Aquatic Ecosystems and Resources Baseline Report

Kudz Ze Kayah Project

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November 2016

Prepared for:

BMC MINERALS (NO.1) LTD.

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ALEXCO ENVIRONMENTAL GROUP INC. SIGNATURES

Report prepared by: 11/24/2016

Andrew MacPhail, B.Sc., BIT.
Environmental Scientist

Report prepared by: 11/24/2016

Catherine Henry, M.Sc.
Environmental Scientist

Report reviewed by: 11/24/2016

David Petkovich, B.Sc., P. Biol.
Senior Aquatic Scientist

Report reviewed by: 11/24/2016

Scott Keesey, B. Sc., EP.
Senior Environmental Manager

LIST OF ACRONYMS

AEG	Alexco Environmental Group Inc.
Btw	Between
CABIN	Canadian Aquatic Biomonitoring Network
CCME	Canadian Council of Ministers of the Environment
CPUE	Catch Per Unit Effort
DFO	Fisheries and Oceans Canada
DO	Dissolved Oxygen
d/s	Downstream
EPT	Ephemeroptera, Plecoptera, Trichoptera
ICP	Inductively Coupled Plasma
IEE	Initial Environmental Evaluation
ISQG	Interim Freshwater Sediment Quality Guidelines
KZK	Kudz Ze Kayah
LB	Left Bank
MMER	Metal Mining Effluent Regulations
ORP	Oxidation-Reduction Potential
PEL	Probable Effects Level
QML	Quartz Mining Licence
RB	Right Bank
TSS	Total Suspended Solids
u/s	Upstream
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

GLOSSARY

Benthic invertebrates: organisms that live in or on the bottom sediments of rivers, streams, and lakes. Benthic invertebrates are an integral component of aquatic ecosystems and provide valuable biological information to assess potential effects of metal toxicity and nutrient enrichment on a system.

Catch per unit effort (CPUE): catch of fish in numbers by a defined period of effort (indirect measure of the abundance).

Chlorophyll *a*: primary photosynthetic pigment common to all algae.

Electrofishing: common scientific survey method using direct current electricity flowing between a submerged cathode and anode. This affects the movement of the fish so that they swim towards the anode where they can be caught. Electrofishing is a common scientific survey method used to sample fish populations to determine abundance, density, and species composition. When performed correctly, electrofishing results in no permanent harm to fish, which return to their natural state in as little as two minutes after being caught.

Fork length: length of a fish measured from the tip of the snout to the end of the middle caudal fin rays.

Fry: juvenile fish life stage reached when fish are capable of feeding themselves.

Minnow trap: cylindrical device with ¼" or ½" mesh and a funnel opening on each end, for capturing small fish.

Overwintering habitat: area used by fish when winter conditions (cold or sub-zero temperatures, ice, snow, limited food supplies) make normal activity or even survival difficult.

Periphyton: complex mixture of algae, cyanobacteria, heterotrophic microbes, and detritus that is attached to submerged surfaces in most aquatic ecosystems. Periphytic algae are simple aquatic plants which inhabit the substrate of water bodies. As photosynthesizers, algae form the base of the aquatic food web.

Phylum: a principal taxonomic category that ranks above class and below kingdom.

Rearing habitat: area where fish take up residence during some stage of development and utilize for feeding, shelter, and growth.

Riparian vegetation: plant habitats and communities along the river margins and banks.

Spawning habitat: areas where eggs are deposited and fertilized.

Substrate: material that rests at the bottom of a stream.

Taxonomic Richness: number of different species represented in an ecological community.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

This report provides a comprehensive summary of the baseline environmental studies of fisheries and aquatic resources in support of mine development planning in the Kudz Ze Kayah (KZK) project area in Yukon Territory. This report contains a compilation of survey data and observations including the Initial Environmental Evaluation (IEE) by Cominco (1996), compliance sampling conducted as per Water Licence Requirements (WUL-QZ97-026) in 2002, 2004, 2006, 2008, 2010, 2012, and 2014 (Laberge & Can-Nic-A-Nick, 2015), as well as the results of recent baseline environmental studies conducted in 2015 and 2016 by Alexco Environmental Group Inc. (AEG) and WUL compliance sampling conducted in 2016. Results to date from this sampling event are presented in this document while samples still requiring analysis (i.e., benthic invertebrate taxonomy) will be included in a report to be submitted to the Yukon Water Board in 2017 and in the next update version of this document.

Data and observations are included for baseline fish and fish habitat, stream sediments, benthic invertebrates, periphyton, and chlorophyll *a* surveys. Additional supporting information describing water quality and other aquatic ecosystem physical parameters is also provided for an overall ecosystem context.

2 ENVIRONMENTAL SETTING

2.1 LOCATION

The KZK project (the Project) is located in the northeastern foothills of the Pelly Mountains, in the St. Cyr Range, approximately 260 km northwest of Watson Lake, 115 km southeast of Ross River and 24 km south west of the Robert Campbell Highway near Finlayson Lake, Yukon (see Figure 2-1). The project area is located on the east side of the divide between the Pelly River and Liard River drainage basins.

The Project area is located within the Yukon Plateau-North Ecoregion which is characterized by a climate consisting of long cold winters (mean temperature of -20°C) and warm summers (mean temperatures of 10.5°C). The area exhibits a typical northern interior climate with over 50% of the precipitation falling as snow and peak snow pack occurring in early April (Cominco, 1996). Terrain within the project area is moderate with generally open valleys and gentle slopes (Yukon Ecoregion Working Group, 2004; Laberge & Can-Nic- A- Nick, 2015).

2.2 STUDY AREA

The aquatic resource study area is located on the east side of the divide between the Pelly River and Liard River drainage basins. Specifically, the deposit lies within an elevated north to south trending valley that drains to the north through Geona Creek into Finlayson Creek and Finlayson River and to the south through South Creek into the North River/Lakes system (Figure 2-2). Both the north and south drainages are part of the Liard basin. Fault Creek is a headwater tributary of Geona Creek. East Creek is a tributary of Finlayson Creek, connecting to Finlayson Creek downstream of the Geona Creek confluence.

The 2015 and 2016 aquatic resources baseline environmental study was primarily focussed on Geona Creek and Fault Creek, as mine development will impact these systems to some extent. The fish resources of Finlayson Creek have been surveyed on numerous occasions over the last two decades. The studies undertaken on Geona Creek and Fault Creek included fisheries investigations and sampling for stream sediments, benthic invertebrates, periphyton and chlorophyll *a*. Due to the fact that aquatic resources within Finlayson Creek have been documented extensively since 2002, more recent study efforts on Finlayson Creek focussed on periphyton, sediment and chlorophyll *a* to fill in information gaps to satisfy assessment and permitting requirements. Aquatic resource conditions within East Creek were also investigated as a reference drainage as it is not expected be impacted by mine development. Figure 2-2 shows the project area watercourses.

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KUDZ ZE KAYAH PROJECT

AQUATIC ECOSYSTEMS AND RESOURCES BASELINE REPORT

FIGURE 2-1
LOCATION OF
KUDZ ZE KAYAH PROJECT AREA

NOVEMBER 2016

KUDZ ZE KAYAH PROJECT

ALEXCO ENVIRONMENTAL GROUP

Datum: NAD 83; Projection UTM Zone 9N

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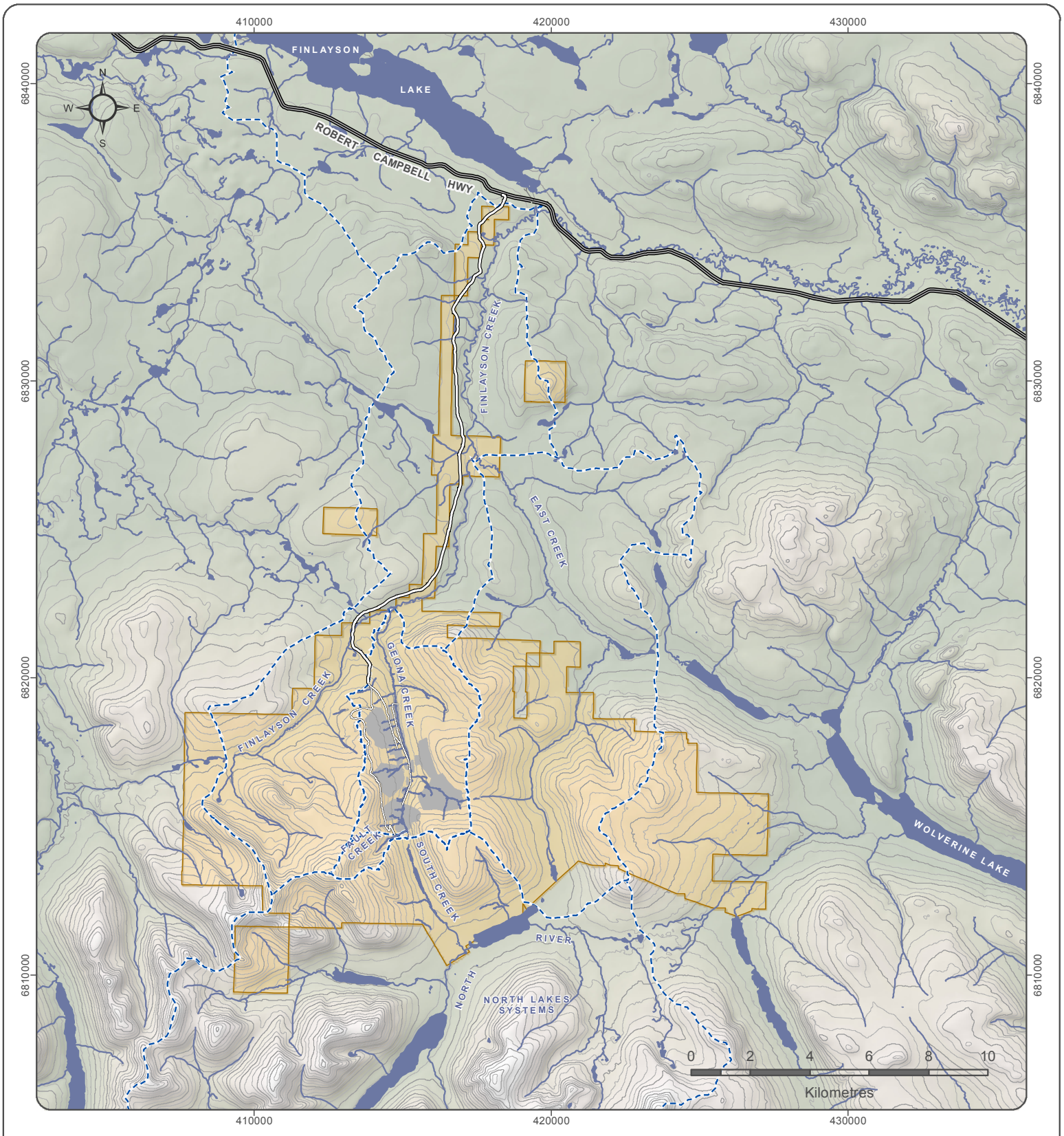

BMC Minerals (No. 1) Ltd. Mineral Claim Areas

Selected Drainages/Catchments

Waterbody

Watercourse

Tote/Propsed Access Road

Proposed Site Road

Contour (40 m interval)

KUDZ ZE KAYAH PROJECT

AQUATIC ECOSYSTEM AND RESOURCES BASELINE REPORT

FIGURE 2-2

PROJECT AREA WATERCOURSES

NOVEMBER 2016

AEG

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3 FISH AND FISH HABITAT

3.1 HISTORICAL STUDIES AND EXISTING INFORMATION

3.1.1 1995 Study

Baseline environmental and socio-economic studies for the Project, including fish and aquatic resources, were completed in 1994 and 1995 to support the IEE. This compilation was submitted for regulatory review in March 1996.

The key objectives of the 1995 fisheries resources baseline study included:

- The inventory of the aquatic habitat conditions in the project area;
- Determination of the limits of fish distribution in Geona Creek and South Creek;
- The inventory the habitat characteristics and fish population distributions in the creeks along the proposed Tote Road alignment;
- Collection of fish tissue sampling for chemical analysis of metals content;
- Provide a basis to assess the potential impacts of a mine development and operation on fishery resources in the local drainages, and develop a mitigation plan if necessary; and
- Collection of sufficient information to allow preparation of a habitat improvement (compensation) plan to offset any immitigable adverse environmental impacts to aquatic habitat and fishery resources.

The following sections present the methods utilized and a summary of the results from the 1994 and 1995 sampling programs.

3.1.1.1 Methods

Fish sampling was conducted in Geona Creek and its headwater ponds: Finlayson Creek, East Creek, South Creek, and its headwater lakes and the North Lakes/River system. Surveys occurred in 1995 in early spring, late spring, summer, and fall and included the use of backpack electrofishing units, minnow (Gee) traps, weir/fence traps and angling gear, aerial surveys, and dive surveys.

Captured fish were identified, enumerated, anaesthetized, and measured for length and weight. A few fish, representative of each size over a range, were retained for more complete examination and analysis. This included the collection of otoliths and scales for aging, stomach contents for diet identification, and tissue samples for metal content (Cominco, 1996).

Aquatic habitat inventories during the assessment included measurements of stream channel width, wetted width, depths, substrate, in situ water quality, discharge rate, fish cover types and amounts, and identification of migration barriers.

3.1.1.2 Results

Key findings of the 1995 fisheries baseline study are summarized below. Detailed results can be found in Section 3.4 of the IEE (IEE 1996).

- Generally low numbers of Arctic grayling (*Thymallus arcticus*) and slimy sculpin (*Cottus cognatus*) were found in the Project area. It was determined that young grayling (2 to 3 years) inhabit the headwater lakes (beaver ponds) in Geona Creek and possibly overwinter in the deepest zones. No full-sized adult grayling were captured or seen in Geona Creek after extensive electrofishing.

- Arctic grayling, and burbot (*Lota lota*) were found to inhabit the headwater lakes in South Creek.

- Several species of adult fish including Arctic grayling, burbot, slimy sculpin, and lake trout (*Savelinus namycush*) were captured in the North Lakes system. Adult grayling were also found in the Finlayson Creek system below Geona Creek in the spring of 1995. The authors concluded that the large fish are moving into the smaller watercourses from large lakes and rivers. However, the headwater areas contained fewer species, fewer adults, and low numbers of fish in general. The beaver dams likely contributed significantly to this pattern of fish distribution.

- The upper East Creek area appeared to be devoid of fish upstream of the beaver dams (above East Lake), based on extensive electrofishing and diver surveys in that area. The numerous large beaver dams were determined to be fish migration barriers, especially at low flows.

- The lake in the mid-section of East Creek was found in April, 1995, to contain sculpins; however, no fish were caught by weir trap, angling, electrofishing, or minnow trapping in this lake from early May to late June, 1995. In late June however, Arctic grayling began to be captured in the weir-type fish trap at the outlet of the lake. By the end of August, 1995, numerous grayling had passed through the trap, moving predominantly upstream into the lake. Several sculpin were captured in the lowermost reach of East Creek (Cominco, 1996).

- No bull trout (char) (*Salvelinus confluentus*) or Dolly Varden char (*Salvelinus malma*) (fall-spawners) were found in any of the creeks sampled.

- It is likely that there are no resident salmonid species other than Arctic grayling in the creeks and beaver ponds within the project area. Lake trout were found in the North Lakes and are known to occur in Finlayson Lake, but none were found in the Finlayson Creek or South Creek systems (Cominco, 1996).

- Samples of Arctic grayling and slimy sculpins were collected for metals analysis in most of the study watercourses. With the exception of mercury, there are no Canadian guidelines on

the maximum metal levels in fish for human consumption and levels during the time of the study. Mercury however was found to be within the guidelines for human consumption for both species.

- Survey results for creeks crossing the Tote Road alignment indicated that none of the small creeks would likely support fish, except the mainstream of Finlayson Creek. One of the small tributary creeks was judged to be physically capable of supporting fish, although it was found to provide only marginal habitat.

The study methodology employed during the investigations described above is consistent with current methods used to characterize fish presence and habitat usage in aquatic systems. The fish studies were relatively comprehensive in providing a good understanding of the fish habitat and its use, however it only provided one year of study in 1995; therefore, current fisheries assessments, completed in 2015 and 2016, were required to support mine development. The 1995 study suggested that fish may overwinter in deeper sections of ponds/pools in upper Geona Creek but no characterization of the system in winter was conducted. Therefore, overwintering habitat potential in Geona Creek was conducted in 2015 to 2016. Additionally, the 1995 studies identified a number of juvenile grayling captured as 1^{+} age-class (i.e., over one year in age but less than two). Their lengths and the date of capture however are more consistent with what would be expected for 0^{+} (i.e., young-of-year) fish. This is discussed in further detail below with the results of the 2015 and 2016 studies.

3.1.2 2002 to 2014 Studies

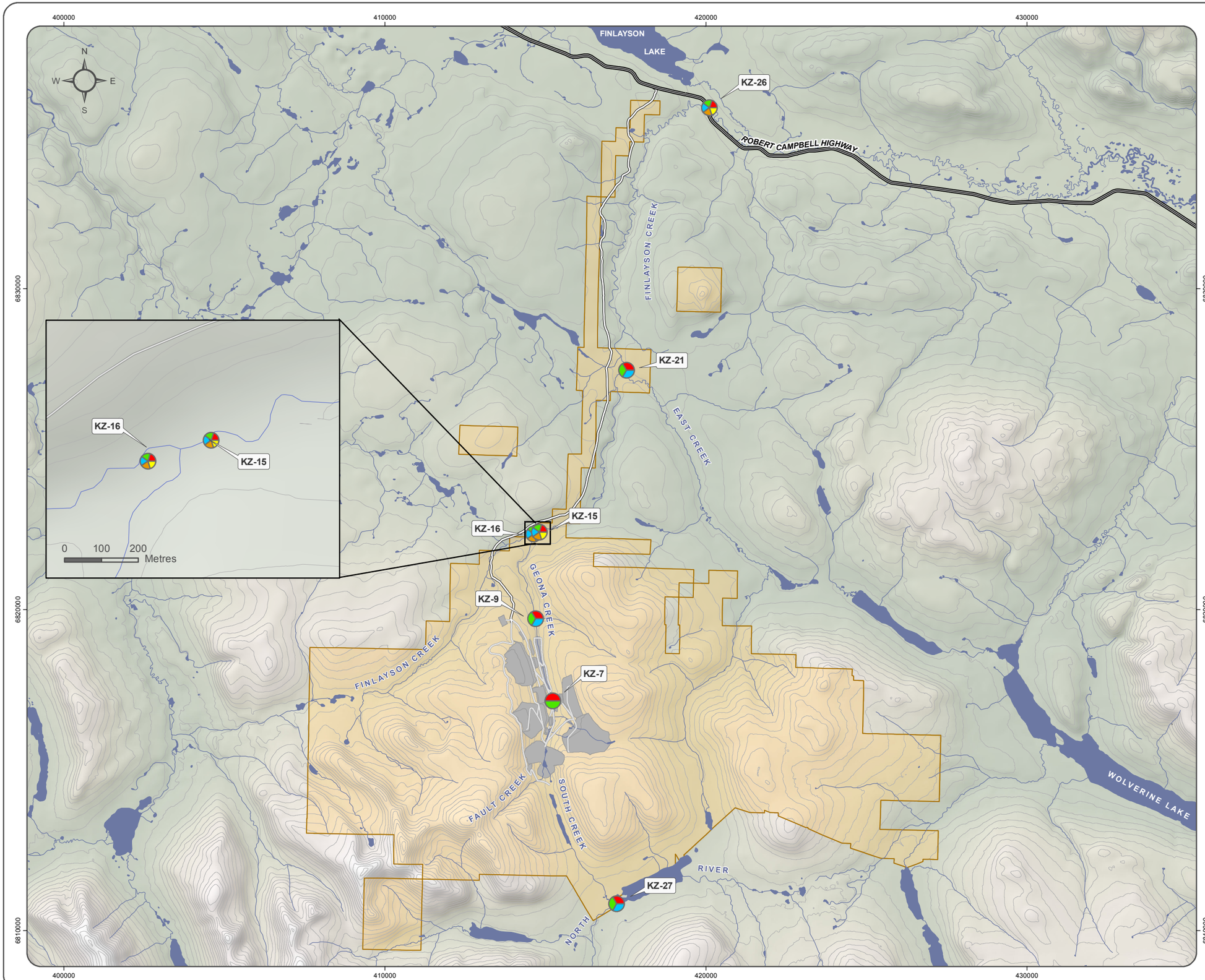
After regulatory approvals for mine development were received by Cominco Ltd. in 1999 (Water Use Licence WUL-QZ97-026), subsequent baseline studies (including surface water quality, fish, benthic invertebrates and stream sediments), have been conducted every two years since 2002 to meet the compliance monitoring requirements of the WUL.

3.1.2.1 Methods

Three sites on Finlayson Creek have been consistently monitored during late summer for fish distribution and abundance and for fish tissue analyses, biennially since 2002 (Figure 3-1). These monitored sites include:

- KZ-16: Finlayson Creek, upstream of the confluence with Geona Creek, at Tote Road. This site serves as a reference site;
- KZ-15: Finlayson Creek, 100 m downstream of the confluence with Geona Creek; and
- KZ-26: Finlayson Creek, just above the confluence with Finlayson River, at Robert Campbell Highway.

Electrofishing and Gee type minnow traps were the primary methods used for establishing fish distribution in the Project area. Captured fish were identified, enumerated, and measured for total or fork length (± 1 mm), weighed (± 0.1 g), and subsequently live-released at site of capture. In addition, a minimum of five slimy sculpin were retained from each sampling site during each sampling event, for whole body inductively coupled plasma (ICP) metal analysis.



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KUDZ ZE KAYAH PROJECT

AQUATIC ECOSYSTEMS AND RESOURCES BASELINE REPORT

FIGURE 3-1

AQUATIC MONITORING STATIONS

JANUARY 2017

AQUATIC RESOURCE MONITORING STATIONS

- Water Quality
- Stream Sediment
- Benthic Invertebrates
- Metals in Benthos Tissue
- Metals in Fish Tissue

- Tote Road/Proposed Access Road
- Proposed Mine Road
- Contour (40 m interval)
- Watercourse
- Waterbody
- Location of Proposed Mine Infrastructure
- BMC Minerals (No.1) Ltd. Mineral Claim Areas

ALEXCO ENVIRONMENTAL GROUP

Digital elevation model created by the Yukon Department of the Environment interpolated from the digital 1:50,000 Canadian National Topographic Database (NTDB Edition 2) contour and watercourse layers. Obtained from Geomatics Yukon.

Canvec compiled by Natural Resources Canada at a scale of 1:10,000 - 1:50,000. Reproduced under license from Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Projection UTM Zone 9N

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3.1.2.2 Results

Key findings of the WUL fisheries assessments are summarized below, while more details on each sampling event can be found in the respective annual reports for WUL QZ97-026.

Fish Distribution and Abundance

From 2002 to 2014 slimy sculpin (Cottus cognatus) and Arctic grayling (Thymallus arcticus) were the only species caught catch in Finlayson Creek with the exception of one burbot that was caught at KZ-26. These results are consistent with the 1995 study. The quantity and quality of fish habitat at Site KZ-26 is higher in comparison to the other upstream monitoring sites and as such total catch, as well as catch per unit effort (CPUE) have generally been higher at this site. Grayling were captured consistently at KZ-26 during each sampling event while only one grayling was captured at the upstream sites (KZ-15, KZ-16) between 2002 and 2016. Additionally, most (67%) of the grayling captured at KZ-26 were on the downstream side of the culvert (Table 3-1). Grayling that have been captured on the immediate upstream side of the culvert were young of the year fish likely produced in upper Finlayson Creek tributaries and likely were in the process of migrating downstream for overwintering when captured (de Graff Pers. Comm). The upper sites (KZ-15 and KZ-16) are situated on Finlayson Creek just upstream and downstream of the Geona Creek confluence. Table 3-1 presents a summary of fish captures from 2002 to 2014 at each of the three monitoring sites.

Species composition at each site was generally consistent over the monitoring period, demonstrating no change in the fish assemblages. This indicates of some level of ecological stability and aquatic conditions that continue to provide suitable habitat to support this generally small population. Although useful for temporal comparisons of fish presence, these bi-yearly studies do not include the Geona Creek watershed and were conducted during only the month of August in each of the years sampled.

