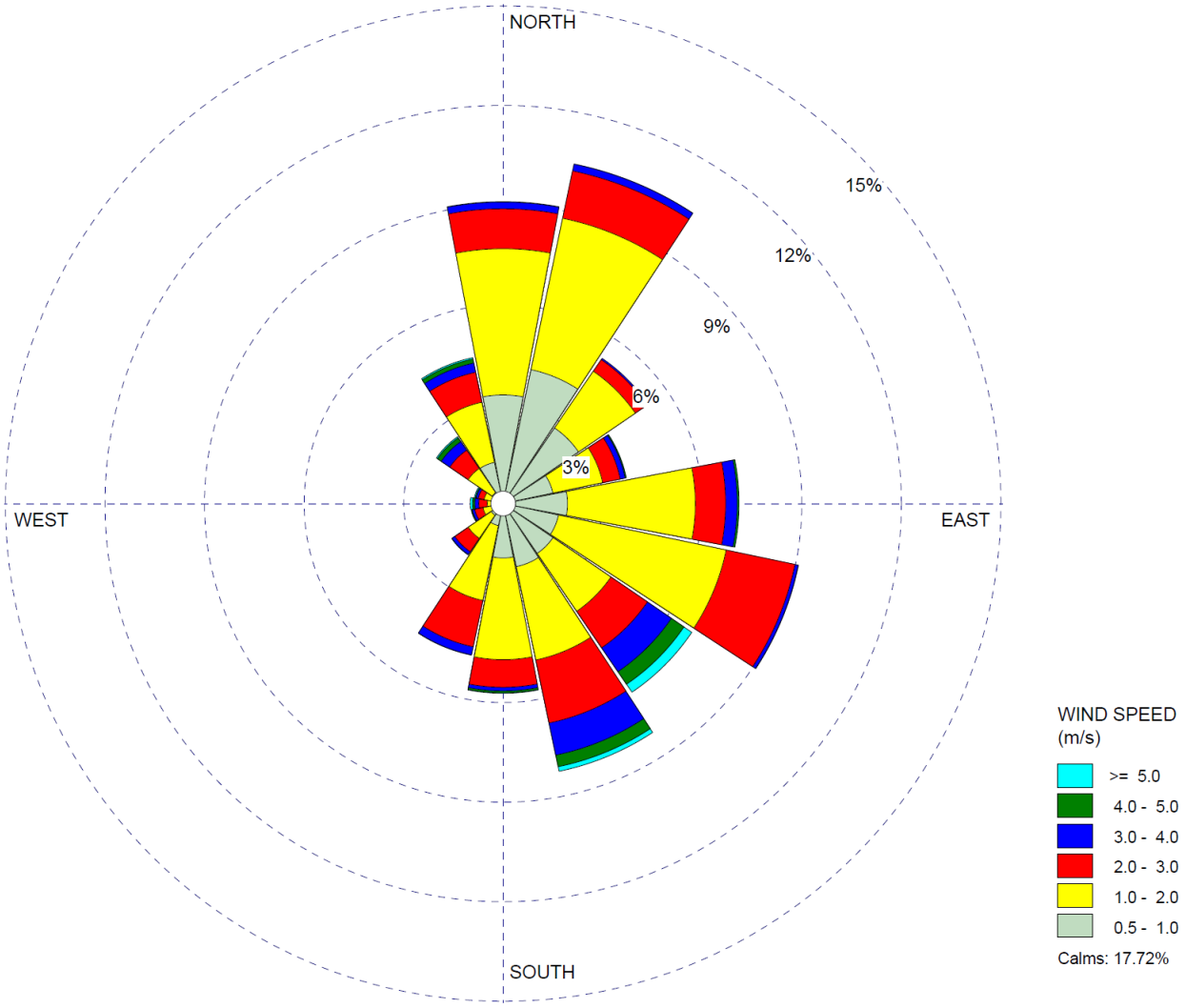

Figure 3 Wind Rose (direction blowing from), Keno District Mill Weather Station, June 2011-Oct.2013

Based on the wind data above in Figure 3 and referring back to Figure 2, we can see that air quality station TSP-1 is located generally upwind from the DSTF and crusher and that station TSP-2 is generally downwind from them. The average TSP concentration is slightly higher at TSP-2 than at TSP-1 (9.3 µg/m^3 versus 8.6 µg/m^3), however both values are over ten times below the YAAQS. When comparing metal concentrations, only manganese is higher on average at TSP-2, while all the other metals are equal or higher at TSP-1. Figure 4 shows that comparison for all parameters that were above detection limit for at least one sample. Note that to provide a conservative estimate for both TSP and metal concentrations, detection limits (RDL) were used to calculate averages for samples that were below RDL, therefore overestimating the actual average values.