Table 3-1: Fish Catch Comparison for Key Finlayson Creek Stations from 2002 to 2014 for Slimy Sculpin and Arctic Grayling

Month and Year	KZ-15 (Upstream of culverts)			KZ-16 (upstream of culverts)			KZ-26 (upstream of culvert)			KZ-26 (downstream of culvert)		
	Effort *	AG Catch **	Other species**	Effort *	AG Catch **	Other species**	Effort *	AG Catch **	Other species**	Effort *	AG Catch **	Other species**
Aug-2002	n/a	0	5 SS	n/a	0	18 SS	MT = 33 trap-hours EF = approx. 662 sec.***	1	-	MT = 16.5 trap-hours EF = approx. 662 sec.***	4	5 SS
Aug-2004	n/a	0	20 SS	n/a	0	31 SS	MT = 85 trap-hours EF = 1024 sec.	30	11 SS	MT = 42 trap-hours EF = 787 sec.	18	19 SS
Aug-2006	MT = 72 trap-hours EF = 888 sec.	0	4 SS	MT = 48 trap-hours EF = 1040 sec.	0	14 SS	MT = 41 trap-hours EF = 403 sec.	0	12 SS	MT = 126 trap-hours EF = 797 sec. ANG = 10 min.	3	17 SS
Aug-2008	MT = 72 trap-hours EF = 838 sec.	0	9 SS	MT = 51 trap-hours EF = 1215 sec.	0	6 SS	MT = 48 trap-hours EF = 431 sec.	2	20 SS	MT = 72 trap-hours EF = 1133 sec. ANG = 5 min.	16	8 SS
Aug-2010	MT = 54 trap-hours EF = 615 sec.	0	25 SS	MT = 48 trap-hours EF = 681 sec.	0	15 SS	MT = 78 trap-hours EF = 412 sec.	6	17 SS	MT = 117 trap-hours EF = 1097 sec. ANG = 5 min.	10	15 SS
Aug-2012	MT = 63 trap-hours EF = 747 sec.	1	13 SS	MT = 54 trap-hours EF = 674 sec.	0	12 SS	MT = 24 trap-hours EF = 480 sec.	0	18 SS	MT = 72 trap-hours EF = 991 sec. ANG = 10 min.	20	9 SS 1 BB
Aug-2014	MT = 61.5 trap-hours EF = 643 sec.	0	10 SS	MT = 63 trap-hours EF = 894 sec.	0	19 SS	MT = 39 trap-hours EF = 356 sec.	0	5 SS	MT = 117 trap-hours EF = 894 sec. ANG = 10 min.	8	20 SS

** MT = Minnow trapping, EF = Electrofishing, ANG = Angling*

*** AG = Arctic grayling, SS = slimy sculpin, BB = burbot*

**** EF effort not delineated between u/s and d/s of culvert – therefore approximated*

Metals in Fish Tissue

Results of slimy sculpin tissue analyses for metal concentrations indicated generally low levels of key tested parameters including arsenic, cadmium, lead, copper, mercury, selenium, and zinc. Concentrations have remained consistent and unchanged since 2002, and below those reported since the initial environmental evaluation was completed in 1995 (Laberge & Can-Nic-A-Nick, 2015). Lower metals concentrations in sculpin tissue observed likely reflect background concentrations. The presence of highly mineralized deposits in the area does not appear to be reflected in Finlayson Creek sculpin tissue residues.

Figure 3-2 shows metal concentrations in sculpin tissue from 1995 to 2014 and seven key parameters known for their toxicity.

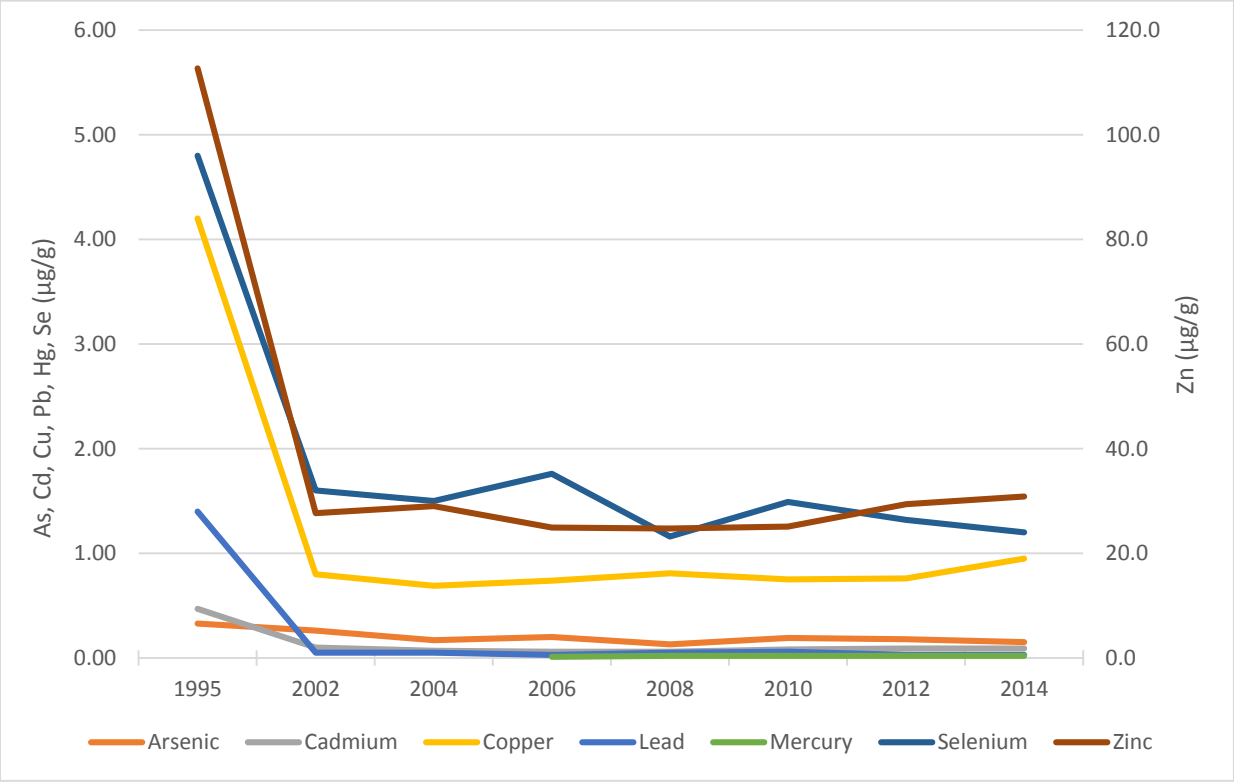


Figure 3-2: Metal Concentrations (Wet Weight) in Whole Body Slimy Sculpin, Finlayson Creek

Note: Adapted from Laberge & Can-Nic-A-Nick, 2015 (Figures 7 to 9)

3.2 2015 AND 2016 STUDIES

Characterizing fish presence, distribution and abundance, and documenting fish habitat quantity and quality in Geona Creek is critical given that this drainage will be directly impacted by the proposed mine development. As the only information available on fish and fish habitat in Geona Creek dates back to 1995, the information was updated in 2015 and 2016. Stream systems can change

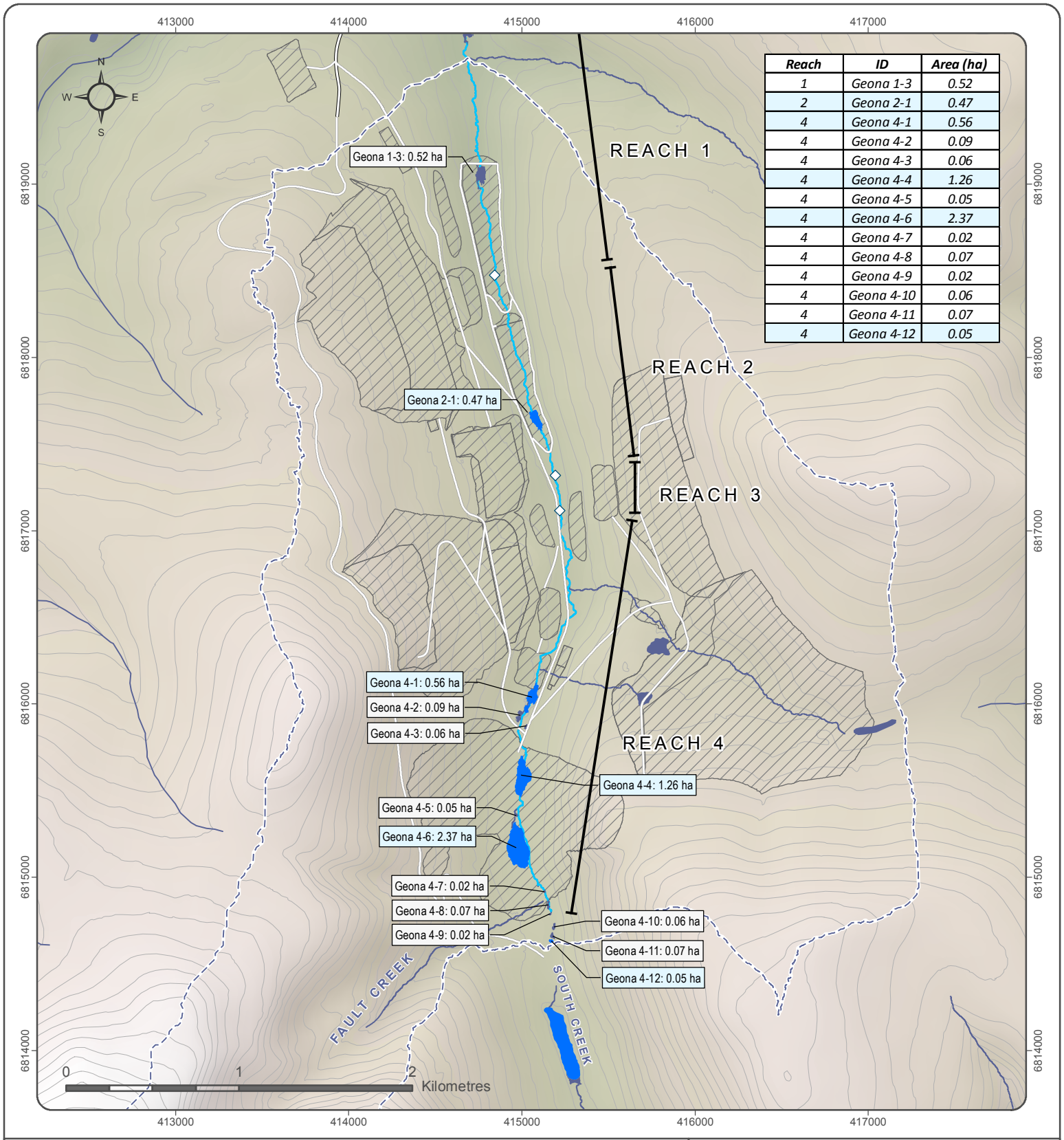
significantly over decades; barriers can degrade or form, changing habitat access and use. Fisheries investigations were also carried out in Fault Creek (a headwater tributary of Geona), Finlayson Creek, South Creek, North River, and East Creek to aid in the characterization of current conditions in the receiving waters and reference areas (Figure 2-2).

3.2.1 Methods

In 2015 fisheries assessments were conducted from June 22 to 24, August 26 to 28 and October 14 to 15, with the use of a Smith-Root LR-24 backpack electrofisher as well as 6.35mm (1/4") and one 3.18mm (1/8") minnow (Gee) traps using cat food as an attractant. All work was conducted in accordance with the Department of Fisheries and Oceans Canada (DFO) Licence to Fish for Scientific Purposes XR 141 2015. Captured fish were identified and enumerated, measured for fork length (i.e., total length ± 1 mm), observed for abnormalities, and released at the location of capture. Additional supporting information collected at the time of sampling includes: physical description and photo documentation of sampling locations, in situ water quality parameters (i.e., temperature, dissolved oxygen, and conductivity), as well as weather conditions at time of sampling.

A reach habitat assessment was carried out on Geona Creek on August 27 and 28, 2015, with a focus on the upper reaches with the highest potential to be impacted by mine development. Information collected included channel characteristics, stream morphology, substrate quality, riparian vegetation, potential barriers to fish migration, bank material, and other instream features that are considered key features in the quantification of fish habitat for different life stages of local species

In order to characterize winter habitat usage in Geona Creek, in situ water quality investigations and physical observations were conducted on pond and creek habitat in the watershed during February and March, 2016. The objective was to determine if suitable rearing habitat is available for fish in the system during winter (the previous fisheries surveys conducted in 1995 did not investigate overwintering habitat potential in Geona Creek). Very little in-stream pool habitat is present in the watershed and it was considered that flow would be low during winter. Therefore, potential overwintering habitat would be limited to the large ponds that occur in the system. The ponds in upper Geona creek (Figure 3-3) were surveyed in late winter on February 9 and March 23, 2016 when flow in the system was considered to be at, or near, its' lowest for the winter season. The investigation involved augering a number of holes through the ice on each of the ponds and measuring dissolved oxygen (DO), pH, conductivity, oxidation-reduction potential (ORP), and temperature using a YSI multi-meter. Between three and five holes were augered where the greatest pond depth in each of the sampled ponds was anticipated to be encountered. In addition to the in situ water chemistry measurements, ice thickness and depth to the bottom of the ponds were measured to determine depth of liquid water below the ice. Visual and olfactory observations of the pond water were also noted.



Reach	ID	Area (ha)
1	Geona 1-3	0.52
2	Geona 2-1	0.47
4	Geona 4-1	0.56
4	Geona 4-2	0.09
4	Geona 4-3	0.06
4	Geona 4-4	1.26
4	Geona 4-5	0.05
4	Geona 4-6	2.37
4	Geona 4-7	0.02
4	Geona 4-8	0.07
4	Geona 4-9	0.02
4	Geona 4-10	0.06
4	Geona 4-11	0.07
4	Geona 4-12	0.05

- Reach Break
- Geona Creek Catchment
- Ponds Sampled for Owerwintering Habitat
- Lake/Pond
- Location of Proposed Mine Infrastructure
- Tote Road/Proposed Access Road
- Proposed Project Site Road
- Geona Creek
- Other watercourse

Reach characteristics from field observations or from 2015 LiDAR data analysis (with the exception of for reach 1, for which LiDAR data was not available and so lenghts and heights taken from CANVEC data (50k)
Datum: NAD 83; Projection: UTM Zone 9N

AEG

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AQUATIC ECOSYSTEMS AND RESOURCES BASELINE REPORT

FIGURE 3-3

SITES SAMPLED FOR OVER-WINTERING HABITAT POTENTIAL, FEBRUARY AND MARCH 2016

FEBRUARY 2017

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In May 2016 the main stem of Geona Creek was surveyed for the presence of Arctic grayling spawning throughout the system. On six occasions from May 17 through June 2, visual assessments of Geona Creek were conducted by a BMC Fisheries Biologist and an environmental monitor, who walked most of the length Geona Creek, where possible (e.g., several beaver impoundments prevented the assessment of some areas), and observed for fish presence. Extra care was taken when potential Arctic grayling spawning habitats (e.g., riffles with gravel substrates) were encountered. Finlayson Creek was also surveyed for the presence of Arctic grayling from the confluence with Geona Creek upstream for approximately 1 km on May 30, 2016.

Further fisheries investigations were carried out on June 13 to 15, July 25 to 28, and September 30 to October 3, 2016 in accordance with DFO Licence to Fish for Scientific Purposes XR 167 2016. As part of the WUL, slimy sculpin were retained for tissue analysis from station KZ-15, KZ-16, and KZ-26 during the October 2016 sampling event. The tissue analysis results however were not available at the time of writing this report.

3.2.2 Results and Discussion

3.2.2.1 Fisheries

Results of the 2015 and 2016 fisheries investigations are generally consistent with previous studies. Fish were captured in generally low numbers, with the highest CPUE near the headwaters of Geona Creek. The only species captured in Geona Creek was Arctic grayling (*Thymallus arcticus*), with the exception of a few slimy sculpin (*Cottus cognatus*) captured at the confluence with Finlayson Creek below the beaver dam. Most of the Arctic grayling captured in Geona Creek were fry or juveniles except for two possible sub-adults or adults (i.e., lengths of 205 mm and 215 mm – see Appendix A).

Only three small grayling were captured during the 2015 June sampling event (Table 3-2). Based on their fork-length size (i.e., 83 to 86 mm – Appendix A) these fish were likely spawned the previous year (i.e., 1+ age-class). During the August 2015 sampling event a number of the grayling captured ranged from 46 mm to 81 mm fork-length. Based on this size range, these individuals were likely recruits from 2015 spawning events (i.e., 0+ age-class). Three additional larger grayling (juveniles) were captured in Geona Creek during the August 2015 sampling event, they ranged in size from 107 mm to 205 mm. Sampling in Geona Creek on October 2015 resulted in the capture of a single 0+ age-class grayling ranging in fork length size of 49 mm to 70 mm.

In June 2016 no grayling were captured in any of the sampled creeks. In July 2016 grayling captured in Geona Creek ranged in size from 36 mm to 215 mm, and from 51 mm to 129 mm in October 2016. No grayling were captured in Finlayson Creek, except below the Robert Campbell highway culvert, suggesting that the culvert is a barrier for fish migration. Monitoring of flow characteristics (velocity, depth) through the culverts was initiated in 2016 to ascertain to what extent the highway culverts may impede fish passage. Fish passage constraints resulting from the current culvert configuration are discussed in more detail in BMC's Fish Habitat Compensation Plan (AEG 2016).

Fish sampling in South Creek, North River, and East Creek indicated the presence of Arctic grayling, slimy sculpin, and burbot. No fish were captured in Fault Creek, despite significant effort. The highest CPUE for minnow trapping was observed between the headwater ponds of Geona Creek (i.e., at the ABM culvert), for Arctic grayling in July 2016. The highest CPUE for electrofishing was observed in Finlayson Creek, upstream of the Robert Campbell Highway culvert, for slimy sculpin in July 2016. Results of the 2015 and 2016 fisheries investigations are summarized in Table 3-2 below, while complete fish data are presented in Appendix A. Sampling locations for 2015 to 2016 electrofishing and minnow trapping events are illustrated on Figure 3-4.

Table 3-2: 2015 to 2016 Fisheries Sampling Results

Date	Location	Method	Effort	Results	Species	CPUE
June 22-23, 2015	Geona Creek, near mouth	MT	107.0 trap-hours	1	SS	0.0093
		EF	108 s.	0		
	Geona Creek, near KZ-9	MT	102.9 trap-hours	0		
		EF	387 s.	0		
	Geona Creek, near KZ-7	MT	93.8 trap-hours	2	AG	0.021
		EF	594 s.	1	AG	0.0017
	Fault Creek, near KZ-2	MT	157.2 trap-hours	0		
		EF	211 s.	0		
August 26-28, 2015	North River u/s of confluence with South Creek	MT	50.6 trap-hours	1	AG	0.020
		EF	161 s.	2	SS	0.012
				1	BB	0.0062
	South Creek just at confluence with N. River	MT	100.1 trap-hours	1	SS	0.010
		EF	120 s.	3	SS	0.025
	Geona Creek, near KZ-7	MT	79.6 trap-hours	0		
		EF	392 s.	2	AG	0.0051
	Geona Creek, 1/2 way between KZ-9 and mouth	MT	69.0 trap-hours	0		
		EF	187 s.	0		
	East Creek, just u/s of KZ-21	MT	44.1 trap-hours	1	SS	0.023
		EF	159 s.	5	SS	0.031
	Fault Creek, near KZ-2	MT	53.1 trap-hours	0		
		EF	116 s.	0		
	Headwater lakes of South Creek and channel between 2 lakes	MT	46.5 trap-hours	3	BB	0.065
		EF	223 s.	5	AG	0.022
	Geona Creek, braided upper reach above first significant pond	MT	88.7 trap-hours	2	AG	0.023
		EF	78 s.	0		

Date	Location	Method	Effort	Results	Species	CPUE
	Geona Creek, channel btw two main upper ponds (at ABM culvert)	MT	65.8 trap-hours	5	AG	0.076
		EF	288 s.	2	AG	0.0069
October 14-15, 2015	Geona Creek, braided upper reach above first significant pond	MT	111.5 trap-hours	0		
	Geona Creek, channel btw two main upper ponds (at ABM culvert)	MT	104.9 trap-hours	6	AG	0.057
		EF	205 s.	6	AG	0.029
June 13-15, 2016	Finlayson Creek, above Geona Creek confluence (near KZ-16)	MT	44.3 trap-hours	0		
		EF	106 s.	1	SS	0.0094
	Geona Creek near mouth (below beaver pond, near KZ-17)	MT	66.5 trap-hours	6	SS	0.135
		EF	106 s.	0		
	Geona Creek near mouth, in beaver pond	MT	22.1 trap-hours	0		
		ANG	20 min.	0		
	Finlayson Creek, below Geona Creek confluence, near KZ-15	MT	44.4 trap-hours	2	SS	0.045
		EF	135 s.	3	SS	0.022
	Geona Creek, near KZ-9	MT	96.0 trap-hours	0		
		EF	68 s.	0		
	Tributary (KZ-18) to Geona Creek that comes in just below KZ-9	MT	46.8 trap-hours	0		
		EF	52 s.	0		
	Geona Creek, near KZ-7	MT	96.8 trap-hours	0		
		EF	191 s.	0		
	Tributary to Geona Creek, near KZ-6	MT	48.0 trap-hours	0		
		EF	53 s.	0		
	Fault Creek, near KZ-2	MT	48.8 trap-hours	0		
		EF	136 s.	0		
July 25-28, 2016	Finlayson Creek at Robert Campbell Highway (KZ-26), d/s of culvert	MT	97.6 trap-hours	6	AG	0.061
				6	SS	0.061
		EF	163 s.	1	SS	0.0061
	Finlayson Creek at Robert Campbell Highway (KZ-26), u/s of culvert	MT	98.7 trap-hours	1	SS	0.010
		EF	168 s.	7	SS	0.042
	Finlayson Creek, below East Creek confluence (near KZ-22)	MT	70.5 trap-hours	2	SS	0.028
	Finlayson Creek, below Geona Creek confluence, near KZ-15	MT	60.4 trap-hours	0		
	Finlayson Creek, above Geona Creek confluence (near KZ-16)	MT	30.7 trap-hours	1	SS	0.033

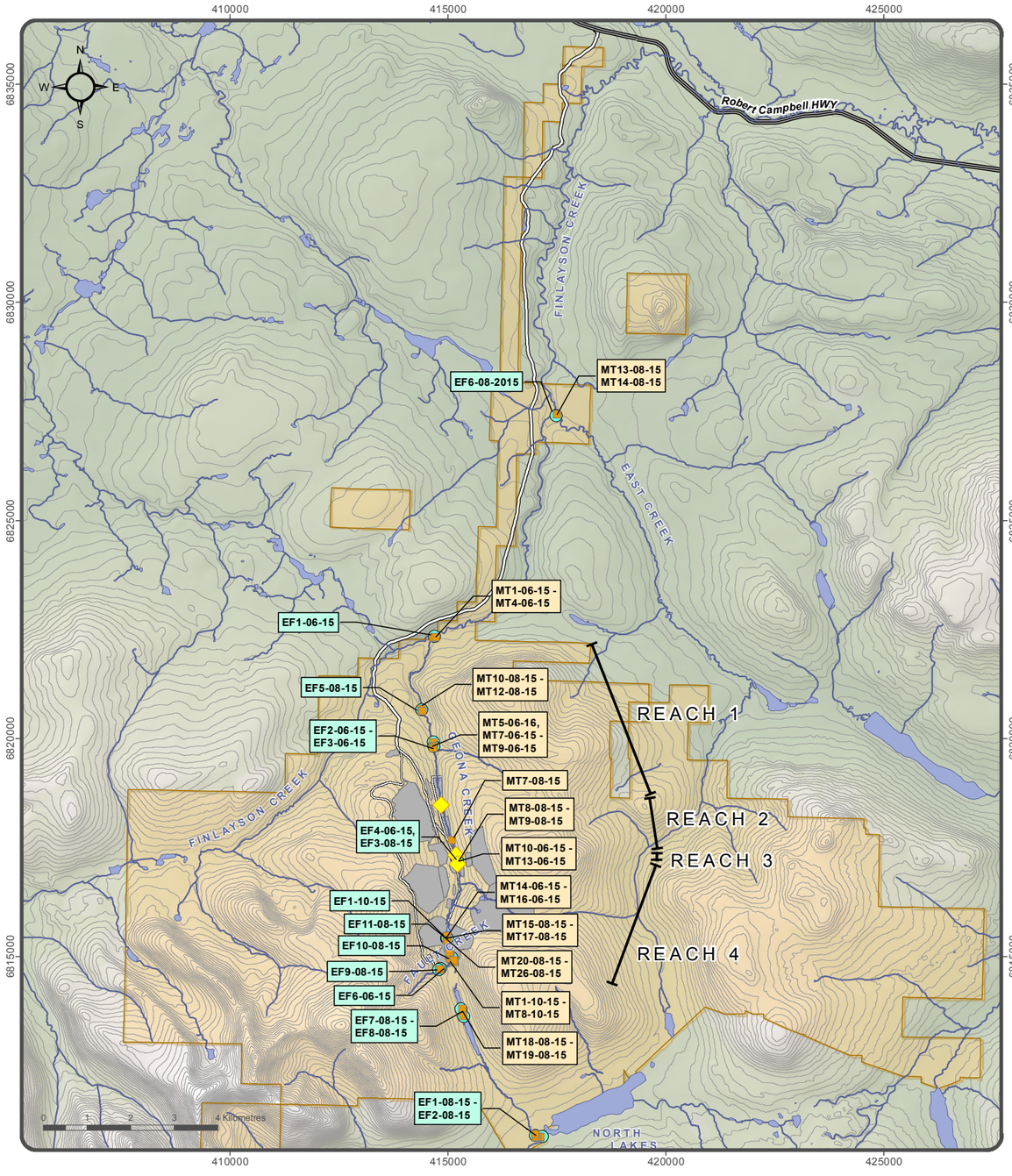
Date	Location	Method	Effort	Results	Species	CPUE
	Finlayson Creak below and above Geona Creek confluence	EF	705 s.	6	SS	0.0085
	Geona Creek near mouth (below beaver pond, near KZ-17)	MT	29.5 trap-hours	0		
	Finlayson Creek near mine access road bridge	EF	679 s.	23	SS	0.034
	Geona Creek, near KZ-9	MT	93.9 trap-hours	0		
	Geona Creek, near KZ-7	MT	57.6 trap-hours	0		
		EF	658 s.	1	AG	0.0015
	Upper Geona Creek, channel where AG spawning was observed	MT	34.8 trap-hours	1	AG	0.029
		EF	289 s.	2	AG	0.0069
	Geona Creek, channel btw two main upper ponds (at ABM culvert)	MT	36.3 trap-hours	4	AG	0.11
		EF	592 s.	8	AG	0.014
	Fault Creek, near KZ-2	EF	198 s.	0		
Sept 30-Oct 3, 2016	Finlayson Creek at Robert Campbell Highway (KZ-26), d/s of culvert	MT	74.4 trap-hours	1	AG	0.013
		EF	347 s.	6	SS	0.017
	Finlayson Creek at Robert Campbell Highway (KZ-26), u/s of culvert	MT	74.5 trap-hours	1	SS	0.013
		EF	329 s.	4	SS	0.012
	Finlayson Creek, below Geona Creek confluence, near KZ-15	MT	86.7 trap-hours	0		
		EF	369 s.	1	SS	
	Finlayson Creek near mine access road bridge	MT	71.2 trap-hours	3	SS	0.042
		EF	529 s.	19	SS	0.036
	Geona Creek, channel btw two main upper ponds (at ABM culvert)	MT	94.5 trap-hours	0		
		EF	811 s.	2	AG	0.0025

**MT = Minnow trapping; EF = Electrofishing; ANG = Angling; d/s = downstream; u/s = upstream*

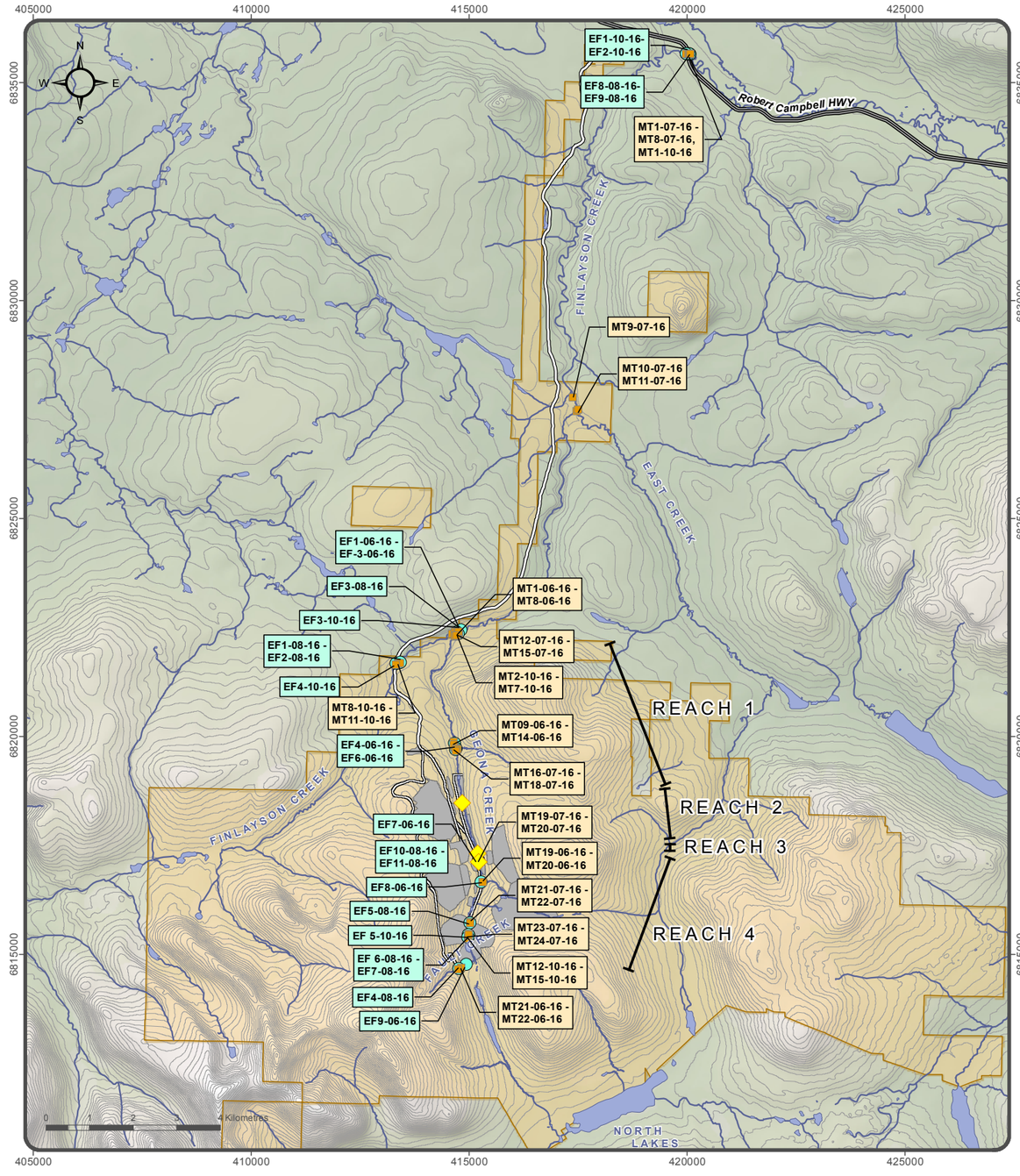
***SS = Slimy sculpin (Cottus Cognatus); AG = Arctic grayling (Thymallus arcticus); BB = Burbot (Lota lota)*

****CPUE = Catch per Unit Effort (#fish/trap-hour for MT and #fish/second for EF)*

2015 FISHERIES MONITORING LOCATIONS



2016 FISHERIES MONITORING LOCATIONS



Datum: NAD 83; Map Projection: UTM Zone 9N

AEG

- Reach Break
- Minnow Trapping Location
- MT-MM-YY — Minnow Trapping Location Label
- Electrofishing Location
- EF-MM-YY — Electrofishing Location Label

EF# - Electrofishing Sampling Location ID
MT# - Minnow Trap Sampling Location ID
MM - Sampling Month; YY - Sampling Year

- Location of Proposed Mine Infrastructure
- BMC Minerals (No. 1) Ltd. Claim Outline
- Waterbody
- Watercourse
- Tote/Proposed Access Road
- Proposed Mine Road

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FIGURE 3-4

2015/2016 FISHERIES MONITORING LOCATIONS

NOVEMBER 2016

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3.2.2.2 Geona Creek Reach Assessment

The following reach descriptions were completed using an adapted version of British Columbia's Site Card for Fish Habitat Assessment (Ministry of Sustainable Resource Management, Aquatic Branch, 2004). The reach assessments were carried out on Geona Creek on August 27 and 28, 2015, with a focus on the upper reaches that will be the most affected by the mine development. The reach description measures key habitat metrics that can be used to assess the quality of habitat within a certain area. Table 3-3 below displays the metrics for each of the reach assessment and Figure 3-5 displays each reach as well as supporting habitat characterization for Geona Creek.

Reach 1 on Geona Creek has an average channel width of 5.5 metres (m) and average wetted width of 3.2 m. The left and right banks are primarily undercut and are composed of fines and gravels with cobbles found intermittently throughout the reach. Riparian vegetation is dominated by shrubs and grasses, interspersed with some wetland species such as sedges and horsetail. Bed material within the reach is composed of fine sediment and gravels, with fine sediment being the dominant bed material. Overhanging vegetation comprises the majority of stream cover within the reach, with a minimal amount of small woody debris, deep pools, and boulders also providing suitable cover for fish. Instream vegetation is composed primarily of algae, but some grasses and shrubs are present and likely only submerged during high flows and flood events.

A step-pool type stream morphology comprises this reach of Geona Creek. Stream pattern within the reach can be characterized as irregular meandering. The reach is occasionally confined, however stream braiding with smaller channels branching off the main stem is common. Historic and current beaver activity is the main driver of pond formation within the reach. Pool habitat within the reach is typically driven by stream pattern (i.e., meandering characteristics) rather than large woody debris and occur at a low frequency. The average pool depth within the reach is approximately 0.8 m.

Reach 2 of Geona Creek has an average channel width of 29.1 m with an average wetted width of 19.2 m. The left and right banks are primarily vertical and are composed of boulders and cobble. Riparian vegetation is dominated by shrubs and grasses within this reach with a minimal amount of wetland vegetation. Bed material within the reach is composed of boulders and cobbles with boulders being the dominant bed material. Boulders make up the majority of stream cover within the reach with small woody debris, large woody debris and overhanging vegetation providing minimal cover. Algae and moss dominated the instream vegetation within this reach.

A riffle-pool type stream morphology characterizes Reach 2 of Geona Creek. Stream patterns within the reach can be described as sinuous. The stream is occasionally confined, with no side channels or braiding within this reach. Historic and current beaver activity is the main driver of pond formation. Pool occurrence within the main channel of the creek is very low within this reach, with an average pool depth of approximately 0.3 m.

Reach 3 on Geona Creek has an average channel width of 13.5 m and average wetted width of 7.8 m. The left bank is gradually sloping and is composed primarily of gravels. The right bank is also sloping

and is composed of gravels, cobbles, and boulders. Riparian vegetation on the left bank is dominated by grasses and shrubs with a few conifers present. Right bank riparian vegetation is composed of grasses and shrubs. Bed material within the reach is composed of gravel, cobbles and boulders with gravel being the dominant bed material. Boulders and over hanging vegetation are the primary providers of cover within this reach. Instream vegetation is largely comprised of mosses, grasses and shrubs, however it is likely that shrubs are only submerged during high flows and flood events. Moss is the dominant instream vegetation within the reach.

A riffle-pool type stream morphology dominates Reach 3 of Geona Creek. Stream pattern within this reach can be described as sinuous. The stream is occasionally confined and pool frequency within the main channel of the creek is low to moderate as some stream features such as boulders and a small waterfall have created some pool habitat. The average pool depth within this reach is approximately 0.2 m.

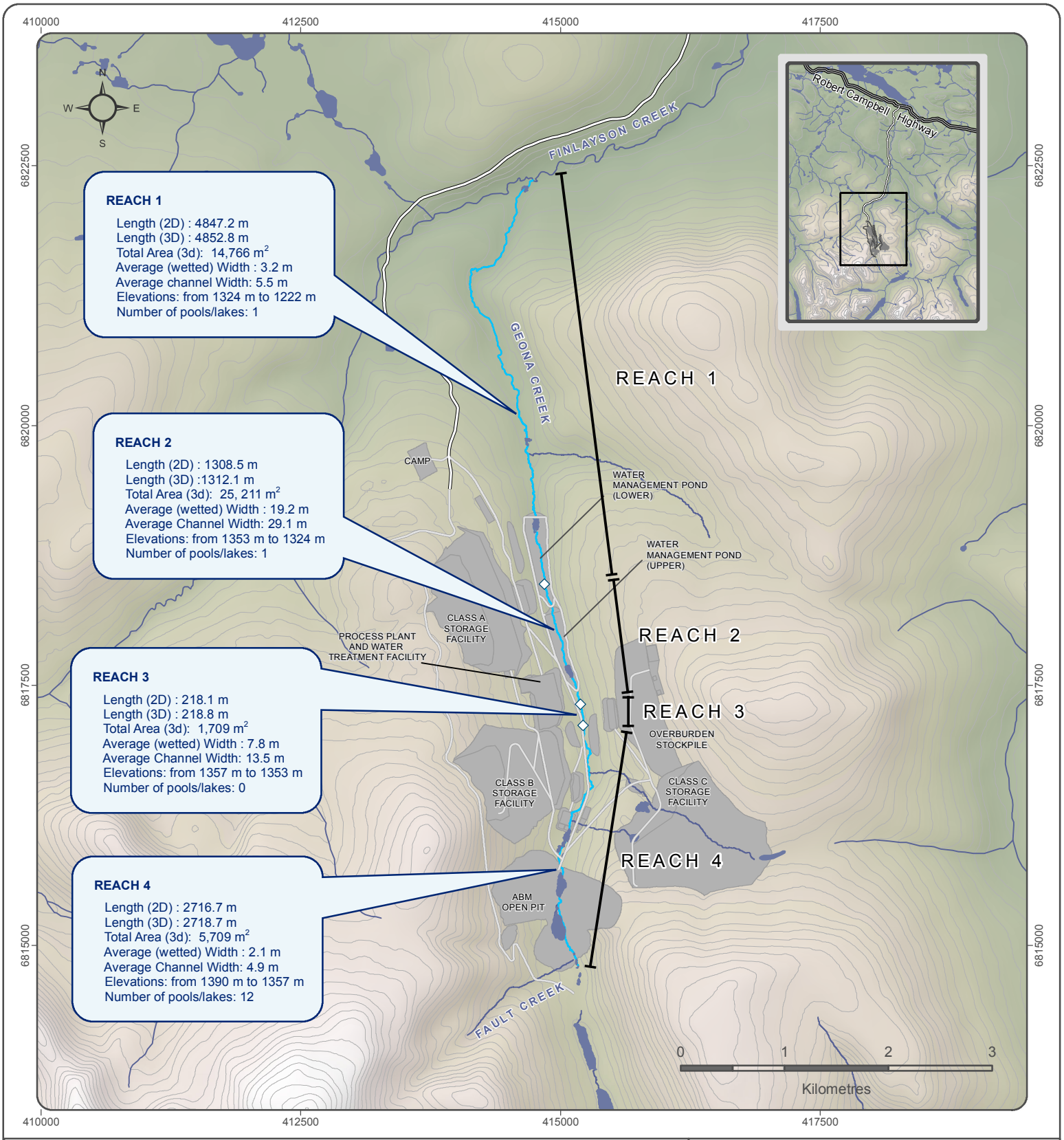
Reach 4 on Geona Creek has an average channel width of 4.9 m and average wetted width of 2.1 m. Both banks are undercut throughout most of the reach with some vertical sections. Substrate on the left bank is composed primarily of gravels while the right bank being highly variable and is composed of a mixture of fines, gravels, cobbles, and boulders. Riparian vegetation on the left and right bank is dominated by grasses and shrubs. Bed material within the reach is composed of cobbles, gravels, and boulders with cobbles being the dominant bed material. Boulders, undercut banks, and overhanging vegetation are the primary providers of cover within this reach. Instream vegetation is largely composed of algae and vascular plants.

A riffle-pool type stream morphology makes up this section of Geona Creek. Stream pattern can be described as irregular wandering. The stream is occasionally confined with no stream braiding within the reach. Pond development within this reach is a result of historic as well as current beaver activity. Pool occurrence within the main channel is low to moderate with boulders and stream morphology being the main drivers of pool development. Average pool depth not including beaver ponds within this reach is approximately 0.3 m.

For a visual representation of each reach please refer to the Photolog located in Appendix B.

Table 3-3: Reach Metrics for Geona Creek

Characteristic		Reach 1	Reach 2	Reach 3	Reach 4
Reach Length (m)		4847	1312	218	2717
Total Area (m^2)		14766	25124	1703	5705
Pond/pool habitat (m^2)		430	4719	No functional pools in this reach	46670
Average Slope (%)		2.6	2.1	2.3	1.2
Channel Width (m)		5.5	29.13	13.53	4.88
Wetted Width (m)		3.2	19.2	7.81	2.1
Average Pool Depth (m)		0.75	0.3	0.2	0.32
Stream Cover	Dominant	Overhanging vegetation	Boulders	Instream vegetation	Boulders
	Sub-dominant	Small woody debris	Small and large woody debris	Overhanging vegetation and boulders	Undercut banks and overhanging vegetation
Total Cover (%)		25	8	12	12
Crown Closure (%)		0	0	0	0
Left Bank Shape		Undercut	Sloping	Sloping	Undercut and vertical
Right Bank Shape		Undercut	Sloping	Sloping	Undercut, vertical and sloping
Riparian Vegetation	LB/RB	Grass and shrubs (both banks)	Grass and shrubs (both banks)	Grass, shrub and conifer/ grass and shrub	Grass, shrub and wetland spp./grass and shrub
Bank Texture	LB/RB	Fines and gravels/ fines, gravel and cobble	Cobbles and boulders (both banks)	Gravel/ gravel, cobbles and boulder	Fines and gravel/ fines, gravel, cobbles and boulder
Bed Material	Dominant	Fines	Boulders	Gravel	Cobble
	Sub-dominant	Gravel	Cobble	Cobble/Boulder	Boulders/Gravel
Stream Pattern		Irregular with some meandering	Sinuous	Sinuous	Irregular wandering
Stream Confinement		Occasionally confined	Occasionally confined	Occasionally confined	Occasionally confined



REACH 1

Length (2D) : 4847.2 m
Length (3D) : 4852.8 m
Total Area (3d): 14,766 m^2
Average (wetted) Width : 3.2 m
Average channel Width: 5.5 m
Elevations: from 1324 m to 1222 m
Number of pools/lakes: 1

REACH 2

Length (2D) : 1308.5 m
Length (3D) :1312.1 m
Total Area (3d): 25, 211 m^2
Average (wetted) Width : 19.2 m
Average Channel Width: 29.1 m
Elevations: from 1353 m to 1324 m
Number of pools/lakes: 1

REACH 3

Length (2D) : 218.1 m
Length (3D) : 218.8 m
Total Area (3d): 1,709 m^2
Average (wetted) Width : 7.8 m
Average Channel Width: 13.5 m
Elevations: from 1357 m to 1353 m
Number of pools/lakes: 0

REACH 4

Length (2D) : 2716.7 m
Length (3D) : 2718.7 m
Total Area (3d): 5,709 m^2
Average (wetted) Width : 2.1 m
Average Channel Width: 4.9 m
Elevations: from 1390 m to 1357 m
Number of pools/lakes: 12

- Reach Break
- Geona Creek
- Other watercourse
- Contour (20 m interval)
- Tote Road/Proposed Access Road
- Proposed Mine Road
- Diversion Ditch
- Pipeline
- Location of Proposed Mine Infrastructure
- Waterbody

Reach characteristics from field observations or from 2015 LiDAR data analysis (with the exception of for reach 1, for which LiDAR data was not available and so lenghts and heights taken from CANVEC data (50k)
Datum: NAD 83; Projection: UTM Zone 9N

AEG

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FIGURE 3-5

GEONA CREEK REACH CHARACTERIZATION

FEBRUARY 2017

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3.2.2.3 Overwintering Potential and Fish Habitat Quality

Table 3-4 summarizes February and March habitat sampling results for overwintering fish habitat potential. It includes dissolved oxygen (DO) and depth of water under the ice in each of the ponds sampled or flow rate at creek sampling sites. Additional water chemistry (pH, conductivity, temperature, ORP) and observational notes are appended (Appendix C).

Table 3-4: Dissolved Oxygen Levels and Water Depth or Flow Rate at Sampling Sites in Geona Creek Watershed and South Lake during February and March 2016

Pond ID or Creek Sampling Site	Dissolved Oxygen (mg/l)		Water Depth (m) under Ice or Flow Rate (l/s)	
	February	March	February	March
4-6	0.3	0.3	NS	<0.1 m
4-4	6.1	0.5	0.15 m	minimal
4-1	No water	6.3	0.2 m	<0.2 m
2-1	NS	No water	No water found – over-flow	0
KZ-2	10.4	10.1	4.5 l/s	3.1 l/s
KZ-7	10.1	10.0	29.8 l/s	15.9 l/s
KZ-9	10.1	9.6	40.6 l/s	26.0 l/s
South Lake	NS	3.22	NS	3.0 m

NS = not sampled

Minimal water was encountered in the ponds in upper Geona Creek during sampling in February and March 2016. Of the 3 to 5 holes drilled on each pond water was encountered usually in only one of the holes. Water under the ice in the upper Geona Ponds where sampled, was noted to be high in organics (per visual observations) and low in DO. DO levels in both Fault Creek (KZ-2) and Geona Creek (KZ-7, KZ-9), however, remained relatively high throughout the winter, although flow decreased substantially from February to March (Table 3-4). The upper pond in the South Lake system (Figure 3-3) was also sampled in March and had 3.0 m of water depth below the ice and a DO of 3.22 mg/L (Table 3-4).

Arctic grayling require ponds or pools that do not freeze to the bottom for overwintering habitat. Further, the ponds or pools need to maintain a minimal level of DO in order to provide usable fish habitat throughout the winter. If DO falls below 1.5 mg/l in a waterbody (as is the case for some of the ponds in upper Geona), it is not likely able to sustain fish species such as Arctic grayling throughout the winter (Stewart *et al.* 2007). The shallow ponds in Geona Creek contain organics which consumes oxygen. During winter months when the ponds are ice covered the oxygen consumed is not readily replaced except through inflow. Although Geona Creek flowing water maintained DO concentrations high enough to sustain overwintering fish populations during February and March (Table 3-4) it may not provide enough flow volume to maintain suitable DO levels for fish in the ponds of upper Geona Creek. Additionally, the shallow ponds in the system freeze almost to the bottom and thus provide very limited aquatic habitat for fish to reside.

Based on investigations to date upper Geona Creek provides marginal to no overwintering habitat for Arctic grayling which is the only species of fish found residing in the creek during the open water season. Arctic grayling are known to migrate from upstream areas of creeks down to their wintering habitat which is typically found in larger creeks and rivers that possess deep pools and do not freeze to the bottom during the winter months (Hubert et al, 1985). Adult Arctic grayling in the Geona Creek system would likely move into Finlayson Creek or even further downstream into the Finlayson River during winter months however some if not all of them may be prevented from moving out of lower Geona due to the large beaver dam situated near its mouth. The beaver dam structure is also likely a barrier to fish moving upstream into Geona creek. Therefore, the adult grayling that have been observed in the system and found to spawn must overwinter successfully somewhere in the system. It is suspected that this is occurring in the beaver pond that has resulted from the dam. Additional characterization of overwintering habitat will be conducted throughout the winter of 2016-17 which will provide further insight regarding overwintering potential and use of Geona Creek.