Dust originating from the DSTF would be expected to contain high concentrations of iron, manganese, calcium, zinc, lead, magnesium, arsenic and aluminum, based on metal characterization analyses of the tailings conducted monthly in 2012 and 2013. Metal speciation results of the air samples obtained to date indicate that only manganese is found in higher concentrations downwind from the DSTF. Therefore, the DSTF could be contributing source of ambient dust observed at TSP-2, but other sources are likely the predominant source being measured.

On days where TSP levels were higher than average and where exceedences of the Ontario AAQCs were observed for lead at TSP-1, winds were generally blowing from the Northeast and from the East (on October 23, 2012 and June 18, 2013 respectively). A source of TSP in this case could have been the roads. Roads within the vicinity of the TSP stations include mine access roads as well as public roads including Duncan Creek Road.

On days where TSP levels were higher than average and/or where exceedences of the Ontario AAQCs were observed for lead at TSP-2, winds were generally blowing from the N-NNE (on August 23, 2012). On days TSP levels were higher than average and/or where exceedences of the Ontario AAQCs were observed for manganese at TSP-2, winds were generally blowing from the NE (March 23-24, 2013) and from the East (April 7, 2013). In this case the DSTF could have been the main source of TSP at TSP-2. On days where exceedences of the Ontario AAQCs were observed for cadmium at TSP-2, winds were generally blowing from the NE, so the DSTF could have been a source in the case as well.