The results of the 2015-2016 fish and fish habitat baseline studies for Fault Creek and Geona Creek as it relates to fish habitat characterization are summarized below. Habitat quality is described by reach for Geona Creek. Further, habitat value is mainly considered as it applies to Arctic grayling as it was the only species captured in the Geona Creek watershed with the exception of one slimy sculpin that was caught near the confluence of Geona Creek and Finlayson Creek.

Fault Creek

Results of the 2015 to 2016 baseline fish and fish habitat assessment indicate that Fault Creek provides no habitat for fish during any time of the year. The lack of overwintering habitat, high gradient profile, lack of pools and poor quality substrate within the stream likely deters fish movement into Fault Creek. This assumption is further supported by the fact that no fish were caught or observed during surveys conducted in June and August of 2015, despite significant effort.

Geona Creek

Stream conditions within Reach 1 provide suitable habitat for juvenile Arctic grayling rearing; and marginal habitat for spawning. Substrate conditions within this reach are not ideal for Arctic grayling spawning and are composed primarily of fine sediments rather than the preferred gravels, however grayling are known to spawn in lower quality habitat if nothing else is available (Hubert et al, 1985). Juveniles may find refuge within deeper pools of the reach, although it is unlikely used for overwintering based on results of overwintering habitat potential investigations. Beaver dams within the system, including one situated at its confluence with Finlayson Creek likely limits fish movement into and within the creek.

Further upstream in Reach 2, the creek channel width increases significantly (up to 6x) and as a result water depth within the creek is reduced. This loss in depth inhibits the development of pool habitat. Within the reach however, beaver ponds provide rearing habitat for juveniles and adults during the open water season but overwintering habitat potential is low. Substrate conditions for spawning are

not ideal within Reach 2 as the dominant substrate is cobble; however, there are some interspersed pockets of gravel substrates found as interstitial material within this reach. There is a significant amount of moss cover on the stream bed within Reach 2, which reduces spawning habitat potential.

In Reach 3 channel width decreases and the bed material transitions from a cobble-dominated substrate to a gravel-dominated substrate. Spawning potential within this reach for grayling appears moderate; however, similar to Reach 2 there is a significant amount of moss cover on the stream bed which may deter spawning in certain areas. Pool occurrence within Reach 3 is low and the pools that are found within the reach are generally less than 1 m in depth.

Within Reach 4, the substrate within the channel is composed primarily of cobbles and gravel which would provide potential spawning habitat for grayling. Additionally, large boulders can be found intermittently in the channelized portion of this reach which provide some cover as well as pool habitat that could be used by Arctic grayling.

No slimy sculpin have been captured in Geona Creek above its confluence area with Finlayson Creek. It is suspected that sculpins in recent years are isolated from Geona Creek as a result of beaver activity in the Creek just upstream of its confluence. Further, as sculpins tend to have high site fidelity and limited instream movements (Arciszewski et al., 2004), the absence of sculpins in Geona Creek supports the findings that conditions for overwintering potential in Geona Creek are limited.

Although specific comparison of Geona Creek channel characteristics between the 2015 results and historical data (from 1995) cannot be made due to different sampling locations and changes in physical habitat over time, general fish habitat quality descriptions appear similar.

3.2.2.4 Arctic Grayling Spawning Assessment

Two spawning adults were observed on three occasions (May 17, 22 and 30, 2016) at the same location between the second and third ponds at the top of the Geona Creek watershed, immediately south of the deposit area. Given the amount of time between assessments and the fact that two intermediate spot checks did not record the presence of any fish, it is doubtful that the same individuals were observed on all three surveys. A site visit on June 2 did not observe the presence of any individuals (BMC, 2016).

A survey on May 18, 2016 of the main stem of Geona Creek from approximately kilometre 20.5 (Tote Road) upstream to the deposit area (approximately 3 km), detected six adult Arctic grayling in one location only. These six adults were found in marginal spawning habitat, immediately downstream of a large beaver impoundment. It is not known if these fish were spawning or simply holding, because the impoundment appeared to create a barrier to fish passage. An Arctic grayling spawning survey at the confluence of Geona and Finlayson Creeks was completed on May 24, without the observation of any fish. There was a 3 m high active beaver impoundment located approximately 200 m upstream of the confluence on Geona Creek, which posed a complete barrier to fish passage. A May 30, 2016 spawning assessment of Finlayson Creek, upstream of the confluence of Geona Creek,

did not observe the presence of any fish. However, it should be noted that Finlayson Creek is a fairly large system (> 3 m wide in some locations) and it is highly probable that fish could have been missed during the shoreline visual assessment (BMC, 2016).

A total of 12 adult Arctic grayling were observed throughout the two-week study period on Geona and Finlayson Creeks during the 2016 spawning assessment. Only one location (between the second and third ponds downstream from the deposit), could be confirmed supporting spawning adults, as the other six individuals were observed downstream (approximately 30 m) of a beaver dam that appeared to be a complete barrier to fish passage.

The presence of a 3 m high active beaver impoundment near the confluence of Geona Creek with Finlayson Creek posed a complete barrier to fish passage. Therefore, it is probable that all adult grayling observed in Geona Creek, must be a small resident population that over winters somewhere in the system. There is a noticeable lack of quality Arctic grayling spawning habitat throughout the upper reaches of Geona Creek, and it could be hypothesized that even with adequate fish passage, Arctic grayling spawning use would be limited (BMC, 2016).

4 AQUATIC ECOSYSTEMS

Biological communities of aquatic ecosystems are comprised of microscopic species such as zooplankton and phytoplankton, and larger invertebrates including benthic invertebrates and vertebrates such as fish. These biological communities not only interact in complex ways with each other, but with abiotic factors including water quantity, water quality, and sediment quality. Monitoring both the abiotic and biotic components of an ecosystem play a pivotal role when developing a strategy to manage aquatic resources. Long-term monitoring provides the data needed to determine trends and support the development of predictive models that can be used to make informed decisions (SADC, 2011).

Aquatic resource investigations at the Project were undertaken in 1996 by Cominco as part of the IEE, and also by Laberge & Can-Nic-A-Nick to fulfill Water Licence Requirements in 2002, 2004, 2006, 2008, 2010, 2012, and 2014. The sections below summarize previous work conducted in the project area and the work conducted by AEG in 2015. The investigations conducted in 2015 and 2016 were undertaken to acquire information that will be used in environmental effects assessment and also for permitting requirements.

4.1 STREAM SEDIMENTS

Incremental fine sediment loading within a stream is known to potentially affect both stream morphology and aquatic biota. Sediments may act as sinks or sources for trace pollutants, but are also important natural habitats for aquatic organisms. The effect that a sediment load has on the aquatic community depends on several factors, including the biological community and life stage in relation to sediment grain size, concentration, and transport method. Sediment monitoring is integral to assess the ecological status of a water body, as it allows for the detection of toxic constituents such as heavy metals and aids in controlling their fate and effect on that system (Reuther n.d.; Rex and Carmichael, 2002).

4.1.1 Historical Studies and Existing Information

Stream sediments were collected in 1994 and 1995 by Cominco as part of the baseline environmental and socio-economic studies for the Project in support of the IEE. In addition, Environment Canada's Environmental Protection Branch collected sediment samples in 1995. After regulatory approvals were received in 1999 (Water Licence QZ97-026), subsequent baseline studies including stream sediments have been conducted every two years since 2000 to meet the requirements of the Water Licence.

4.1.1.1 Methods

Stream bed sediment samples were collected by Cominco from eight sites in the area of the ore body (ABM Deposit) in July 1994, and included sites in Geona Creek, its tributaries and South Creek. In September 1995 sediment samples were collected from six sites, including three sites in Geona Creek,

two in South Creek and one in East Creek. The 1995 samples were collected in triplicate. The 1994 samples were analyzed for metals. The 1995 samples were screened (by sieving), and the fraction less than 53 µm was analyzed by Zenon for metals, total organic carbon, and acid volatile sulphide. The particle size distributions were also reported (Cominco, 1996). Starting in 2002, the following seven sites (see Figure 3-1) were sampled for stream sediments every two years, following a consistent methodology:

- KZ-7: Geona Creek, 100 m downstream of the proposed polishing pond location;
- KZ-9: Geona Creek, downstream of KZ-7;
- KZ-15: Finlayson Creek, 100 m downstream of confluence with Geona Creek;
- KZ-16: Finlayson Creek, upstream of confluence with Geona Creek, at Tote road. This site serves as a reference site;
- KZ-21: East Creek just above confluence with Finlayson Creek;
- KZ-26: Finlayson Creek, just above confluence with Finlayson River, at Robert Campbell Highway; and
- KZ-27: North River below upper North Lake and upstream of South Lake.

Triplicate sediment samples were collected from each site. Sample sites were selected from areas of deposition along the stream bank within the wetted width, generally characterized by the finest grain size evident at the site (Laberge & Can-Nic-A-Nick, 2015).

Samples were collected with a stainless steel or Teflon trowel and placed in zip-lock plastic bags. At the lab the samples were dried and passed through a series of seven sieves with mesh sizes 2.0 mm, 850 µm, 425 µm, 250 µm, 150 µm, 106µm and 53 µm with the percent that remained on the sieve reported. The finest portion of the material was analyzed for metals by an ICP scan and for total organic carbon (Laberge & Can- Nic- A-Nick, 2015).

4.1.1.2 Results

Results for selected metals and sites are summarized below, while more details are presented in the IEE and annual reports. The following metals were chosen for closer analysis due to their potential toxicity to aquatic systems: arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), selenium (Se), and zinc (Zn), some of which are present in the mineral deposit.

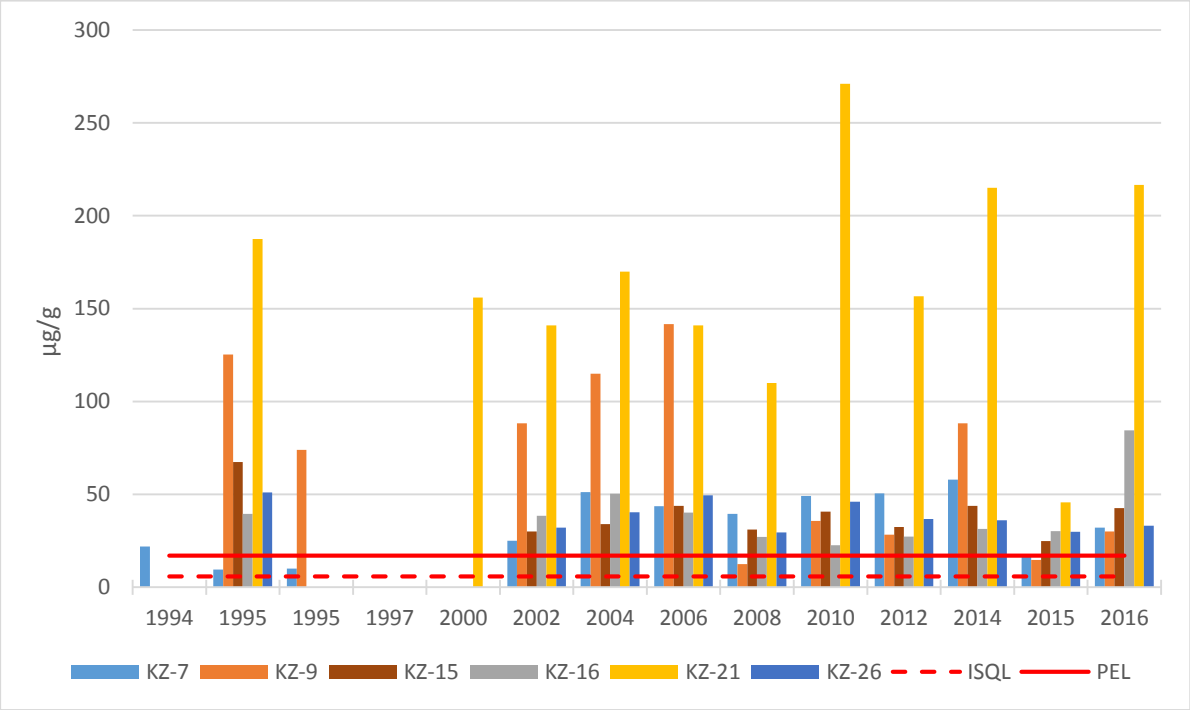
The mean concentrations of these metals are compared to the CCME (1999) interim freshwater sediment quality guidelines (ISQG), and to the probable effects levels (PEL). Generally, concentrations greater than the PEL have a 50% incidence of creating adverse biological effects. No guidelines have been developed for selenium (Laberge & Can-Nic-A-Nick, 2015).

Figures 4-1 to 4-7 present these results. Note that results from 2015 and 2016 were included in the graphs for a visual comparison but a more detailed discussion of those results is presented in section 4.1.2.

The two summaries below were provided by Laberge & Can-Nic-A-Nick, 2015, regarding results up to 2014.

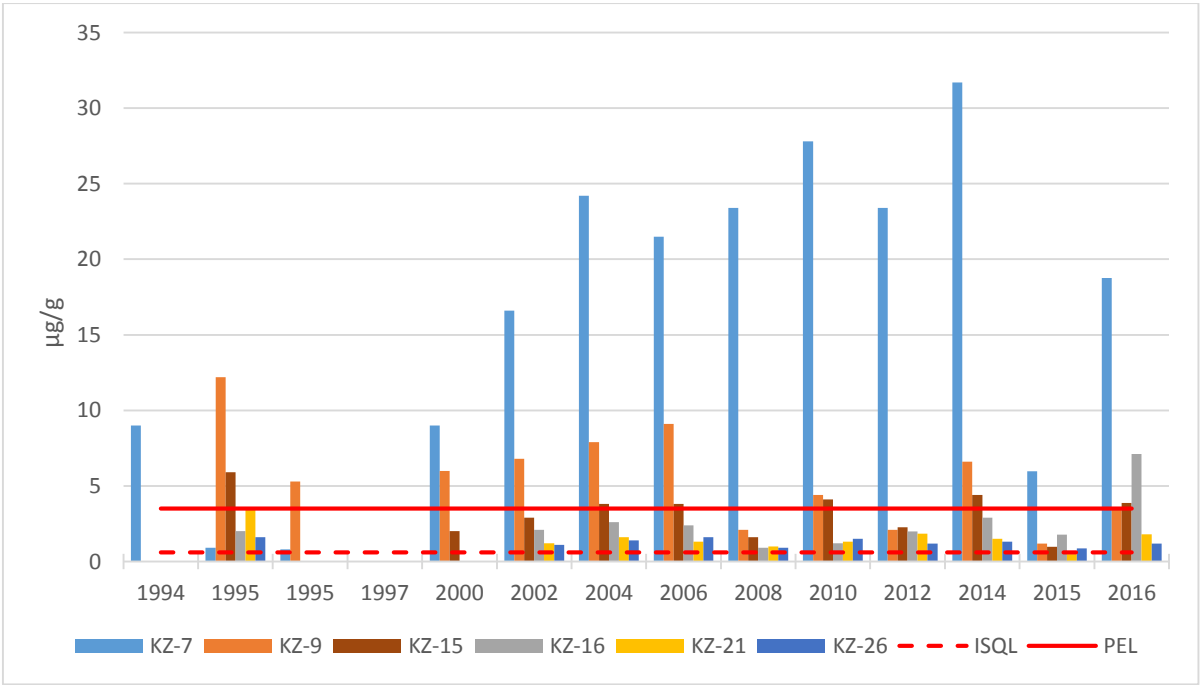
Detected concentrations of the selected metals did not fluctuate significantly over time at most of the sites until 2006, where much greater concentrations of copper and lead were recorded in the stream sediments in Geona Creek and in Finlayson Creek. Up until 2006, copper concentrations had been low throughout the study area. An extremely high concentration of copper was recorded in the stream sediments at the background site on Finlayson Creek, KZ-16, in 2006. The increase was not quite as dramatic for lead, however very high concentrations were recorded at KZ-16 and also at KZ-7 in 2006. These high concentrations were not duplicated during the following sampling periods. Levels of copper have exceeded the PEL at some of the sites since, but concentrations were significantly lower than in 2006. The highest concentrations of several of the selected metals occurred in the sediments at KZ-7, Geona Creek near the ore body.

Cadmium and zinc concentrations have increased over the past decade at KZ-7, although there has been no disturbance at the site. Arsenic concentrations are considerably higher at East Creek, KZ-21. The concentrations of arsenic in the stream sediments at KZ-9 were greater in the earlier years than recently. This coincides with a change in its sampling location in 2008, when the original site was flooded by beaver activity and the site was moved further downstream. Anomalously high copper readings were documented at several of the sites in 2006. These levels have not been duplicated.



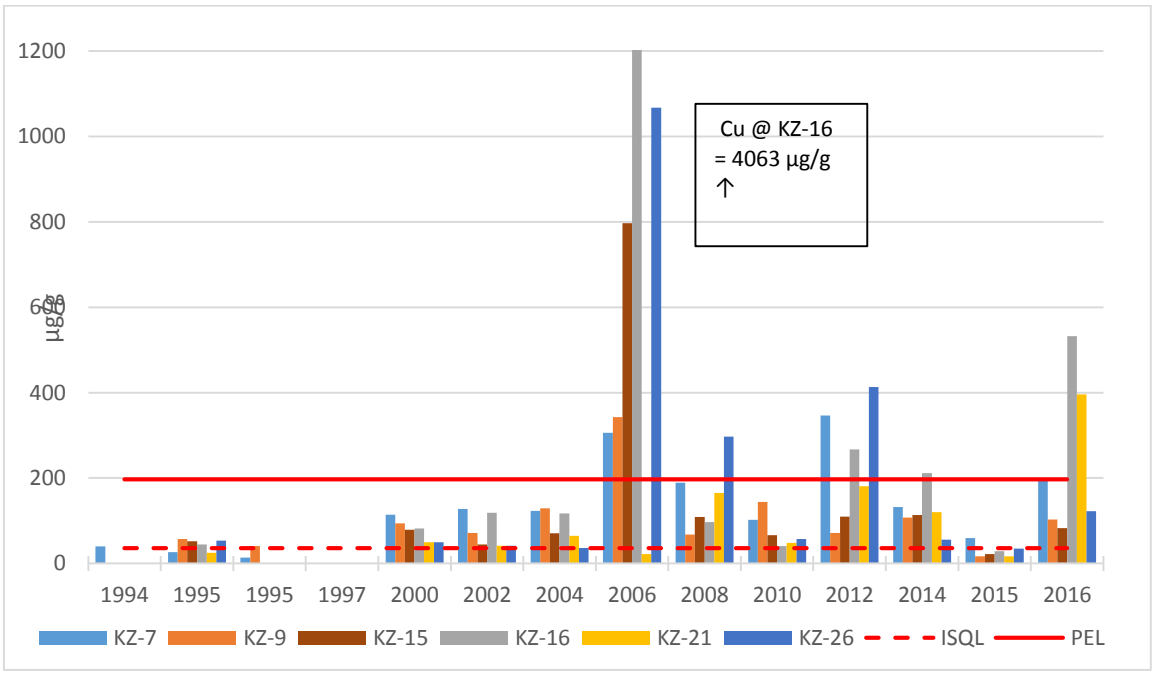
ISQG = Interim Sediment Quality Guideline PEL = Probable Effect Level

Figure 4-1: Arsenic Concentrations in Stream Sediments, 1994-2016



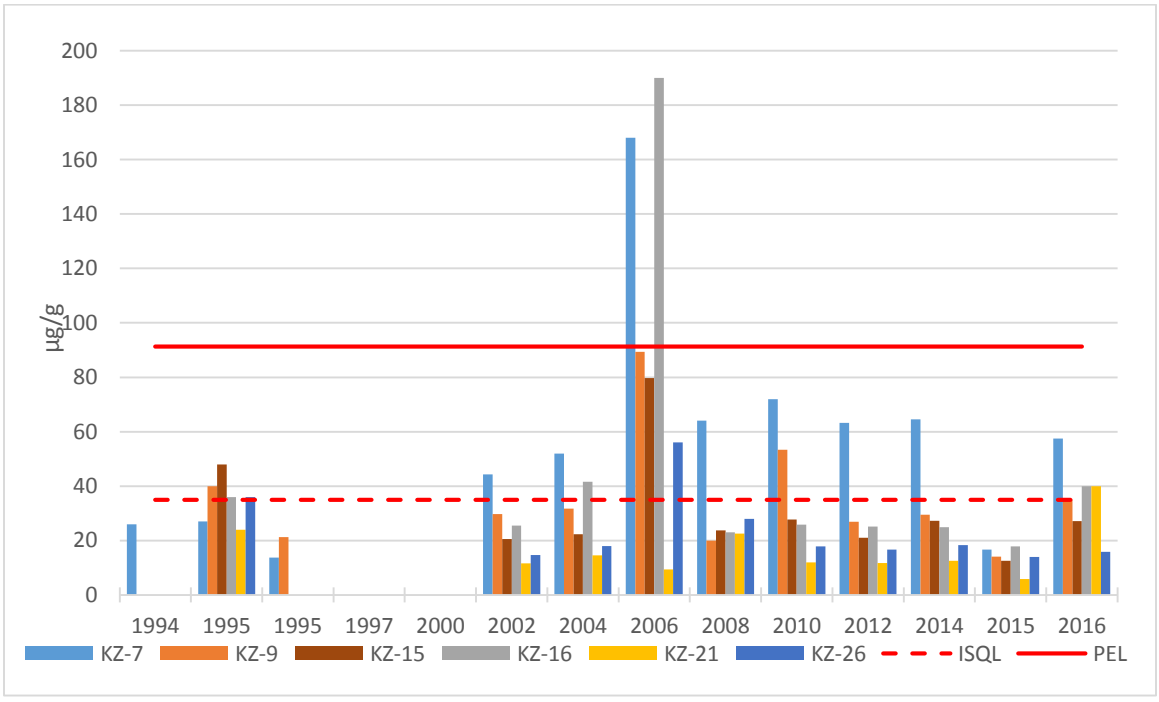
ISQG = Interim Sediment Quality Guideline PEL = Probable Effect Level

Figure 4-2: Cadmium Concentrations in Stream Sediments, 1994-2016



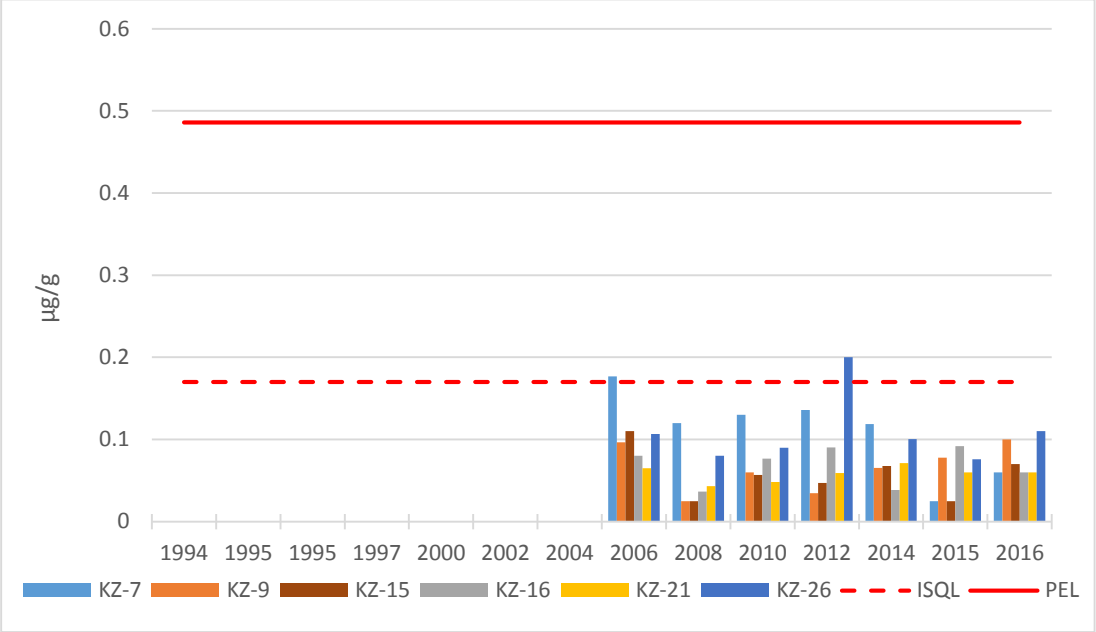
*ISQG = Interim Sediment Quality Guideline PEL = Probable Effect Level

Figure 4-3: Copper Concentration in Stream Sediments, 1994-2016



*ISQG = Interim Sediment Quality Guideline PEL = Probable Effect Level

Figure 4-4: Lead Concentrations in Stream Sediments, 1994-2016



*ISQG = Interim Sediment Quality Guideline PEL = Probable Effect Level
** Average calculated using ½ RDL when results <RDL

Figure 4-5: Mercury Concentrations in Stream Sediments, 1994-2016

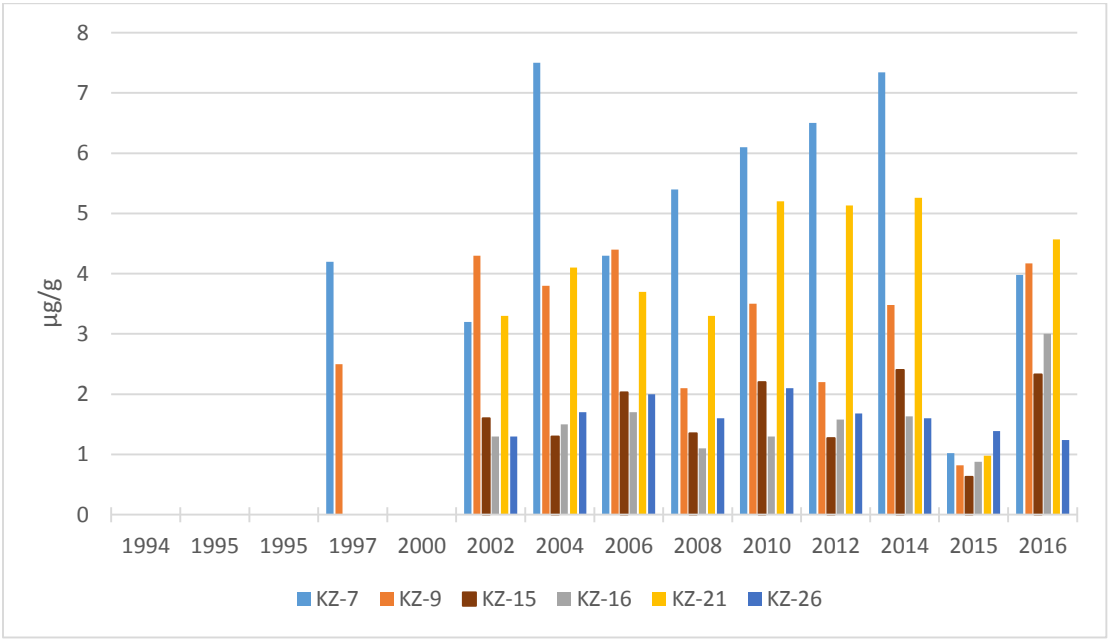
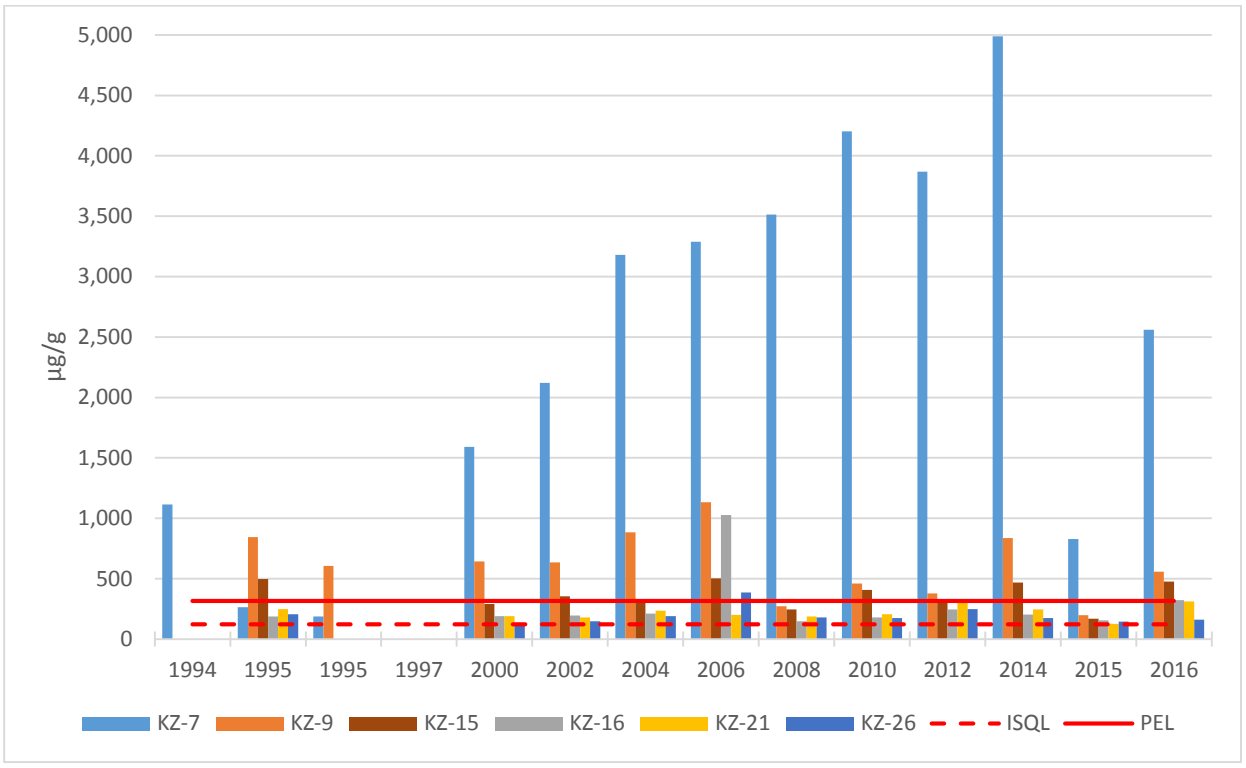


Figure 4-6: Selenium Concentrations in Stream Sediments, 1994-2016



**ISQG = Interim Sediment Quality Guideline* *PEL = Probable Effect Level*

Figure 4-7: Zinc Concentrations in Stream Sediments, 1994-2016

Note that selenium, zinc, and to a lesser extent, cadmium have displayed an increasing trend at station KZ-26 from 2000 to 2015. The reason for that trend is unknown but there might be an influence from the highway (e.g., runoff, increased bank erosion, culvert, etc.) as sampling during these events at KZ-26 was conducted downstream of the highway and the culvert. Since the sampling stations located upstream on Geona Creek do not display a similar trend, it can be concluded that it is a localized effect.

The 2015 metal in sediment results returned generally lower concentrations when compared with previous monitoring events, and is likely linked to the fact that grain size distribution was towards larger particles in 2015 (see section 4.1.2.2). In the case of KZ-26, the fact that samples were collected upstream of the culvert rather than downstream as was done historically could also explain the lower values if there were an influence from the highway in historical results. Further, the 2016 metal in sediment results were generally consistent with historical results from previous monitoring events.

Stream bed sediment particle size distribution is determined by water velocity and influences the type and quality of habitat available for aquatic organisms. Particle size distribution data were available for the years 2006, 2008, 2010, 2014, and 2016 and average results are presented in Figure 4-8.

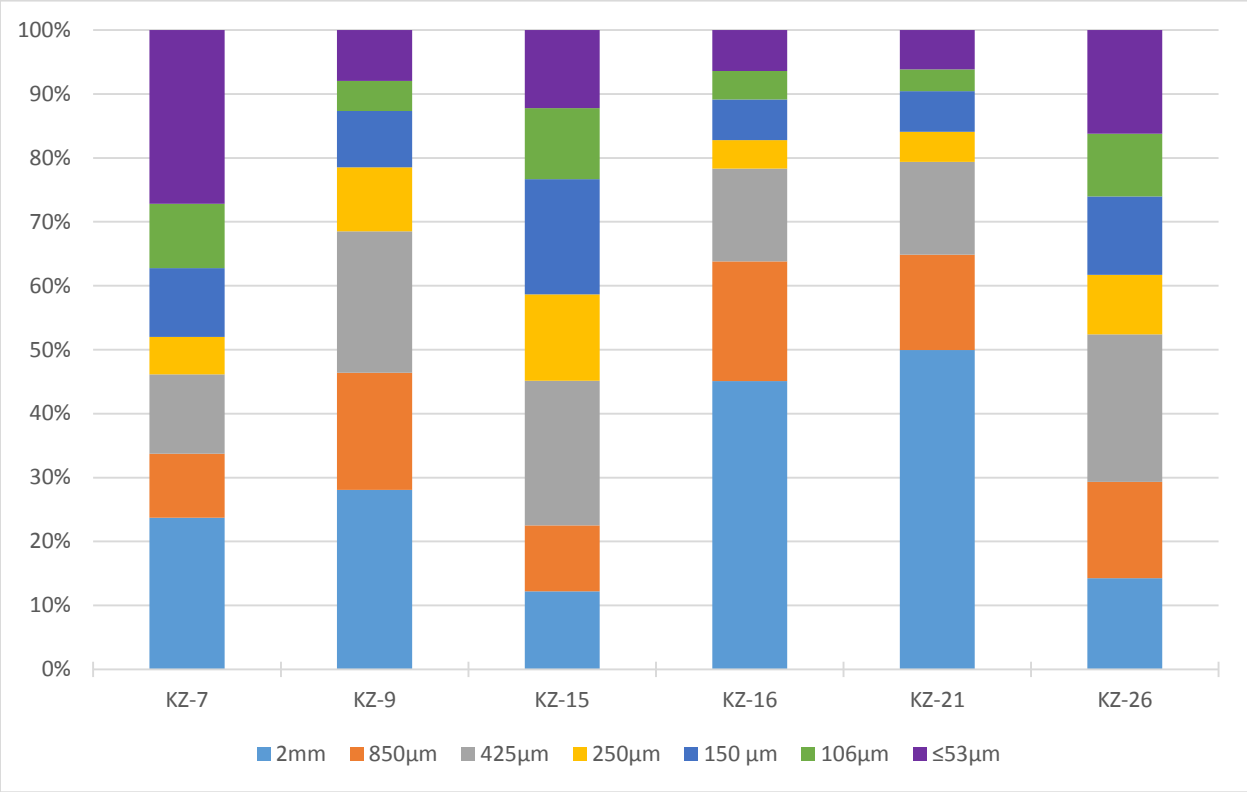


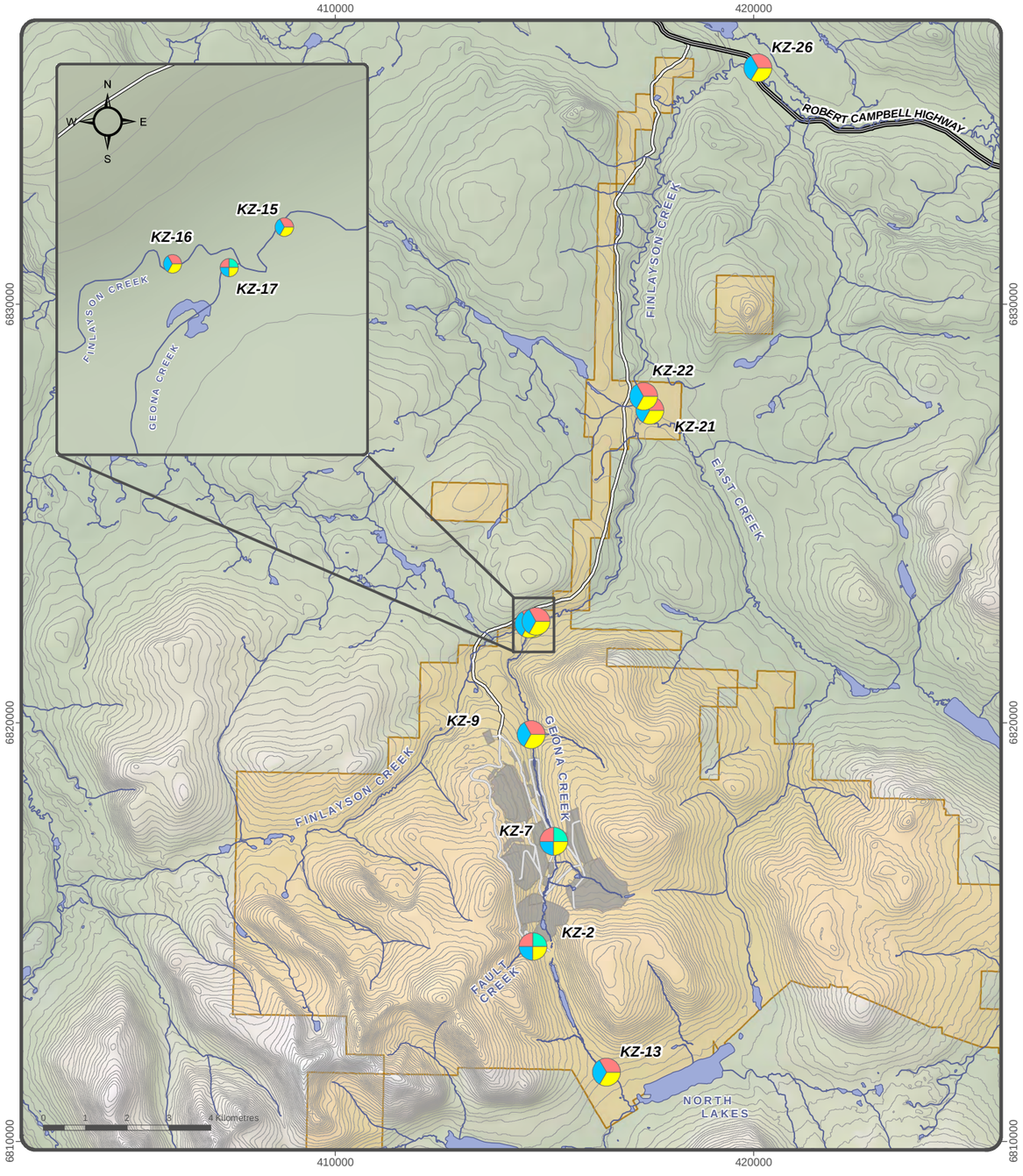
Figure 4-8: Average Fractional Components of Stream Sediments, 2006-2016

The dominant size class at each site was more or less consistent over time, and variations can possibly be attributed to the exact sampling location chosen at each sampling event. It cannot be excluded that changes in the channel morphology or flow pattern, due to beaver activity for example, may have caused some changes in dominant particle size class as well. Overall, the averages shown in Figure 4-8 are deemed representative of conditions over the 2006 to 2016 period.

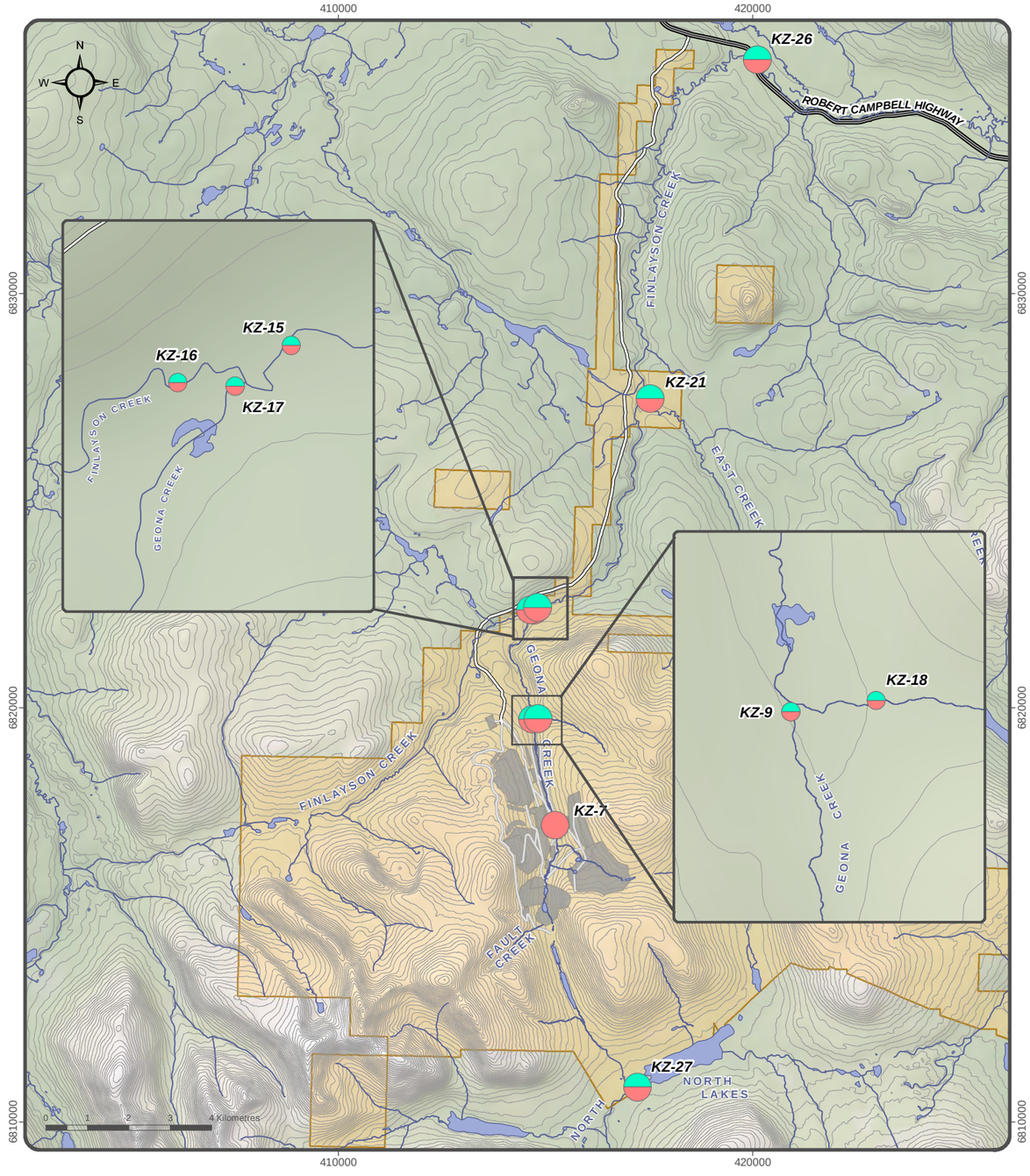
4.1.2 2015 and 2016 Studies

Stream sediments were collected on Finlayson Creek, Geona Creek and Fault Creek at sites KZ-2, KZ-7, KZ-9, KZ-13, KZ-15, KZ-16, KZ-17, KZ-21, KZ-22, and KZ-26 on September 9, 10 and 11, 2015. In October 2016 locations sampled for stream sediments included: KZ-7, KZ-9, KZ-15, KZ-16, KZ-17, KZ-18, KZ-21, KZ -26 and KZ-27. Figure 4-9 illustrates each of the sampling locations. Stream sediments were collected to satisfy monitoring requirements of Water Use Licence QZ97-026 but also to gain information that will aid in environmental effects assessment and permitting for the Project.

2015 AQUATIC RESOURCE SAMPLING LOCATIONS



2016 AQUATIC RESOURCE SAMPLING LOCATIONS



Datum: NAD 83; Map Projection: UTM Zone 9N

AEG

AQUATIC RESOURCE MONITORING LOCATIONS

- Benthic Invertabrates
- Stream Sediment
- Chlorophyll A
- Periphyton

- Location of Proposed Mine Infrastructure
- BMC Minerals (No. 1) Ltd. Claim Areas

- Tote Road/Proposed Access Road
- Proposed Mine Road
- Contour (40 m interval)

BMC MINERALS

KUDZ ZE KAYAH PROJECT

AQUATIC ECOSYSTEMS AND RESOURCES BASELINE REPORT

FIGURE 4-9
2015/2016 AQUATIC RESOURCE SAMPLING LOCATIONS

JANUARY 2017

D:\Project\AllProjects\Kudz_Ze_Kayah\Maps\03_Study\Aquatic\Sediment_Etc\Sed_Chlorophyl_Periphyton_Smpl_20161228.mxd (*Last edited by: amatlashevska;28/12/2016/11:07 AM*)

4.1.2.1 Methods

Sediment samples were collected in replicates of three from the active channel and placed directly into 250 ml glass jars using a stainless steel trowel. Immediately after collection, the sample containers were placed in a cooler, and were later placed in a refrigerator at approximately 4°C until they could be shipped in coolers with ice packs, to Maxxam Analytics in Burnaby, B.C. For each site, the lab used one of the three replicates for particle size analysis, one for metals and pH analysis and one was archived. Results were reported in units of µg/g on a dry weight basis. Chain of Custody forms accompanied all samples.

4.1.2.2 Results and Discussion

Stream sediment samples were analysed for 32 metals (see results in Appendix D), however only key metals that are potentially toxic to aquatic systems or for which interim freshwater sediment quality guidelines (ISQG) or probable effects levels (PEL) exist are presented for 2015 and 2016 in Table 4-1. The red cells in this table indicate concentrations that exceeded both the ISQG and PEL.

Table 4-1: Stream Sediment Metal Concentrations (µg/g), 2015 and 2016

Year	Total Arsenic (As)		Total Cadmium (Cd)		Total Chromium (Cr)		Total Copper (Cu)		Total Lead (Pb)		Total Mercury (Hg)		Total Selenium (Se)		Total Zinc (Zn)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
KZ-2	7.85	n/a	1.33	n/a	10.5	n/a	28.6	n/a	24.1	n/a	<0.050	n/a	0.58	n/a	335	n/a
KZ-7	16.4	32.03	5.96	18.77	28.3	48	59.4	197	16.6	57.53	<0.050	0.06	1.02	3.98	827	2560
KZ-9	14.7	30	1.19	3.51	23.1	51.1	16.6	102.8	14.1	4.17	0.078	0.1	0.82	4.17	198	557
KZ-13	5.55	n/a	0.223	n/a	23	n/a	12.2	n/a	9.27	n/a	0.074	n/a	<0.50	n/a	99.8	n/a
KZ-15	24.8	42.7	0.974	3.88	30.1	54.2	21.9	82.77	12.5	2.33	<0.050	0.07	0.63	2.33	168	474.7
KZ-16	30.2	84.43	1.77	7.12	29.9	39	28.5	532.3	17.8	3	0.092	0.06	0.88	3	154	321.3
KZ-17	33.7	39.8	1.92	3.46	38.5	58.7	31.3	116.5	16.4	1.56	<0.050	0.06	1.41	1.56	293	388.7
KZ-26	29.8	33.2	0.874	1.18	35.6	37.5	34.6	122.2	13.9	15.8	0.076	0.11	1.39	1.24	145	160.7
KZ-21	45.7	216.7	0.491	1.79	25.9	55.7	16.5	396	5.8	5.8	0.06	0.06	0.98	4.57	125	312
KZ-22	26.4	n/a	0.669	n/a	24.3	n/a	17.5	n/a	7.06	n/a	<0.050	n/a	<0.50	n/a	96	n/a
KZ-27	n/a	9.63	n/a	1.62	n/a	62.8	n/a	112.07	n/a	17.1	n/a	0.09	n/a	1.82	n/a	162.67
KZ-18	n/a	60.17	n/a	7.98	n/a	50.3	n/a	444	n/a	40.83	n/a	0.06	n/a	3.65	n/a	487
ISQL (CCME, 1999)	5.9		0.6		37.3		35.7		35		0.17		n/a		123	
PEL (CCME, 1999)	17		3.5		90		197		91.3		0.486		n/a		315	

**Text in red indicate exceedance of the ISQL, text in red shaded cell indicate exceedance of the PEL,*
n/a indicate no sample was taken at this location in 2015 or 2016

Arsenic levels are high throughout the study area, except in South Creek (KZ-13) in 2015. Concentrations exceed the PEL in Finlayson Creek at KZ-15, KZ-16, KZ-26 and KZ-22 in 2015 and at KZ-15, KZ-16, and KZ-26 in 2016. In Geona Creek the PEL is exceeded at KZ-17 in 2015, and at KZ-7, KZ-9 and KZ-17 in 2016. Both 2015 and 2016 saw an exceedance of the PEL at East Creek (KZ-21). Additionally, in 2016 the PEL was exceeded for arsenic in the North River (KZ-27) and in an unnamed tributary of Geona Creek (KZ-18), which is drains into Geona Creek just below the KZ-9 hydrometric station.