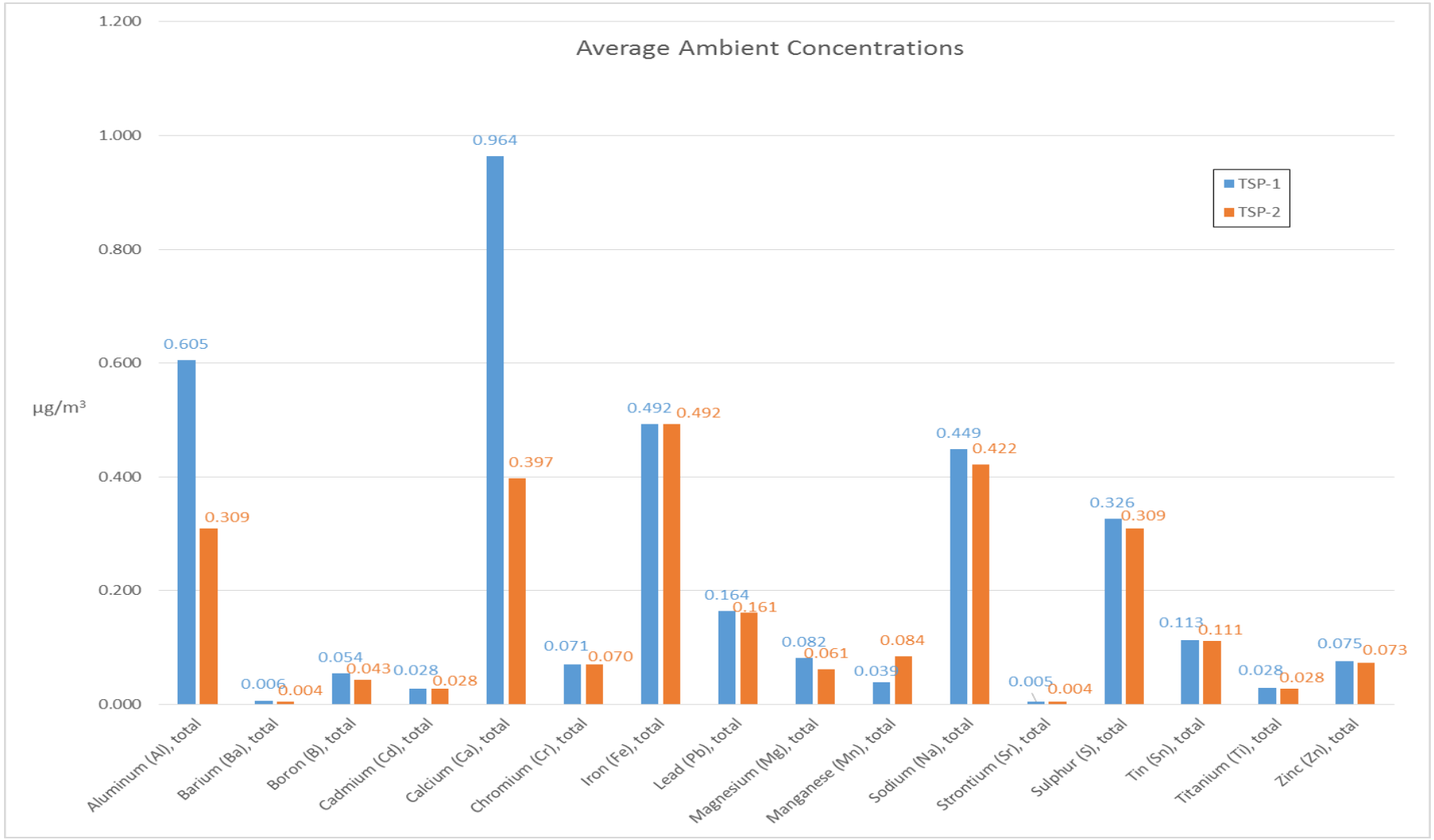

Figure 4 Average Ambient Metal Concentrations

3.4. CONCLUSION

- All TSP samples collected to date near the District Mill and DSTF are on average at least 10 times below the Yukon air quality standard for TSP.
- Two metal concentrations (lead) exceeded the Ontario ambient air quality criteria for TSP-1 out of 35 samples collected to date and 5 exceedances (3 manganese, 1 lead and 1 cadmium) were measured at TSP-2 from 36 samples collected to date. Air quality samples will continue to be collected 4 times per month to identify if these are infrequent events or if any trends can be established.
- A few samples were damaged during transport to the lab and could not be analyzed. Precautions have been taken to prevent this from happening again in the future.
- Access understands through discussion with Alexco that the Yukon Government collected air quality samples (PM2.5) in 2013 in the Keno City area. It is recommended that the data collected by Yukon Government be combined with the Alexco data once it becomes available in the annual Quartz Mining Licence report.

4. REFERENCES

Ontario Ministry of Environment. 2012. Ontario's Ambient Air Quality Criteria. Standards Development Branch. PIBS#6570e01. April 2012.

Yukon Environment. 2010. Yukon Ambient Air Quality Standards. April 2010.

Keno Hill Water Treatment Systems Sludge Management Plan – Keno Hill Silver District Mining Operations QZ12-053

Prepared by:

Alexco Keno Hill Mining Corp.

September 2013
Revision No. 1

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LIST OF ABBREVIATIONS

gpm..... Gallons per minute
l..... Litres
lps ..... Litres per second
m..... Meters
MMF..... Multi-Media Filtration System
TSS ..... Total Suspended Solids
VFD..... Variable Frequency Drive
WTSOM ..... Water Treatment System Operations Manual

1.0 BACKGROUND

Alexco Resource Corp. (Alexco), through its wholly owned subsidiary Alexco Keno Hill Mining Corp. (AKHM) maintains and operates the water treatment facility for the Bellekeno Undertaking at Keno Hill under Type "A" Water Use License (WUL) QZ12-053. Pursuant to Part H, Condition 84-85 of WUL QZ12-053, within six months of the effective date of the licence, the Licensee shall submit to the board an updated **Sludge Management Plan** dealing specifically with the Keno Hill Silver District Undertaking and shall implement the plan. This submittal fulfills those requirements of Conditions 84-85. The Keno Hill Silver District undertaking only currently consists of one water treatment system at the Bellekeno Mine. If additional water treatment system(s) are commissioned the Sludge Management Plan will be updated and re-submitted to the Board.