Cadmium levels are also elevated throughout the project area, except in South Creek (KZ-13) and East Creek (KZ-21) in 2015. The PEL was exceeded in Geona Creek at KZ-7 in 2015 and at KZ-7 and KZ-9 in 2016. PEL exceedances were also observed in Finlayson Creek at KZ-15 and KZ-16, which did not occur in 2015. Concentrations also exceeded the PEL in an unnamed tributary of Geona Creek (KZ-18).

Chromium levels were generally below the ISQL in 2015, with the exception of Geona Creek at the mouth (KZ-17). In 2016, ISQL exceedances for chromium were noted in Geona Creek (KZ-7, KZ-9 and KZ-17), Finlayson Creek (KZ-15, KZ-16 and KZ-26) North River, and an unnamed tributary of Geona Creek (KZ-18). There were no exceedances of the PEL for chromium in both 2015 and 2016. Copper levels were generally below the ISQL in 2015 with the exception of Geona Creek (KZ-7). In 2016, the PEL for copper was exceeded in Finlayson Creek (KZ-16), East Creek (KZ-21) and in an unnamed tributary of Geona Creek (KZ-18).

Lead concentrations in 2015 indicated no exceedances of the ISQL. In 2016, exceedances were observed in Geona Creek (KZ-7) and in an unnamed tributary of Geona Creek (KZ-18). No exceedences of both the ISQL and PEL for Mercury were observed in 2015 or 2016.

In 2015, zinc was elevated above the PEL within Fault Creek (KZ- 2) and upper Geona Creek (KZ-7). The 2016 results indicate exceedance of the PEL in Geona Creek (KZ-7, KZ-9 and KZ-17), Finlayson Creek (KZ 15 and KZ-16) and in an unnamed tributary of Geona Creek (KZ-18). Although observed metal concentrations were generally lower in 2015 than historically for most parameters and the magnitude of exceedences was generally lower, the parameters showing exceedences are consistent with historical data and indicate that these drainages lies within naturally mineralized zones. Metal concentrations and magnitude of exceedances were generally higher in 2016 when compared to 2015, which may be attributed to higher discharge rates that were experienced in the months prior to sampling.

Particle size analysis results from 2015 and 2016 are presented in Table 4-2 and are shown Figure 4-10 and Figure 4-11 below.

Table 4-2: Fractional Components of Stream Sediments, 2015 and 2016

Year	KZ-2	KZ-7		KZ-9		KZ-13	KZ-15		KZ-16		KZ-17		KZ-26		KZ-21		KZ-22	KZ-18	KZ-27
	2015	2015	2016	2015	2016	2015	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2016
2mm	43.2	27.07	54.4	71.77	11.1	66.94	30.09	1.9	32.37	65.3	52.65	50.7	66.31	0.8	22.75	80.7	14.75	58.30	3.30
850µm	28.22	41.05	18.6	3.12	8.6	4.3	40.16	8.4	39.47	10.2	18.46	13.3	12.03	3.9	58.26	9.1	66.05	12.80	7.00
425 µm	13.77	13.34	10.1	2.57	15.9	3.38	16.09	19.6	17.07	7.8	9.27	8	10.44	37.6	12.18	2.7	12.01	11.90	11.80
250 µm	7.29	5.91	2.8	3.93	12.1	5.34	7.52	9.9	7.18	3.6	6.47	3.1	4.51	13.2	3.46	1.1	3.51	4.40	1.00
150 µm	3.98	3.79	3.4	7.29	19.6	8.91	3.37	21.2	2.25	5	3.94	8.7	2.98	9.7	1.16	1.7	1.29	5.50	13.80
106 µm	1.36	1.92	2	3.87	11.3	4.44	1.05	13.7	0.52	2.4	1.58	6.7	1.46	6.5	0.38	1.1	0.51	2.10	9.40
0.053 µm	1.21	2.89	3.5	4.54	12.2	4.65	0.93	14.5	0.4	3	3.88	6	0.97	11.2	0.51	1.8	0.65	2.4	16.20
<0.053 µm	0.97	4.03	4.8	2.91	8.5	2.04	0.79	10.2	0.74	2.4	3.75	3.3	1.3	16.8	1.3	1.8	1.23	2.4	28.90

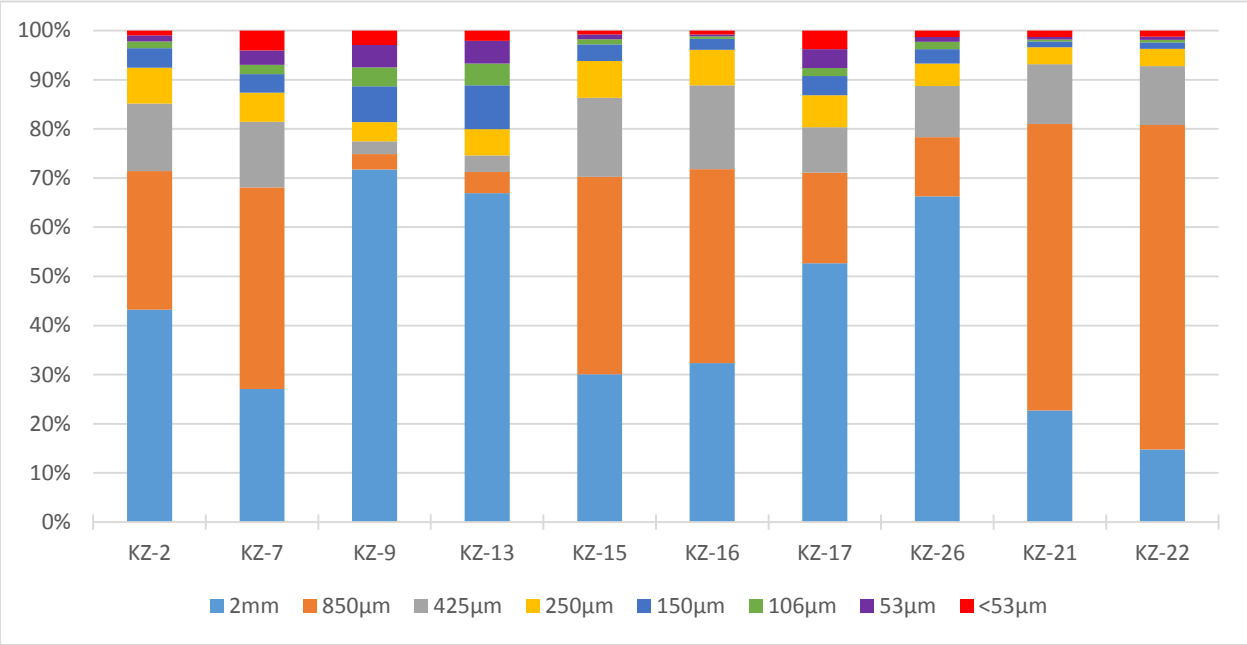


Figure 4-10: Fractional Components of Stream Sediments, 2015

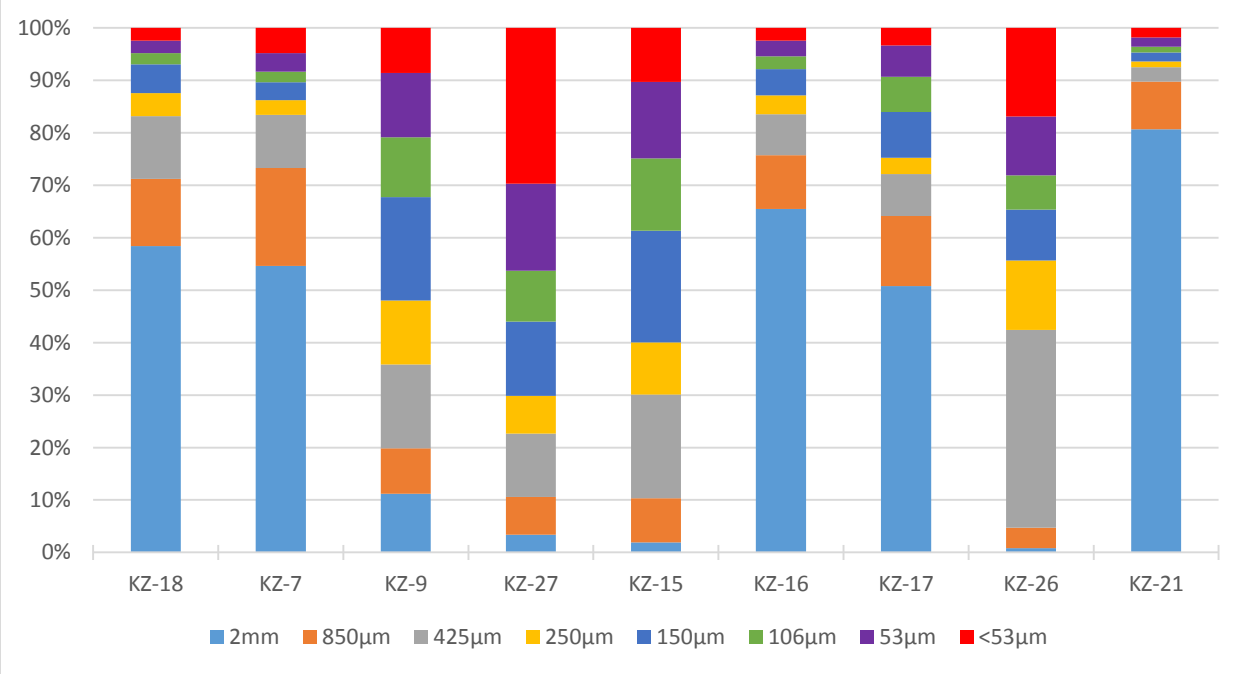


Figure 4-11: Fractional Components of Stream Sediments, 2016

Dominant class is towards larger particle sizes at all sites (i.e., either 2 mm or 850 µm). Historical data indicated dominance of smaller particle sizes at some sites (see Figure 4-8), while others had similar dominant size class. Differences could be attributable to a slightly different sampling location,

or to a temporary change in flow pattern that could have affected sediment transport (e.g., high precipitation event prior to sampling). Overall, fractional components of stream sediments appear to vary somewhat from year to year.

4.2 BENTHIC INVERTEBRATES

Benthic invertebrates are an integral component of aquatic ecosystems and provide valuable biological information to assess potential impacts of metal toxicity and nutrient enrichment on a system. Benthic invertebrate monitoring data is integral to environmental effects assessment as it provides the effect measurement to the assessment (i.e., the effect of the stressor on the biota). Further, it may detect effects on the aquatic ecosystem that cannot be measured with traditional physical-chemical monitoring such as changes in water quantity, presence of invasive species and habitat degradation (Environment Canada, 2012).

4.2.1 Historical Studies and Existing Information

Benthic invertebrate communities were surveyed and sampled in 1995 by Cominco as part of the baseline environmental and socio-economic studies for the Project in support of the IEE. After regulatory approvals were received in 1997 (IEE) and 1999 (Water Licence QZ97-026), subsequent baseline studies, including benthic invertebrates, have been conducted every two years since 2000 to meet the requirements of the water licence.

4.2.1.1 Community Composition Methods

Benthic invertebrates were collected from Geona Creek, Finlayson Creek, North River and East Creek during the baseline study in September 1995, and as a requirement of the water licence at sites KZ-9, KZ-15, KZ-16, KZ-17, KZ-21, KZ-26, and KZ-27. Five replicates were collected using a Waters Knapp sampler in 1995, triplicate samples were collected with a Hess sampler in 2000 and triplicate samples were collected with a Surber sampler in 2002, 2004, 2006, 2008, 2010, 2012, and 2014. Sampling efforts from 2002 through 2014 were very consistent, following standard methods and therefore provides comparative baseline data.

4.2.1.2 Community Composition Results

Key results presented below are excerpts from Laberge & Can-Nic-A-Nick (2015), while more details on each study can be found in the IEE and respective annual reports. Table 4-3 summarizes these results.

Table 4-3: Summary of Benthic Invertebrate Taxa and Density Data, 1995-2014

Site	Year	Avg # Taxa/Site	Density, #/m^2	Dominant Taxa
KZ-9	1995	34.2	162,886	Diptera
	2000	28.3	474,240	Diptera
	2002	33.3	250,549	Diptera
	2004	32.0	196,476	Diptera
	2006	37.5	15,710	Diptera & Plecoptera
	2008	34.7	6,437	Diptera
	2010	30.3	33,620	Diptera
	2012	44.0	7,488	Diptera
	2014	26.0	54,740	Diptera
KZ-15	1995	35.0	53,251	Diptera
	2000	24.7	29,140	Ephemeroptera
	2002	40.7	16,645	Diptera
	2004	40.7	64,646	Diptera
	2006	30.0	2,526	Diptera & Plecoptera
	2008	33.7	3,280	Plecoptera & Diptera
	2010	46.0	38,418	Diptera & Ephemeroptera
	2012	34.3	13,118	Diptera & Plecoptera
	2014	36.3	11,116	Ephemeroptera
KZ-16	1995	27.6	30,086	??
	2000	21.7	16,030	Ephemeroptera
	2002	35.0	5,784	Diptera
	2004	28.3	7,079	Diptera & Ephemeroptera
	2006	33.0	3,606	Diptera & Plecoptera
	2008	35.0	4,507	Diptera & Plecoptera
	2010	44.0	7,797	Diptera & Plecoptera
	2012	31.3	5,310	Diptera
	2014	31.3	15,181	Ephemeroptera & Diptera
KZ-17	1995	Not Done	Not Done	Not Done
	2000	23.7	83,400	Diptera
	2002	35.3	23,635	Diptera
	2004	32.3	129,820	Diptera
	2006	40.7	21,679	Diptera
	2008	32.3	14,966	Diptera

Site	Year	Avg # Taxa/Site	Density, #/m^2	Dominant Taxa
KZ-21	1995	38.0	74,577	??
	2000	25.0	219,700	Diptera
	2002	34.3	75,544	Diptera
	2004	32.0	222,027	Diptera
	2006	22.3	22,512	Diptera
	2008	32.0	17,097	Diptera
	2010	43.0	90,926	Diptera
	2012	39.0	16,118	Diptera
	2014	33.7	24,851	Diptera
KZ-26	1995	Not Done	Not Done	Not Done
	2000	28.7	97,490	Oligochaeta
	2002	31.7	12,232	Oligochaeta & Nematoda
	2004	33.7	18,859	Diptera & Oligochaeta
	2006	35.3	7,255	Oligochaeta & Diptera
	2008	36.3	9,444	Diptera
	2010	51.0	15,691	Diptera & Ephemeroptera
	2012	33.7	6,473	Oligochaeta & Diptera
	2014	39.0	11,195	Diptera
KZ-27	1995	31.2	118,080	Diptera
	2000	32.7	85,540	Diptera
	2002	38.0	90,409	Diptera
	2004	31.3	180,599	Diptera
	2006	37.7	45,658	Diptera
	2008	42.7	24,255	Diptera
	2010	42.3	37,391	Diptera
	2012	36.3	31,166	Diptera
	2014	30.0	34,736	Diptera

Source: Laberge & Can-Nic-A-Nick, 2015 (Table 10)

Densities have typically been lower at the Finlayson Creek sites than at the other sample locations, especially at the reference site KZ-16, upstream of the Geona Creek confluence. The study periods 2006, 2008 and 2012 had lower population numbers overall, and 2000 was generally the most productive. As the study area continues to remain undisturbed these variations in density are natural fluctuations and tend to be related to the climatic conditions experienced that season (Laberge & Can-Nic-A-Nick, 2015).

The density and diversity at key sites over time are illustrated in Figure 4-12 and Figure 4-13, respectively. The average number of taxa (Figure 4-13) at each site enables comparisons between studies as five replicates were analyzed in 1995 and triplicates were analyzed in all of the other studies. All communities have been diverse with little change over the years. A summary is provided below from Laberge & Can-Nic-A-Nick, 2015.

The communities at KZ-17, Geona Creek upstream Finlayson Creek, KZ-21, East Creek and KZ-27, North River have continuously been dominated by Diptera. Diptera has shared dominance with Plecoptera or Ephemeroptera over the years at Geona Creek (KZ-9) and the upper Finlayson Creek sites (KZ-16 and KZ-15). The community structure downstream on Finlayson Creek, KZ-26, is markedly different from the other two Finlayson Creek sites. Oligochaeta (aquatic earthworms) has frequently dominated the population at KZ-26 or shared dominance, usually with Diptera.

There has been no recent anthropological disturbance to the Finlayson watershed. The numbers of organisms can fluctuate year to year naturally due to climatic conditions, and seasonal timing of sampling, etc. The diversity and dominant taxa data would indicate that the populations in the study area are stable.

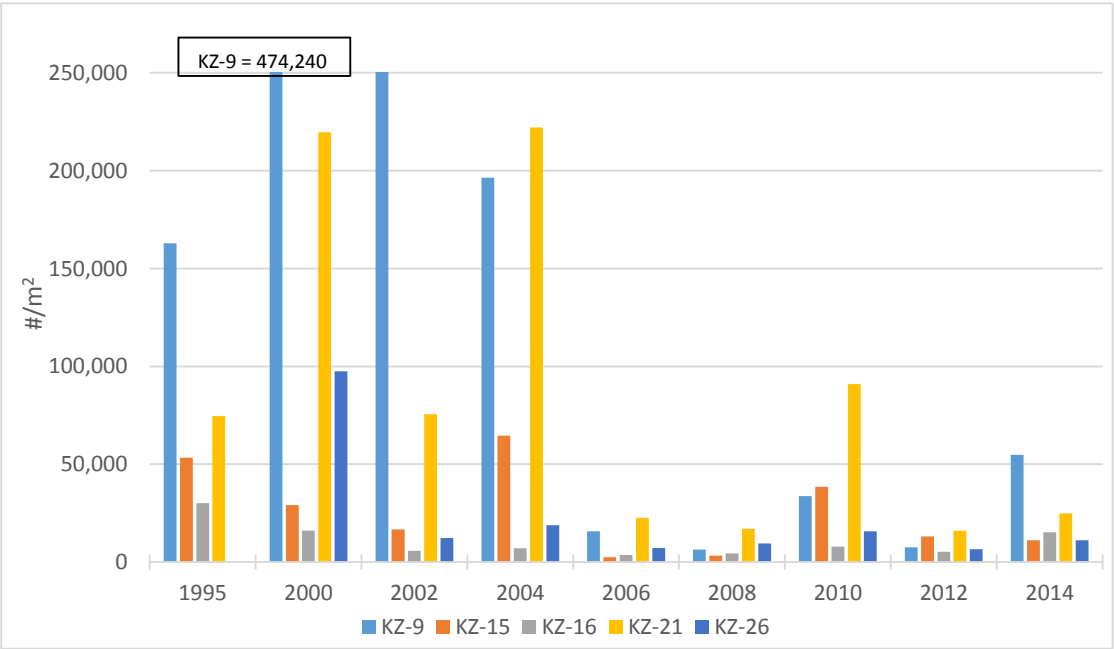


Figure 4-12: Benthic Invertebrate Density in Geona and Finlayson Creeks, 1995-2014

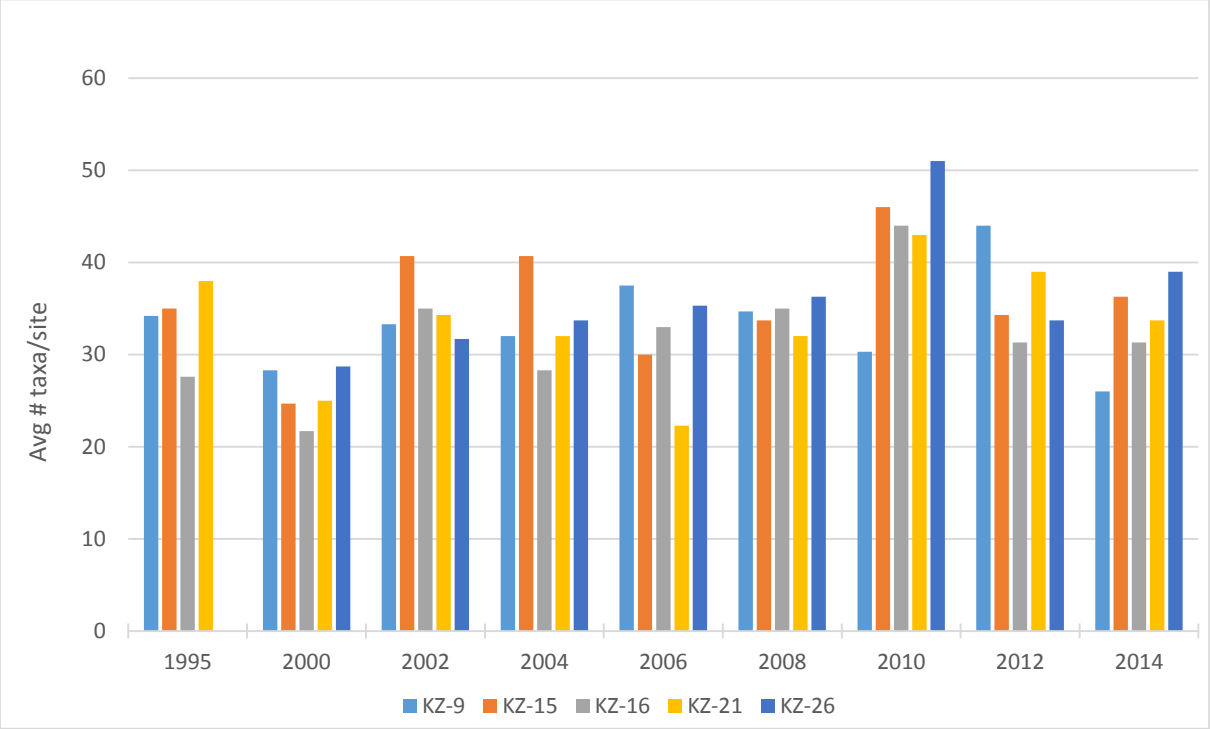


Figure 4-13: Benthic Invertebrate Average Taxonomic Richness (Diversity) in Geona and Finlayson Creeks, 1995-2014

4.2.1.3 Metals in Benthic Invertebrate Tissue Methods

Benthos samples from three sites, KZ-15, KZ-16, and KZ-26 have been collected for metals analysis on seven occasions since 2002, adhering to the procedure described below.

All captured invertebrates and detritus were placed in one litre Nalgene wide mouthed bottles, immediately placed on ice, and frozen within 12 hours. Since the gut contents are not necessarily incorporated into invertebrate tissue, invertebrates are usually allowed 24 hours to purge their gut materials prior to analysis or freezing. As the metal concentrations in the invertebrates represent the "dose" of metals that predators would consume, the invertebrates were not permitted to depurate for this study. At the Laberge Environmental Services' laboratory in Whitehorse, the samples were thawed, the invertebrates removed from the detritus, identified, rinsed with distilled water, placed into glass vials and refrozen prior to shipment to the Maxxam lab in Burnaby. (Laberge & Can-Nic-A-Nick, 2015.)

At the lab, each tissue sample was homogenized, dried, and digested with a nitric-perchloric acid mixture to solubilize the solid matter and remove the organic by oxidation and volatilization. The concentrations of the elements were determined by ICPMS LL. (Laberge & Can-Nic-A-Nick, 2015.)

4.2.1.4 Metals in Benthic Invertebrate Tissue Results

A summary of results for key parameters is presented in Table 4-4: Summary of Metals in Benthic Invertebrates Tissues (µg/g, wet weight), while complete data are available in the respective annual reports. Laberge and Can-Nic-A-Nick (2015) indicated in their report that that the mean concentrations documented during the Project studies fell well below the mean concentrations in the Yukon database. No clear trends emerge from these data, with generally consistent values over time. The elevated values obtained in 2014 are likely attributable to the fact that the lab treated the samples as plant tissue rather than as benthic invertebrate tissue.

Table 4-4: Summary of Metals in Benthic Invertebrates Tissues (µg/g, wet weight)

Site	Year	Arsenic	Cadmium	Copper	Lead	Selenium	Zinc
KZ-16	2002	1.4	0.23	4.7	0.5	0.5	23
	2004	0.6	0.10	3.0	0.3	<0.5	16
	2006	1.1	0.21	2.5	2.1	0.3	49
	2008	0.1	0.04	<0.5	0.04	0.1	4
	2010	1.4	0.08	2.6	5.5	0.2	10
	2012	0.4	0.17	3.7	3.5	0.2	15.1
	2014	7.0	2.64	94	15.6	42	280
KZ-15	2002	1.0	0.24	5.3	0.8	<0.5	43
	2004	0.3	0.13	3.4	0.4	<0.5	28
	2006	0.3	0.11	3.3	3	0.3	23
	2008	0.1	0.09	0.7	0.04	0.1	10
	2010	0.3	0.17	2.6	0.3	0.5	24
	2012	0.6	0.19	4.8	4.4	0.4	31.9
	2014	3.69	2.57	45	2.42	3.89	352
KZ-26	2002	2.4	0.21	8.4	1.7	<0.5	34
	2004	<0.2	0.14	5.0	0.2	<0.5	31
	2006	0.7	0.23	2.8	1.1	0.5	34
	2008	0.1	0.04	0.6	0.04	0.1	7
	2010	0.6	0.17	3.2	0.4	0.4	24
	2012	0.4	0.09	3.9	0.6	0.2	15.3
	2014	7.61	1.49	59.7	9.14	3.21	337

Benthic invertebrates readily accumulate contaminants and have been suggested to be reliable indicators of metal bioavailability in metal-contaminated aquatic systems (Kiffney and Clements, 1992). These organisms are an important biomonitoring tool because they are relatively sessile and thus are representative of local conditions, are common in freshwaters of all types, many taxa are closely associated with the sediments (an important sink for trace metals), and may accumulate

metals at concentrations orders of magnitude greater than ambient levels. (Laberge and Can-Nic-A-Nick, 2015)

4.2.2 2015 and 2016 Studies

Benthic invertebrate communities were sampled at monitoring stations KZ-2, KZ-7 and KZ-17 on September 9, 10, and 11, 2015. In 2016 benthic invertebrate communities were sampled at sites KZ-9, KZ-15, KZ-16, KZ-17, KZ-18, KZ-21, KZ-26, and KZ-27 (see Figure 4-9). Benthic invertebrate tissue for metal analysis were collected from stations KZ-15, KZ-16, and KZ-26. Benthic invertebrate data were collected to satisfy monitoring requirements of Water Use Licence QZ97-026 but also to fill in baseline information gaps (i.e., lack of historical benthic data for Geona Creek) that will support the environmental effects assessment, as well as the development of the Fish Habitat Compensation Plan. Only methods and results for the 2015 sampling event are presented below, as results of the 2016 sampling event were not available at the time of writing this interim report but will be included in the final version.

4.2.2.1 Methods

Benthic invertebrates were sampled from areas of riffle habitat with similar stream depths and velocities using a circular Hess sampler with an area of 0.0934 m^2 and 250 µm mesh net. The organisms caught in the mesh were then washed into a sample bottle and preserved with 10% formalin solution. The methods were repeated two more times at nearby areas to obtain three replicate samples at each site. Benthic invertebrate samples were shipped to Cordillera Consulting, in Summerland, B.C. for taxonomic identification to the lowest practical taxonomic level. Chain of Custody forms accompanied all samples. Supporting stream characterization information was also collected at each site following the Canadian Aquatic Biomonitoring Network's (CABIN) Field Manual for Wadeable Streams (Environment Canada, 2012) and is summarized below in Table 4-5.

Table 4-5: Field Station Characterization for 2015 Benthic Invertebrate Monitoring Stations

Characteristic		KZ-2	KZ-7	KZ-17
Habitat Type		Riffle	Riffle	Riffle
Overhead Canopy		Open	Open	Open
Macrophyte Coverage (%)		5	15	12
Streamside Vegetation		Ferns, Grasses and Shrubs	Ferns, Grasses and Shrubs	Ferns, Grasses and Shrubs
Width (m)	Wetted	2.0	6.5	3.1
	Bankfull	3.0	7.7	3.1
Substrate	Dominant	Cobble	Boulder	Cobbles
	Secondary	Boulder	Cobble	Gravel
	Surrounding	Gravel	Sand and finer	Sand and Finer
Water Temperature (°C)		4.7	5.1	5.3

Riffle-type habitats were exclusively sampled during the 2015 sampling. Overhead canopy was minimal or non-existent at each site although there was streamside vegetation present which can provide cover and bank stabilization. Aquatic macrophyte presence was highest at KZ-7 followed by KZ-17 and KZ-2, with mosses located on the stream bed in Geona Creek being the dominant group near station KZ-7. Cobbles was the dominant substrate type at KZ-2 and KZ-17 and boulders were the dominant substrate at KZ-7. Surrounding material was typically composed of sand and fines or of gravel.

4.2.2.2 Results and Discussion

Abundance and Taxonomic Richness

Table 4-6 below presents a summary of community metrics, where abundance is the sum of the total number of organisms of the triplicates for each site, density is calculated based on the total area sampled per site and diversity determined for each site by enumerating all the taxonomic groups identified from species to phylum (in all triplicates). These particular metrics were chosen to enable comparisons with historical results, however additional metrics as well as the complete raw data are appended to this report (Appendix E).

Table 4-6: Benthic Invertebrates Community Metrics, 2015

	KZ-2	KZ-7	KZ-17
Abundance (# organisms)	818	22,794	10,196
Density (# organisms/m^2)	8,758	244,047	109,165
Diversity (total # taxonomic groups)	46	42	50
Average # taxa per site	31	26	31

Fault Creek (KZ-2) has a much lower abundance and density than Geona Creek, which was expected given the channel and habitat characteristics. Fault Creek is at a higher elevation then the other sites and is a cascading system with high water velocities. Geona Creek upstream (KZ-7) has the highest abundance and density, and corresponds to a location where fish have been observed (see section 3.2). The highest diversity was found at KZ-17.

When comparing with benthic invertebrate results from 2014, it can be noted that Geona Creek supports a greater abundance and density than surrounding watercourses (Finlayson Creek, East Creek, North River and Fault Creek), while diversity is greatest in lower Finlayson Creek.

Distribution

The benthic invertebrate community composition was calculated as a percentage of the major taxonomic orders present (average of 3 replicates), and pie charts were generated for each site (Figures 4-14 to 4-16).

Diptera (true flies) were the dominant order at all three the sites. Plecoptera (stoneflies) was the subdominant order at KZ-2 and KZ-7, while Ephemeroptera (mayflies) was the subdominant order at KZ-17. These results are consistent with historical results for Geona Creek (see Table 4-3).

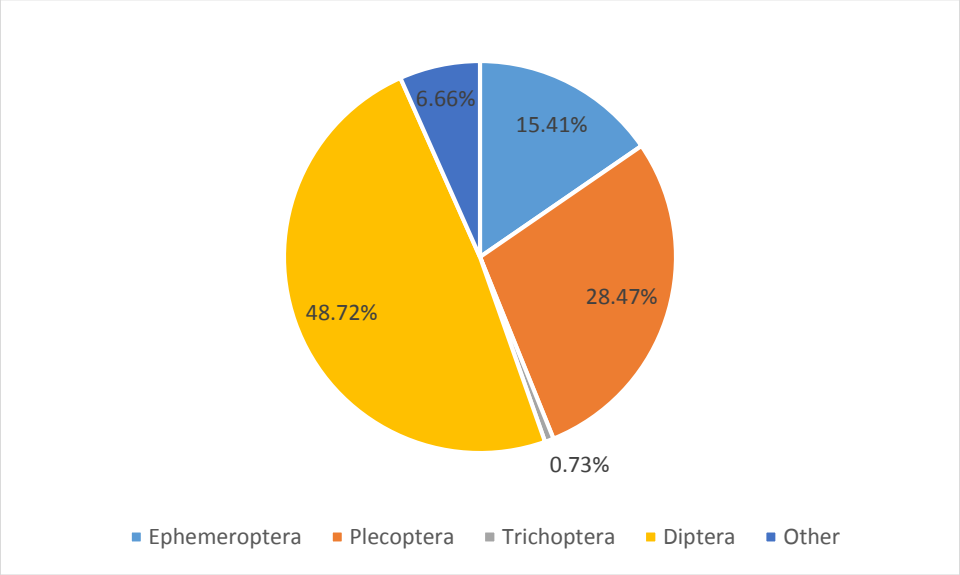


Figure 4-14: Benthic Invertebrate Community Composition at KZ-2 (Fault Creek), 2015

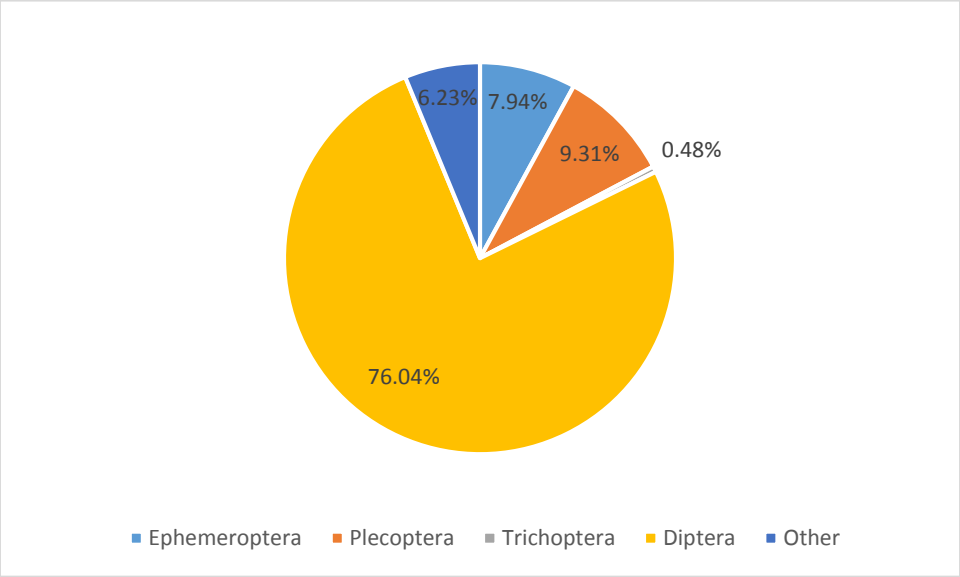


Figure 4-15: Benthic Invertebrate Community Composition at KZ-7 (Geona Creek), 2015

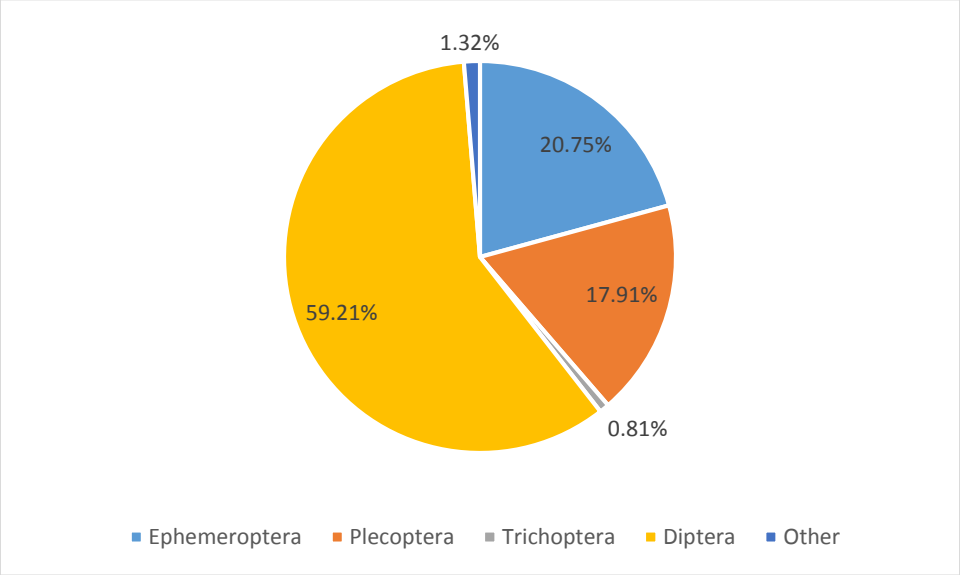


Figure 4-16: Benthic Invertebrate Community Composition at KZ-17 (Geona Creek), 2015

Many aquatic insects require good water quality to thrive. Larvae of mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera) require clear, clean, well oxygenated water and have very low tolerance to pollution (Rosenberg and Resh, 1993). Analyzing the combined EPT (Ephemeroptera, Plecoptera, Trichoptera) at a site, gives an indication of the overall health of the stream. (Laberge and Can-Nic-A-Nick, 2015).

Table 4-7 below presents EPT (Ephemeroptera, Plecoptera, Trichoptera) metrics for the three sites sampled in 2015.

Table 4-7: EPT Abundance, Richness and Proportion, 2015

	KZ-2	KZ-7	KZ-17
Abundance	371	4,046	3,543
Richness	16	11.7	15
Proportion	44.6%	17.7%	39.5%

The highest EPT abundance occurred in Geona Creek at KZ-7, however there was relatively small representation within the community. To the contrary, abundance is much lower in Fault Creek (KZ-2) but the EPT proportion is high.

Streams with an EPT richness greater than 8 are considered to be of good quality, and values less than 5 could indicate that the habitat is compromised in some way. All three locations sampled in 2015 would therefore be considered to provide good habitat quality. Similarly, results from historical sampling events produced comparable EPT metrics for Geona Creek.

In addition, Laberge and Can-Nic-A-Nic (2015) have presented their results for several groups within EPT that have very low tolerance to chemical pollution (including metals), which were first identified by Lehmkuhl (1979) (12 of these taxa have been identified in the study area). Table 4-8 below presents a similar analysis for the 2015 results.

Table 4-8: Presence (+) and Absence (-) of Sensitive Benthic Invertebrate Taxa, 2015

	KZ-2	KZ-7	KZ-17
Plecoptera			
Nemouridae	+	+	+
Perlodidae	+	+	+
Capniidae	+	+	+
Taeniopterigidae	-	-	-
Chloroperlidae	+	+	+
Leuctridae	+	+	+
Ephemeroptera			
Epeorus	+	-	+
Rithrogena	-	-	-
Ephemerellidae	+	+	+
Trichoptera			
Brachycentriidae	-	-	-
Hydropsychidae	-	+	+
Rhyacophilidae	+	+	+
Total # of sensitive taxa	8	8	9

Fault Creek and Geona Creek at KZ-7 have eight sensitive taxa present, while Geona Creek at KZ-17 has nine sensitive taxa. These results are consistence with studies from 2014 where Geona Creek at KZ-9 was found to have eight sensitive taxa (Laberge and Can-Nic-A-Nick, 2015). Finlayson Creek was then found to have more sensitive taxa present (11 out of 12).

4.3 PERIPHYTON

Periphytic algae are simple aquatic plants which inhabit the substrate of water bodies. As photosynthesizers, algae form the base of the aquatic food web. Periphyton studies were not included in the initial baseline studies in 1995 or subsequently as a requirement of the Water Licence. As periphyton is an important component of aquatic ecosystems and can provide a valuable biological monitoring tool to assess potential impacts of nutrient enrichment and metal toxicity, periphyton sampling was undertaken in 2015 to fill this information gap.

4.3.1 Methods

Periphyton samples were collected from Finlayson Creek, Geona Creek and Fault Creek at sites KZ 2, KZ-7, KZ- 9, KZ-13, KZ-15, KZ-16, KZ-17, KZ-21, KZ-22, and KZ-26 on September 9, 10, and 11, 2015. Figure 4-9 illustrates each of the sampling locations. Samples were collected following sampling protocols outlined in British Columbia's Freshwater Biological Sampling Manual for periphyton sampling (Resources Inventory Committee, 1997). Following sample collection, samples were preserved with 1 mm of Lugols solution and shipped to G3 Consulting Ltd in Surrey, B.C. for taxonomic identification to the lowest possible level. Chain of Custody forms accompanied all samples. Once at the lab, each periphyton sample was made-up to a final sample volume of 100 ml, and an appropriate sub-sample (0.1 to 0.2 ml) was taken from each and filtered through a 0.45 µm membrane filter for microscope slide preparation. Densities reported are the number of algae per cm^2.

4.3.2 Results and Discussion

Periphyton community metrics are summarized in Table 4-9 below, while complete results can be found in Appendix F. Density was obtained based on a sampling surface area of 204.3 cm^2 (10 disks of 20.43 cm^2 per site). Abundance and density were the highest in Geona Creek (KZ-9) and the lowest in Fault Creek (KZ-2). These results are generally consistent with benthic invertebrate results (see section 4.2). Diversity was highest in East Creek (KZ-21) and lowest in Fault Creek (KZ-2).

The dominant phylum observed at all sites was Bacillariophyta, with other phyla generally representing less than 1% of the total number of algae. Exceptions are Cyanobacteria which represent 4.35% of algae in Fault Creek (KZ-2) and Chlorophyta representing 1.60% in lower Finlayson Creek (KZ-26). Within the phylum Bacillariophyta, the dominant orders observed were Bacillariophyceae and Fragilariophyceae, representing respectively an average of 56% and 41% of cells across all sites. Of note is the presence of *Didymosphenia geminate*, an invasive species, which was observed in Finlayson Creek (KZ-22 and KZ-26), Geona Creek (KZ-7) and South Creek (KZ-13). In all cases Dydimo represented less than 1% of the total number of cells.

Table 4-9: Periphyton Metrics and Results, 2015

Site	Abundance (total # algae)	Density (# algae/cm^2)	# Taxa	Dominant Taxon (%)
KZ-2	9,328,237	45,660	10	*Hannaea arcus* (50%)
KZ-7	112,750,000	551,884	25	*Achnanthes minutissima* (40%)
KZ-9	186,842,857	914,551	28	*Achnanthes minutissima* (26%)
KZ-13	128,857,146	630,725	17	*Achnanthes minutissima* (31%)
KZ-15	106,529,310	521,436	29	*Achnanthes minutissima* (34%)
KZ-16	97,716,667	478,300	28	*Achnanthes minutissima* (62%)
KZ-17	125,152,500	612,592	25	*Synedra ulna* (15%)
KZ-21	56,124,444	274,716	30	*Cocconeis placentula* (29%)
KZ-22	120,593,478	590,276	28	*Fragilaria vaucheria* (20%)
KZ-26	87,851,042	430,010	17	*Diatoma tenue* (47%)

4.4 CHLOROPHYLL *A*

Chlorophyll *a* is the primary photosynthetic pigment and is common to all algae. Chlorophyll *a* studies were not included in the initial baseline studies in 1995 or subsequently as a requirement of the Water Licence. Determining chlorophyll *a* concentrations provides a measure of algae biomass and thus, the primary productivity of a given location. Sunlight, water temperature and nutrients are factors influencing chlorophyll *a* concentrations. Trends in chlorophyll *a* content can be an indicator of pollution levels through an increase/decrease in nutrients.

4.4.1 Methods

Chlorophyll *a* samples were collected on Finlayson Creek, Geona Creek and Fault Creek at sites KZ-2, KZ-7, KZ- 9, KZ-13, KZ-15, KZ-16, KZ-17, KZ-21, KZ-22, and KZ-26 on September 9, 10, and 11, 2015. Figure 4-9 illustrates each of the sampling locations. Samples were collected following protocols outlined British Columbia's Field Sampling Manual protocols for Chlorophyll *a* sampling (Clark, 2003). All samples were filtered and preserved on site at the time of collection and were kept frozen prior to transportation to Maxxam Analytics in Burnaby, B.C. Chain of Custody forms accompanied all samples.

4.4.2 Results and Discussion

Chlorophyll *a* concentrations in the project area are generally low, which is an indication of low productivity systems. Results are presented in Figure 4-17 below.

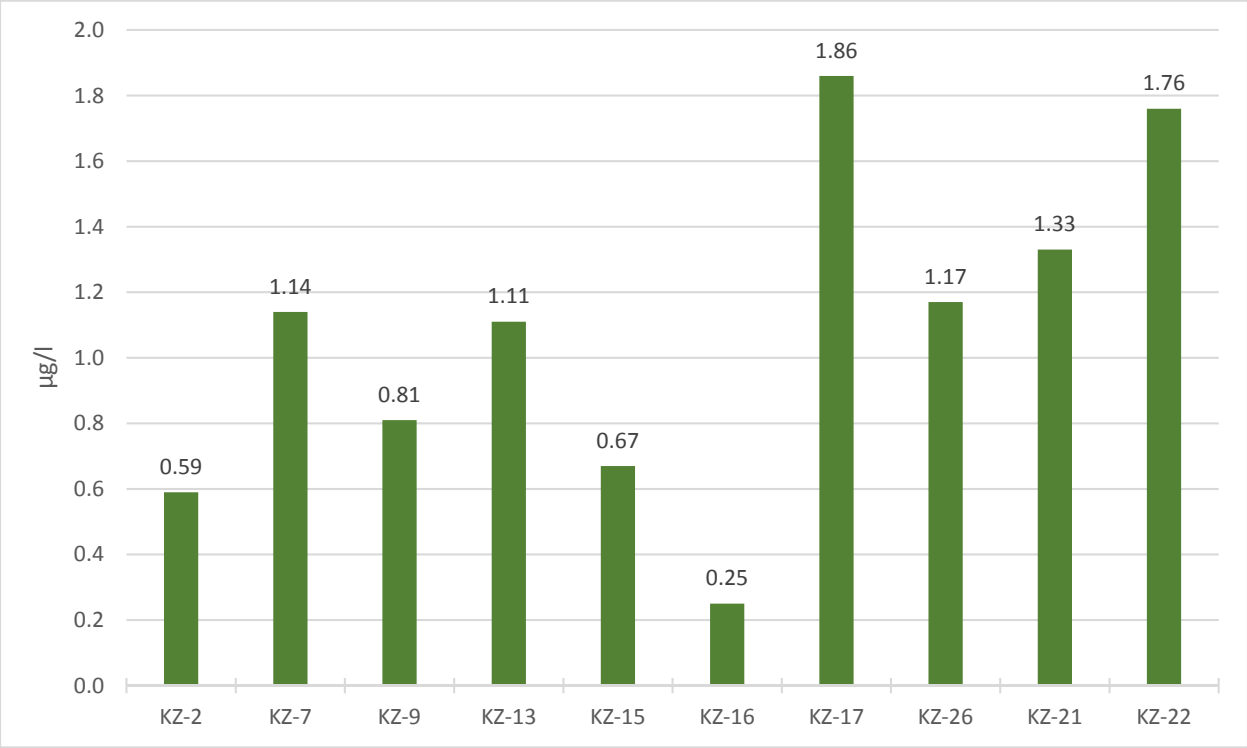


Figure 4-17: Chlorophyll *a* Concentrations in Water Samples, 2015

The highest concentration was observed at the mouth of Geona Creek (KZ-17) and the lowest in Finlayson Creek just above the confluence with Geona Creek (KZ-16). See Appendix G for laboratory Certificate of Analysis. Canopy coverage, and therefore sunlight penetration, may explain in part the differences observed among the sites.