The Bellekeno water treatment system uses basic metal hydroxide precipitation technology and particulate removal technology including coagulation, settling, and filtration. In general, lime solution is added to the underground mine collected waters and a zinc hydroxide precipitate (sludge) is formed and settles to the bottom of two lined ponds. The suspended solids in the mine discharge and the zinc hydroxide particulates are removed by coagulation with lime, settling in ponds, and filtration in a multimedia filtration process. The purpose of the Sludge Management Plan is to outline the process by which the sludge that is produced as a byproduct of the water treatment system is managed.

This manual is intended to be an operational document that will require periodic updates as modifications and improvements are made to the current water treatment system process and sludge management. This document is released as Revision One (1).

1.1. PRECIPITATION CHEMISTRY

To help understand the system's functionality, it is important to outline the chemistry of metal hydroxide precipitation. With hydroxide precipitation, soluble heavy metal ions are converted to relatively insoluble metal hydroxide precipitates by adding an alkaline precipitating agent (e.g. lime slurry). Precipitation reactions, which originate in the rapid mix tank, form metal-hydroxide precipitates as shown below where M^+ is the soluble metal cation being removed.

$$M^+ + Ca(OH)_2 = M(OH)_2\,(s) + Ca^{2+}$$

The metal ion combines with hydroxide ion to form the insoluble metal hydroxide solid. This reaction is pH dependent; as more base (e.g. lime solution) is added, the reaction is driven further to the right on the pH scale and more metals precipitate out of solution. Conversely, as the pH is decreased, the thermodynamic equilibrium moves to the left, which could allow metals to resolubilize. Generally, excess lime is added, which stabilizes the metal hydroxide precipitate, making this reaction practically irreversible.

The solubilities of the metal hydroxide precipitates (sludge) vary, depending on the metal ion being precipitated, the pH of the water, and to a limited extent the precipitating agent(s) being used. Typically the solubilities of most metal hydroxide precipitates decrease with increasing pH to a minimum value beyond which the precipitates become more soluble (i.e. amphoteric properties). The solubility trend of zinc hydroxide vs. pH is shown in Figure 1.

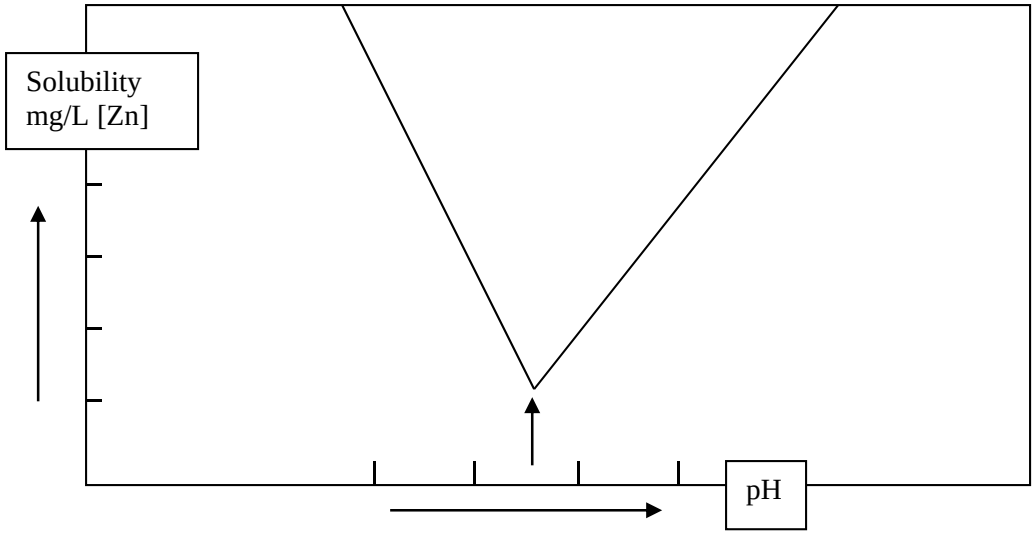

FIGURE 1 - ZINC HYDROXIDE SOLUBILITY VS. PH

It can be seen from the figure that by controlling the pH levels to within a specific range, the efficiency of metals removal can be maximized. The Bellekeno water treatment facility targets a pH range between 8.5 and 9.5.

The addition of lime and ferric iron to the mine discharge also aids the settling rate and efficiency of the suspended solids that are in the water from the underground mining and exploration activities. Thus the sludge produced from this process will be a combination of metal hydroxides, residual lime, and fine rock particles that were suspended in the water removed from the underground.

2.0 TREATMENT SYSTEMS

2.1. WATER TREATMENT PROCESS

As with most underground mines, water inflows into the Bellekeno mine must be managed. The inflowing water pools and collects within the Bellekeno mine's drifts, stopes, and underground workings. To keep this water from slowly filling the mine, it is collected in sumps located underground at different levels. Dewatering pumps suspended from the ceiling remove the top layer of water and send it through overhead steel pipes to the surface for treatment.

Figure 2 provides a diagram of the overall Bellekeno treatment system which should be used for reference.

REV.	SHEET	DATE	BY
C	5	11/5/10	EJL

BELLEKENO 625
Treatment Flow Sheet

Lime Slurry
($Ca(OH)_2$ or NaOH)

Mixing Shed

Iron Addition

From mine discharge

Lime Addition in a Rapid Mix Tank
- Optional Settling Aids
  * Flocculent
  * Iron addition

Heater

Back-Wash Discharge

Pond Dividers (2X)
Geo-fabric

Pond 1

Pond 2

Settling Ponds

Submersible Pumps (2X)

All permanent outside pipes are heat-traced and insulated

Ammonia Ion Exchange System
PILOT STUDY

Multi-Media Filter (MMF)

Heater

FO

Concentrated Brine Tank

Spillway / Overflow Path
HDPE lined trench

Decant Box

Release:
Lightning Creek Drainage with an In-ground diffuser

Connection List

Connection #	Equipment	Part Number	Interface	Material	Description
1	BJM Submersible Pump	J37H	2" NPT-Male	Cast Iron	Verticle discharge, need conversion to 3" pipe as well as steel to HDPE
2	MMF - Influent	MM 2460-3A	3" 150# Flange	Cast Iron	Influent interface w/ MMF - requires 3" gasket and 4 bolts/nuts
3	MMF - Backwash	MM 2460-3A	2" NPT - Male	Cast Iron	Backwash interface w/ MMF - NPT to 2" HDPE line for return to mix tank
4	MMF - Effluent	MM 2460-3A	3" 150# Flange	Cast Iron	Effluent interface w/ MMF - requires 3" gasket and 4 bolts/nuts
5	Sea Metrics Flow Meter	WTP-101-300-18	3" 150# Flange	PVC	Interface w/ Flow Meter - requires 3" gasket and 4 bolts/nuts
6	3" Flanged Ball Valve	3700	3" 150# Flange	Steel	3" teflon coated ball valve - American Valve
7	Open Pipe	NA	Decant Box - Open Tank	HDPE	Release into Decant Box
8	Open Pipe	NA	Open Tank	HDPE	Release into Mix Tank - Fluid will pass back through the system

DESCRIPTION
PROCESS FLOW SHEET

FIGURE 2 - BELLEKENO WATER TREATMENT FLOW SHEET

After water is pumped to the surface, it enters a small water treatment shed seen in Figure 3 that is located near the Bellekeno 625 portal. The treatment shed houses a lime slurry tank and barrels of ferric chloride (ferric chloride being repositioned into the ion exchange building). On average, the flow is between 3.0 and 7.0 litres per second (lps). Downstream of the flow meter, the water reports to a circular rapid mix tank and mixer located underneath the treatment shed that ensures proper mixing of the water as the lime slurry and ferric chloride are added to the tank.

From the rapid mix tank, water passes into the first lined holding pond (Pond 1). It is in this pond that the majority of total suspended solids (TSS) and metal hydroxide flocculants settle out in the form of a grey sludge that collects at the bottom. To keep the pond from filling with sludge, a vacuum truck removes the sludge on a weekly basis.

FIGURE 3 - BELLEKENO WATER TREATMENT SHED

Pond 1 is connected to a much larger pond termed Pond 2 via a weir. Surface water is decanted from Pond 1 and spills into Pond 2 to allow for additional settling.

Once water slowly flows through Pond 2, it enters a submersible pump, filtered through a Multi-Media Filtration (MMF) system, if ammonia levels are elevated it is pumped through an ion exchange unit and then discharged through a diffuser, where it flows down to join the Lightning Creek drainage system.

2.2. POND DESLUDGING

Once or twice a year depending on pond sludge volumes, the Bellekeno 625 water treatment settling ponds get a significant volume of built up sludge containing bentonite clay from the underground drilling operations which makes normal pond desludging operations difficult to undertake. When the settling ponds reach capacity, they require desludging to ensure that the adequate retention time is available to properly treat the wastewater.

The desludging of the Bellekeno 625 settling ponds will include:

- Building a temporarily unlined bermed dewatering area east of the settling ponds (site previously used for this purpose);
- Dewatering pond #1 and bypassing treated flows to pond #2. Once pond #1 is desludged, return treated flow to pond and bypass pond #2 to allow desludging in pond #2;
- Pumping the sludge into the newly constructed dewatering area;
- Allowing the sludge to dewater;
- Using a dump truck to haul the dried sludge to the Valley Tailings sludge pit;
- Removing approximately 10 cm of soil from below the dewatering area and hauling it to the Valley Tailings sludge pit; and,
- Recontouring of the berm and dewatering area.

All water released from the pond and from the dewatering area will be in compliance with the effluent discharge criteria. There will be no additional environmental impacts associated with the desludging of the settling ponds as the sludge will be contained and the water quality will meet licence discharge standards.

FIGURE 4 - VACUUM TRUCK USED TO DESLUDGING PONDS

3.0 SLUDGE MANAGEMENT

3.1. SLUDGE VOLUMES

From past experience, AKHM has found that removing between three to five truckloads of sludge per week is needed from Pond 1 to maintain settling capacity in this pond. The maximum estimated sludge weight produced in a given week is approximately 2,400 kilograms. This calculation is based on the tank volume of the vacuum truck and an estimation of 4% solids in the collected sludge.

3.2. SLUDGE CHARACTERISTICS

The characteristics of the sludge produced at Bellekeno were determined as part of the sludge management process. A sample of sludge was removed from the first settling pond on November 12, 2010, and submitted to Maxxam Analytics of Burnaby, BC. The results are summarized in the following tables:

TABLE 1. SUMMARY OF PHYSICAL AND ABA PARAMETERS OF BELLEKENO SLUDGE.

	BK625 Sludge	Detection Limits
Wet Sample Wt. (g)	948.22	-
Dry Sample Wt. (g)	121.01	-
Sample Type & Condition	Wet Tailings/Sediment	-
% Moisture (Wt.%)	83.9	-
Pulp Density (g/ml)	1.06	-

Paste pH	8.4	0.5
Total Sulphur (Wt.%)	0.85	0.02
Sulphate Sulphur (Wt.%)	0.29	0.01
Sulphide Sulphur* (Wt.%)	0.56	0.02
Maximum Potential Acidity (Kg CaCO3/Tonne)**	17.5	0.6
Neutralization Potential (Kg CaCO3/Tonne)	327.9	-
Net Nuetralization Potential* (Kg CaCO3/Tonne)**	310.4	-
Fizz Rating	Strong	-

These data show that the Bellekeno sludge is highly neutralizing (see "Net Neutralizing Potential" and "Neutralization Potential" data points) and that despite whatever sulfide sulfur the suspended solids in the mine discharge may have, the amount of lime added is sufficient to create a strongly alkaline sludge.

TABLE 2. MAJOR METALS, CATIONS, AND TRACE METALS, BELLEKENO SLUDGE. (INCLUDES QA/QC INFORMATION.)

Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe %	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca %	P %	La	Cr	Mg %	Ba	Ti %	B	Al %	Na %	K %	W	Hg	Sc	Tl	S %	Ga	Se	Te
BK625 Sludge	5.3	95.2	4663	4066	47.6	35.7	8.1	2125	2.58	118.4	8.4	1.3	5.3	227	57.6	19	1.5	13	12.74	0.043	6	53	0.39	102	0.003	<20	0.78	0.024	0.09	31.3	0.1	1.4	0.1	0.89	2	0.9	<0.2
QAQC																																					
Reference Material (1)																																					
STD OREAS45PA	1	632.6	18.5	120	0.3	310.7	113.1	1111	16.83	4.1	1.1	49	6.4	15	<0.1	0.1	0.2	233	0.25	0.035	17	867	0.12	193	0.145	<20	3.69	0.009	0.08	<0.1	0.03	46.6	<0.1	<0.05	18	0.5	<0.2
True Value STD OREAS45PA	0.9	600	19	119	0.3	281	104	1130	16.559	4.2	1.2	43	6	14	0.09	0.13	0.18	221	0.2411	0.034	16.2	873	0.095	187	0.124	-	3.34	0.011	0.0665	0.011	0.03	43	0.07	0.03	16.8	0.54	-
Percent Difference	11.1	5.4	-2.6	0.8	0	10.6	8.7	-1.7	1.6	-2.4	-8.3	14	6.7	7.1		-23.1	11.1	5.4	3.7	2.9	4.9	-0.7	26.3	3.2	16.9	-	10.5	-18.2	20.3	-	0	8.4	-	-	7.1	-7.4	-
Reference Material (2)																																					
STD DS7	19	105.6	61.9	382	0.8	55.5	9.8	603	2.31	51.9	4.3	49.6	3.7	68	5.9	4.4	4.4	80	0.91	0.074	11	189	1.04	390	0.122	36	0.99	0.09	0.46	2.9	0.21	2.3	3.6	0.19	4	3.6	0.9
True Value STD DS7	20.5	109	70.6	411	0.9	56	9.7	627	2.39	48.2	4.9	70	4.4	69	6.4	4.6	4.5	84	0.93	0.08	12	179	1.05	410	0.124	39	0.959	0.089	0.44	3.4	0.2	2.5	4.2	0.19	5	3.5	1.08
Percent Difference	-7.3	-3.1	-12.3	-7.1	-11.1	-0.9	1	-3.8	-3.3	7.7	-12.2	-29.1	-15.9	-1.4	-7.8	-4.3	-2.2	-4.8	-2.2	-7.5	-8.3	5.6	-1	-4.9	-1.6	-7.7	3.2	1.1	4.5	-14.7	5	-8	-14.3	0	-20	2.9	-16.7
Detection Limits	0.1	0.1	0.1	1	0.1	0.1	0.1	1	0.01	0.5	0.1	0.5	0.1	1	0.1	0.1	0.1	2	0.01	0.001	1	1	0.01	1	0.001	20	0.01	0.001	0.01	0.1	0.01	0.1	0.1	0.05	1	0.5	0.2
Acme Group No.	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX

TABLE 3. WHOLE ROCK ANALYSIS, BELLEKENO SLUDGE. (INCLUDES QA/QC INFORMATION.)

Sample ID	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	CaO %	MgO %	Na_2O %	K_2O %	MnO %	TiO_2 %	P_2O_5 %	Cr_2O_3 %	Ba %	LOI %	Total %
BK625 Sludge	40.6	9.1	4.51	19.1	0.88	0.25	1.35	0.3	0.62	0.1	0.02	0.09	19.7	96.65
QA/QC														
Reference Materials-1														
STD: SY-4(D)	50	20.66	6.31	8.06	0.52	7.15	1.62	0.11	0.27	0.12	<0.001	0.04	4.56	99.39
True Value STD SY-4	49.9	20.69	6.21	8.05	0.54	7.1	1.66	0.11	0.29	0.13	0.03	4.56	-	-
Percent Difference	0.2	-0.1	1.6	0.1	-3.7	0.7	-2.4	0	-6.9	-7.7	17.6	0	-	-
Reference Materials-2														
STD SO-18	58.1	14	7.6	6.3	3.4	3.8	2.2	0.4	0.7	0.8	0.6	0.1	1.93	99.16
True Value STD SO-18	58.47	7.67	6.42	3.35	3.71	2.17	0.4	0.7	0.83	-	-	-	-	-
Percent Difference	-0.6	-1	-1.6	0.6	1.6	0	2.6	4.3	-2.4	-	-	-	-	-
Detection Limits	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.001	0.01	-	-
Method	4X	4X	4X	4X	4X	4X	4X	4X	4X	4X	4X	4X	4X	4X

Some of the general characteristics of the Bellekeno sludge are:

- After densification along the bottom of Pond 1, the sludge is approximately 84% water with the 16% solids being fine particulates from the mine operations, and lime-based metal hydroxide sludge principally comprised of excess lime and hydroxides of manganese, iron and zinc.
- The whole rock analysis shows that the major constituents are principally silicates and residual lime, low percentages of gangue minerals, and minor minerals associated with the vein materials (Table 3).
- The lead, zinc, and silver content are consistent with some minor amounts of broken fine grain vein material being suspended in the mine discharge, and being removed by settling and filtration processes in the treatment system.
- As of this writing, the only additive used (other than lime) is ferric chloride which promotes flocculent formation. The sludge is highly alkaline because of its significant makeup consisting of a hydroxide from the lime that is added. In the future, an additional polymer may be used to aid in settling.
- Because of the lime content, the sludge is highly net neutralizing with a Neutralization Potential of 310.4 kg $CaCO_3$/Tonne, a maximum potential acidity of 17.5 $CaCO_3$/Tonne, and a neutralization potential of 327.9 $CaCO_3$/Tonne. The ratio of approximately NP/AP = 18.7:1 shows a highly alkaline sludge with a strong excess of lime.

Acidification or low redox conditions generally could lead to particle breakdown. The circum-neutral drainage from Bellekeno indicates that there is no acid generating potential that would potentially destabilize and re-leach metals from the sludge, especially in light of the significant NP:AP ratio of the sludge and the amount of AP necessary to cause dissolution of the sludge. The general characteristics of the tailings are mildly net neutralizing conditions; the addition of lime-rich sludge will benefit the tailings if mixed into the DSTF with respect of net neutralization, pH, and physical characteristics (the lime enhances cementation reactions). If the sludge is closed in the valley tailings area, the sludge composition is such that the sludge should be expected to remain stable under the conditions found in the valley tailings storage pond area.

3.3. SLUDGE DISPOSAL

Sludge collected in the vacuum truck will be transported either to the separate Bellekeno storage pond in the Valley Tailings Facility or to the Keno Hill District Mill and deposited in the low pyrite thickener where it will be mixed with filtered and dry stacked tailings. Both of these locations are suitable long term storage locations and the sludge characteristics presented demonstrate the sludge will be stable in either area. The separate sludge storage location for Bellekeno sludge at the VTF is shown in Figure 5.

FIGURE 5. BELLEKENO 625 SLUDGE DEPOSIT LOCATION IN VALLEY TAILINGS AREA.

3.4. PROPOSED CLOSURE

In the approved water license, the Water Board agreed that the use of a bioreactor to treat closure water discharged from the Bellekeno 625 underground mine workings is a feasible technology for long term treatment of waters generated from the mine. In addition, AKHM plans to implement various passive measures if required, such as potentially in situ treatment of the mine pool, in conjunction with the bioreactor to maximize performance of the system.

AKHM plans to build the bioreactor in the existing settling ponds and that effort would be undertaken during closure when the Bellekeno mine is flooding. The ponds will be drained and completely desludged at that time, and then the empty ponds would be converted into bioreactors. That would allow the discharge from the mine to be controlled as necessary through active pumping thereby giving the bioreactor time to become established. The Board also requested additional information such as details required to design and operate such a bioreactor and further evaluation of the performance from the Galkeno 900 bioreactor system. That information will be provided as part of the revised Reclamation and Closure Plan.

3.5. MONITORING AND MITIGATION

The following measures will be implemented during the duration of water treatment and sludge generation at Bellekeno:

- Sludge volumes will be recorded in the Operator's Log Book for each load of sludge pulled from the Water Treatment retention ponds
- Sludge samples will be collected quarterly and tested for metals and ABA.
- The above information will be included in the Company's Monthly Report to the Yukon Water Board as well as summarized in the Annual Report

The template used for the Operator's Log Book is included for reference in this document's Appendix.

4.0 APPENDIX

Sludge/Water Tracking Log

Week:

Sludge Removal

Removed From	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Comment
	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	
SK 100															
GK 300 Desludge Pond															
GK 900															
BK 625															
Other:															
Other:															

Sludge Deposit

Deposited At	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Comment
	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	
Sime Pit															
Valley															
Mill/DSTF															
Other:															
Operator:															

Water Removal

Removed From	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Comment
	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	
Flat Creek															
SK 100															
GK 300 Old Pond															
GK 900															
Other:															

Lime Deposit

Deposited At	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Comment
	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	gal	loads	
SK 100															
GK 300															
GK 900															
BK 625															
Mill															
Other:															
Operator:															