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APPENDIX A

2015-2016 FISH DATA

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MINNOW TRAPPING

Site	Description	Zone	Northing	Easting	Date and Time in	Date and Time out	Soak Time (hrs)	Results	Species	Notes
MT1-06-15	Geona Creek near mouth, right channel	09 V	6822328	414720	22/06/2015 11:00	23/06/2015 13:48	26.8	1	SS	
MT2-06-15	Geona Creek near mouth, left channel	09 V	6822323	414703	22/06/2015 11:13	23/06/2015 14:03	26.8	0		
MT3-06-15	Geona Creek near mouth, left channel	09 V	6822321	414675	22/06/2015 11:15	23/06/2015 14:00	26.8	0		
MT4-06-15	Geona Creek near mouth, beaver pond	09 V	6822310	414662	22/06/2015 11:20	23/06/2015 13:58	26.6	0		Rope sectioned - likely by beaver
MT5-06-15	Geona Creek near KZ-9, below beaver pond	09 V	6819905	414661	22/06/2015 14:06	23/06/2015 15:52	25.8	0		
MT7-06-15	Geona Creek near KZ-9, beaver pond	09 V	6819824	414662	22/06/2015 14:11	23/06/2015 15:55	25.7	0		
MT8-06-15	Geona Creek near KZ-9, above beaver pond	09 V	6819809	414682	22/06/2015 14:15	23/06/2015 15:57	25.7	0		
MT9-06-15	Geona Creek near KZ-9, above beaver pond	09 V	6819777	414667	22/06/2015 14:19	23/06/2015 16:00	25.7	0		
MT10-06-15	Geona Creek near KZ-7, main channel d/s of WQ station	09 V	6817252	415216	22/06/2015 15:44	23/06/2015 15:15	23.5	0		
MT11-06-15	Geona Creek near KZ-7, main channel d/s of WQ station	09 V	6817191	415212	22/06/2015 15:49	23/06/2015 15:17	23.5	0		
MT12-06-15	Geona Creek near KZ-7, right channel u/s of WQ station	09 V	6817113	415221	22/06/2015 15:54	23/06/2015 15:20	23.4	1	AG	Likely same individual that was captured by EF on June 22
MT13-06-15	Geona Creek near KZ-7, left channel u/s of WQ station	09 V	6817105	415215	22/06/2015 15:59	23/06/2015 15:25	23.4	1	AG	
MT14-06-15	Fault Creek near KZ-2	09 V	6814692	414803	22/06/2015 17:18	24/06/2015 8:40	39.4	0		Could not retrieve traps on June 23 due to thundershowers and safety concerns with helicopter
MT15-06-15	Fault Creek near KZ-2	09 V	6814692	414803	22/06/2015 17:20	24/06/2015 8:40	39.3	0		
MT16-06-15	Fault Creek near KZ-2	09 V	6814698	414810	22/06/2015 17:23	24/06/2015 8:40	39.3	0		
MT17-06-15	Fault Creek near KZ-2	09 V	6814705	414817	22/06/2015 17:25	24/06/2015 8:40	39.2	0		
MT1-08-15	North River u/s of confluence w/ South Creek	09 V	6810842	417119	26/08/2015 11:45	27/08/2015 13:02	25.3	1	AG	
MT2-08-15	North River u/s of confluence w/ South Creek	09 V	6810859	417123	26/08/2015 11:45	27/08/2015 13:03	25.3	0		
MT3-08-15	Pond at confluence of South Creek & North River	09 V	6810849	417053	26/08/2015 11:48	27/08/2015 13:06	25.3	0		
MT4-08-15	Pond at confluence of South Creek & North River	09 V	6810842	417022	26/08/2015 12:11	27/08/2015 13:10	25.0	0		
MT5-08-15	Pond at confluence of South Creek & North River	09 V	6810864	417015	26/08/2015 12:13	27/08/2015 13:08	24.9	0		
MT6-08-15	South Creek u/s of confluence w/ North River	09 V	6810925	417000	26/08/2015 12:15	27/08/2015 13:08	24.9	1	SS	
MT7-08-15	Geona Creek, beaver pond d/s of KZ-7	09 V	6817662	415096	26/08/2015 13:02	27/08/2015 16:50	27.8	0		
MT8-08-15	Geona Creek, just u/s of KZ-7 right channel	09 V	6817113	415220	26/08/2015 13:52	27/08/2015 15:47	25.9	0		
MT9-08-15	Geona Creek, just u/s of KZ-7 left channel below ~0.5 m waterfall	09 V	6817107	415216	26/08/2015 13:52	27/08/2015 15:47	25.9	0		
MT10-08-15	Geona Creek, d/s of KZ-9, 1/2 btw KZ-9 and mouth	09 V	6820682	414399	26/08/2015 14:45	27/08/2015 13:48	23.0	0		
MT11-08-15	Geona Creek, d/s of KZ-9, 1/2 btw KZ-9 and mouth	09 V	6820632	414410	26/08/2015 14:49	27/08/2015 13:50	23.0	0		
MT12-08-15	Geona Creek, d/s of KZ-9, 1/2 btw KZ-9 and mouth	09 V	6820632	414418	26/08/2015 14:51	27/08/2015 13:50	23.0	0		
MT13-08-15	East Creek, just u/s of KZ-21	09 V	6827433	417508	26/08/2015 15:30	27/08/2015 13:32	22.0	1	SS	
MT14-08-15	East Creek, just u/s of KZ-21	09 V	6827433	417508	26/08/2015 15:30	27/08/2015 13:32	22.0	0		
MT15-08-15	Fault Creek, just d/s of KZ-2	09 V	6814704	414816	26/08/2015 16:45	27/08/2015 10:28	17.7	0		
MT16-08-15	Fault Creek, just d/s of KZ-2	09 V	6814693	414800	26/08/2015 16:48	27/08/2015 10:30	17.7	0		
MT17-08-15	Fault Creek, just d/s of KZ-2	09 V	6814694	414812	26/08/2015 16:50	27/08/2015 10:30	17.7	0		
MT18-08-15	Creek btw headwater lakes of South Creek, just u/s of lake #2	09 V	6813623	415364	27/08/2015 9:27	28/08/2015 8:45	23.3	3	BB	
MT19-08-15	Creek btw headwater lakes of South Creek, just d/s of lake #1	09 V	6813799	415330	27/08/2015 9:39	28/08/2015 8:54	23.3	0		Lots of small grayling observed around trap, 3 larger ones ~180mm
MT20-08-15	Geona Creek, braided upper reach above first significant pond, in channel	09 V	6814943	415050	27/08/2015 11:11	28/08/2015 9:22	22.2	0		
MT21-08-15	Geona Creek, braided upper reach above first significant pond, in small pond	09 V	6814911	415141	27/08/2015 11:15	28/08/2015 9:30	22.3	1	AG	
MT22-08-15	Geona Creek, braided upper reach above first significant pond, in small pond	09 V	6814858	415165	27/08/2015 11:19	28/08/2015 9:27	22.1	0		
MT23-08-15	Geona Creek, braided upper reach, in channel near confluence w/ first significant pond	09 V	6815026	415060	27/08/2015 11:27	28/08/2015 9:37	22.2	1	AG	

Site	Description	Zone	Northing	Easting	Date and Time in	Date and Time out	Soak Time (hrs)	Results	Species	Notes
MT24-08-15	Geona Creek, channel btw two main upper ponds, d/s of culvert	09 V	6815464	414989	27/08/2015 11:47	28/08/2015 10:19	22.5	5	AG	
MT25-08-15	Geona Creek, channel btw two main upper ponds, u/s of culvert	09 V	6815382	414983	27/08/2015 12:12	28/08/2015 9:50	21.6	0		
MT26-08-15	Geona Creek, channel btw two main upper ponds, u/s of culvert	09 V	6815368	414982	27/08/2015 12:14	28/08/2015 9:50	21.6	0		
MT1-10-15	Geona Creek, braided upper reach above first significant pond, in channel	09 V	6815031	415057	14/10/2015 8:05	15/10/2015 11:55	27.8	0		Lots of bugs in traps (water beetles)
MT2-10-15	Geona Creek, braided upper reach above first significant pond, in small pond	09 V	6815088	415032	14/10/2015 8:05	15/10/2015 12:00	27.9	0		In situ at12:00 on 15 Oct '15 T:0.4, DO 92%/11.3 mg/L; SPC 220.4 us/cm; pH 7.41; ORP 217.5 mV
MT3-10-15	Geona Creek, braided upper reach above first significant pond, in small pond	09 V	6814860	415151	14/10/2015 8:16	15/10/2015 12:08	27.9	0		Lots of bugs in traps (water beetles)
MT4-10-15	Geona Creek, braided upper reach, in channel near confluence w/ first significant pond	09 V	6814904	415134	14/10/2015 8:16	15/10/2015 12:11	27.9	0		
MT5-10-15	Geona Creek, channel btw two main upper ponds, d/s of culvert	09 V	6815467	414986	14/10/2015 9:09	15/10/2015 11:25	26.3	5	AG	
MT6-10-15	Geona Creek, channel btw two main upper ponds, u/s of culvert	09 V	6815469	414986	14/10/2015 9:14	15/10/2015 11:28	26.2	0		
MT7-10-15	Geona Creek, channel btw two main upper ponds, u/s of culvert	09 V	6815367	414971	14/10/2015 9:16	15/10/2015 11:28	26.2	1	AG	
MT8-10-15	Geona Creek, channel btw two main upper ponds, u/s of culvert	09 V	6815362	414980	14/10/2015 9:18	15/10/2015 11:30	26.2	0		
MT1-06-16	Log cluster below KZ-16 on Finlayson Creek	09 V	6822390	414679	13/06/2016 9:44	14/06/2016 7:55	22.2	0		
MT2-06-16	Undercut bank on Finlayson Creek below KZ-16	09 V	6822372	414693	13/06/2016 9:40	14/06/2016 7:50	22.2	0		
MT3-06-16	Small waterfall at Geona Creek mouth	09 V	6822329	414718	13/06/2016 9:55	14/06/2016 8:00	22.1	4	SS	
MT4-06-16	Just below beaver dam located above KZ-17	09 V	6822311	414695	13/06/2016 10:00	14/06/2016 8:16	22.3	0		
MT5-06-16	In beaver pond above KZ-17	09 V	6822306	414673	13/06/2016 10:05	14/06/2016 8:10	22.1	0		
MT6-06-16	Small waterfall above KZ-17	09 V	6822324	414699	13/06/2016 10:10	14/06/2016 8:18	22.1	2	SS	
MT7-06-16	Pool/ back eddy above KZ-15	09 V	6822369	414753	13/06/2016 10:15	14/06/2016 8:25	22.2	0		
MT8-06-16	Undercut bank above KZ-15	09 V	6822381	414763	13/06/2016 10:15	14/06/2016 8:30	22.2	2	SS	
MT9-06-16	Below dam below KZ-9	09 V	6819879	414661	13/06/2016 10:39	14/06/2016 11:03	24.4	0		
MT10-06-16	Pond above beaver dam below KZ-9	09 V	6819814	414679	13/06/2016 10:55	14/06/2016 11:07	24.2	0		
MT11-06-16	Channel below KZ-9 on Geona Creek	09 V	6819774	414664	13/06/2016 11:00	14/06/2016 11:10	24.2	0		
MT12-06-16	Small tributary that comes in below KZ-9 station	09 V	6819711	414735	13/06/2016 11:50	14/06/2016 11:15	23.4	0		
MT13-06-16	Small tributary that comes in below KZ-9 station	09 V	6819723	414698	13/06/2016 11:55	14/06/2016 11:20	23.4	0		
MT14-06-16	In Geona creek above KZ-9 WQ station	09 V	6819674	414689	13/06/2016 12:05	14/06/2016 11:20	23.3	0		
MT15-06-16	Small barrier above KZ-7 on Geona Creek	09 V	6817103	415218	13/06/2016 12:50	14/06/2016 13:39	24.8	0		
MT16-06-16	Above small barrier above KZ-7 on Geona Creek	09 V	6817090	415226	13/06/2016 12:55	14/06/2016 13:40	24.8	0		
MT17-06-16	Side channel on Geona above KZ-7	09 V	6817102	415232	13/06/2016 13:00	14/06/2016 13:45	24.8	0		
MT18-06-16	Geona Creek above KZ-7 in mainstem	09 V	6817136	415218	13/06/2016 13:15	14/06/2016 13:46	24.5	0		School of approximately 6 1+ grayling noticed above KZ-7
MT19-06-16	Below KZ-6 just before tributary enters Geona Creek	09 V	6816655	415301	13/06/2016 14:05	14/06/2016 14:10	24.1	0		
MT20-06-16	Near KZ-6 WQ station	09 V	6816659	415323	13/06/2016 14:10	14/06/2016 14:05	23.9	0		
MT21-06-16	Pool on fault Creek d/s of WQ station	09 V	6814698	414815	13/06/2016 15:30	14/06/2016 15:53	24.4	0		
MT22-06-16	Fault creek in pool at SG location	09 V	6814663	414746	13/06/2016 15:35	14/06/2016 15:58	24.4	0		
MT1-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835652	420047	25/07/2016 14:35	26/07/2016 14:59	24.4	3	AG	
								1	SS	
MT2-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835651	420053	25/07/2016 14:39	26/07/2016 14:55	24.3	3	AG	
MT3-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835672	420044	25/07/2016 14:35	26/07/2016 15:03	24.5	4	SS	
MT4-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835659	420060	25/07/2016 14:37	26/07/2016 15:05	24.5	1	SS	
MT5-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835664	420014	25/07/2016 14:27	26/07/2016 15:09	24.7	0		one fish observed jumping
MT6-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835653	420013	25/07/2016 14:27	26/07/2016 15:10	24.7	0		
MT7-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835665	419980	25/07/2016 14:33	26/07/2016 15:12	24.7	0		

Site	Description	Zone	Northing	Easting	Date and Time in	Date and Time out	Soak Time (hrs)	Results	Species	Notes
MT8-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835658	419983	25/07/2016 14:33	26/07/2016 15:10	24.6	1	SS	
MT9-07-16	Finlayson Creek KZ-22, just u/s of WQ station	09 V	6827787	417376	25/07/2016 16:15	26/07/2016 15:47	23.5	2	SS	
MT10-07-16	Finlayson Creek KZ-22, side channel just u/s of East Creek confluence	09 V	6827459	417464	25/07/2016 16:25	26/07/2016 15:56	23.5	0		
MT11-07-16	Finlayson Creek KZ-22, pool below East Creek confluence	09 V	6827497	417507	25/07/2016 16:30	26/07/2016 15:58	23.5	0		
MT12-07-16	Finlayson Creek KZ-15, side channel below Geona Creek confluence	09 V	6822369	414757	26/07/2016 10:25	27/07/2016 16:40	30.2	0		
MT13-07-16	Finlayson Creek above Geona Creek confluence, below KZ-16	09 V	6822349	414613	26/07/2016 10:30	27/07/2016 17:14	30.7	1	SS	
MT14-07-16	Geona Creek near mouth, below beaver dam	09 V	6822359	414712	26/07/2016 11:30	27/07/2016 16:58	29.5	0		
MT15-07-16	Finlayson Creek KZ-15, side channel below Geona Creek confluence	09 V	6822362	414767	26/07/2016 11:35	27/07/2016 17:43	30.1	0		
MT16-07-16	Geona Creek KZ-9	09 V	6819720	414686	27/07/2016 8:15	28/07/2016 15:33	31.3	0		
MT17-07-16	Geona Creek KZ-9	09 V	6819738	414675	27/07/2016 8:15	28/07/2016 15:34	31.3	0		
MT18-07-16	Geona Creek KZ-9	09 V	6819743	414668	27/07/2016 8:15	28/07/2016 15:35	31.3	0		
MT19-07-16	Geona Creek, just above KZ-7, left channel, pool below log jam	09 V	6817106	415215	27/07/2016 12:41	28/07/2016 17:30	28.8	0		
MT20-07-16	Geona Creek, just above KZ-7, right channel	09 V	6817115	415223	27/07/2016 12:41	28/07/2016 17:30	28.8	0		observed fish ~150 mm, likely AG
MT21-07-16	Geona Creek upper reach, where AG spawning has been observed	09 V	6815743	415023	27/07/2016 15:38	28/07/2016 9:00	17.4	0		In situ 27/07/2016 at 15:39: T=14.1°C, DO=106%, 9.29 mg/L, SPC=201.1 uS/cm, pH=8.29, ORP=94.9 mV
MT22-07-16	Geona Creek upper reach, where AG spawning has been observed	09 V	6815724	415024	27/07/2016 15:41	28/07/2016 9:08	17.5	1	AG	
MT23-07-16	Geona Creek upper reach, below culvert, near pond inlet	09 V	6815471	414987	27/07/2016 15:50	28/07/2016 9:46	17.9	2	AG	
MT24-07-16	Geona Creek upper reach, above culvert	09 V	6815377	414978	27/07/2016 15:50	28/07/2016 10:10	18.3	2	AG	
MT1-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835652	420047	30/09/2016 13:57	01/10/2016 14:47	24.8	0		
MT4-07-16	Finlayson Creek KZ-26 below culvert	09 V	6835659	420060	30/09/2016 14:00	01/10/2016 14:47	24.8	1	AG	
MT5-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835664	420014	30/09/2016 13:50	01/10/2016 14:42	24.9	0		
MT6-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835653	420013	30/09/2016 13:52	01/10/2016 14:39	24.8	0		
MT8-07-16	Finlayson Creek KZ-26 above culvert	09 V	6835658	419983	30/09/2016 13:54	01/10/2016 14:43	24.8	1	SS	retained for tissue analysis
MT1-10-16	Finlayson Creek KZ-26 below culvert	09 V	6835654	420070	30/09/2016 14:02	01/10/2016 14:47	24.8	0		
MT2-10-16	Finlayson Creek near KZ-15 (just below Geona confluence)	09 V	6822373	414751	01/10/2016 10:43	02/10/2016 8:27	21.7	0		
MT3-10-16	Finlayson Creek near KZ-15 (just below Geona confluence)	09 V	6822367	414766	01/10/2016 10:45	02/10/2016 8:27	21.7	0		
MT4-10-16	Finlayson Creek near KZ-15 (just below Geona confluence)	09 V	6822372	414767	01/10/2016 10:45	02/10/2016 8:27	21.7	0		
MT5-10-16	Finlayson Creek near KZ-15 (just below Geona confluence)	09 V	6822354	414746	01/10/2016 10:52	02/10/2016 8:27	21.6	0		
MT6-10-16	Geona Creek, in beaver pond above KZ-17	09 V	6822296	414682	01/10/2016 12:30	02/10/2016 8:49	20.3	0		
MT7-10-16	Geona Creek, in beaver pond above KZ-17	09 V	6822305	414669	01/10/2016 12:30	02/10/2016 8:49	20.3	0		one dead shrew in trap
MT8-10-16	Finlayson Creek by access road bridge (KZ-16B)	09 V	6821673	413369	01/10/2016 16:45	02/10/2016 10:35	17.8	2	SS	retained for tissue analysis
MT9-10-16	Finlayson Creek by access road bridge (KZ-16B)	09 V	6821678	413376	01/10/2016 16:49	02/10/2016 10:35	17.8	0		
MT10-10-16	Finlayson Creek by access road bridge (KZ-16B)	09 V	6821680	413411	01/10/2016 16:51	02/10/2016 10:35	17.7	1	SS	retained for tissue analysis
MT11-10-16	Finlayson Creek by access road bridge (KZ-16B)	09 V	6821643	413312	01/10/2016 16:55	02/10/2016 10:45	17.8	0		
MT12-10-16	Upper Geona Creek just u/s of ABM culvert	09 V	6815363	414981	02/10/2016 15:35	03/10/2016 15:15	23.7	0		
MT13-10-16	Upper Geona Creek just u/s of ABM culvert	09 V	6815366	414985	02/10/2016 15:35	03/10/2016 15:15	23.7	0		
MT14-10-16	Upper Geona Creek just d/s of ABM culvert	09 V	6815424	414980	02/10/2016 15:35	03/10/2016 15:10	23.6	0		
MT15-10-16	Upper Geona Creek just d/s of ABM culvert	09 V	6815446	414984	02/10/2016 15:35	03/10/2016 15:10	23.6	0		

**SS = Slimy sculpin (Cottus Cognatus); AG = Arctic grayling (Thymallus arcticus); BB = burbot (Lota lota);*
u/s=upstream; d/s=downstream; btw= between;

ELECTROFISHING

Run	Location	Date and Time	Voltage (V)	Frequency (Hz)	Duty Cycle (%)	Effort (s)	Results	Notes
Jun15-1	Geona Creek near mouth (left channel)	22/06/2015 10:30	255	30	12	108	0	
Jun15-2	Geona Creek near KZ-9, below beaver pond	22/06/2015 13:00	345	30	12	208	0	
Jun15-3	Geona Creek near KZ-9, above beaver pond	22/06/2015 13:30	195	30	12	179	0	
Jun15-4	Geona Creek near KZ-7	22/06/2015 15:00	250	30	12	594	1 fish observed 1 AG captured	Frequency changed to 40 Hz at 420 s.; Voltage changed to 200 V at 536 s.
Jun15-5	Fault Creek	22/06/2015 17:00	360	30	12	211	0	
Aug15-1	North River just u/s of confluence w/ South Creek	26/08/2015 11:30	345	30	12	161	2 SS 1 BB	1 SS observed but not captured
Aug15-2	South Creek just u/s of confluence with North River	26/08/2015 12:00	345	30	12	120	3 SS	6 SS observed but not captured
Aug15-3	Geona Creek near KZ-7, beaver pond	26/08/2015 12:55	185	30	12	129	0	
Aug15-4	Geona Creek near KZ-7	26/08/2015 13:30	320	30	12	263	2 AG	
Aug15-5	Geona Creek, d/s of KZ-9, half way btw KZ-9 and mouth	26/08/2015 14:30	190	30	12	187	0	
Aug15-6	East Creek, just u/s of KZ-21, left channel	26/08/2015 15:40	190	30	12	159	5 SS	
Aug15-7	Headwater Lake of South Creek #2 & mouth of creek btw two lakes	27/08/2015 9:00	280	30	12	112	5 AG	Observed schools of small AG in channel btw 2 lakes - sizes of sampled fish are representative
Aug15-8	Headwater Lake of South Creek #1 & mouth of creek btw two lakes	27/08/2015 9:45	420	30	12	111	0	Observed schools of small AG in channel btw 2 lakes
Aug15-9	Fault Creek, just d/s of KZ-2	27/08/2015 10:22	360	30	12	116	0	
Aug15-10	Geona Creek headwaters (braided upper reach)	27/08/2015 11:00	290	30	12	78	0	Not many suitable locations for EF, very braided
Aug15-11	Geona Creek, channel btw two main upper ponds (at culvert)	27/08/2015 11:47	220	30	12	288	2 AG	
Oct15-1	Geona Creek, channel btw two main upper ponds (at culvert)	14/10/2015 8:45	280	30	12	205	6 YOY AG+ 3 YOY observed not caught	Cobble, fines and boulders substrate In situ at1100 on 15 Oct '15 T:1.8°C; DO 92%/11.3 mg/L; SPC 220.4 us/cm; pH 7.41; ORP 217.5 mV Distance ~100 m
Jun16-1	Upstream of KZ-15 towards confluence	15/06/2016 8:50	205	30	12	135	3 SS + 2 SS observed	
Jun16-2	Two tributaries at KZ-17 below beaver dam	15/06/2016 9:10	265	30	12	106	2 SS observed	
Jun16-3	Downstream of KZ-16	15/06/2016 9:30	320	30	12	106	SS	
Jun16-4	Downstream of KZ-9	15/06/2016 11:27	245	30	12	83	0	
Jun16-5	Tributary downstream of KZ-9	15/06/2016 11:45	290	30	12	52	0	
Jun16-6	Geona Creek above KZ-9	15/06/2016 12:00	280	30	12	68	0	Poor electrofishing conditions
Jun16-7	Geona Creek above KZ-7	15/06/2016 13:30	265	30	12	191	1 AG obs approx 180mm	
Jun16-8	Tributary with KZ-6	15/06/2016 14:00	305	30	12	53	0	
Jun16-9	Fault Creek below station	15/06/2016 15:50	360	30	12	136	0	
Jul16-1	Finlayson Creek just d/s of bridge	26/07/2016 16:45	260	30	12	507	20 SS	
Jul16-2	Finlayson Creek just u/s of bridge	26/07/2016 17:20	260	30	12	172	3 SS	
Jul16-3	Finlayson & Geona confluence	27/07/2016 16:30	240	30	12	705	6 SS	conditions not great for EF, 2 more fish observed but not captured
Jul16-4	Fault Creek above culvert	28/07/2016 8:35	360	30	12	198	0	
Jul16-5	Upper Geona Creek (where spawning was observed)	28/07/2016 9:00	205	30	12	289	2 AG	2 more AG observed but not captured
Jul16-6	Upper Geona Creek below culvert	28/07/2016 9:45	270	30	12	296	2 AG	3 more AG observed but not captured

Run	Location	Date and Time	Voltage (V)	Frequency (Hz)	Duty Cycle (%)	Effort (s)	Results	Notes
Jul16-7	Upper Geona Creek above culvert	28/07/2016 10:10	270	30	12	296	6 AG	2 more AG observed but not captured
Jul16-8	Finlayson Creek below culvert	28/07/2016 12:00	215	30	12	163	1 SS	conditions not great for EF, deep, fast flowing & turbid water
Jul16-9	Finlayson Creek above culvert	28/07/2016 12:20	215	30	12	168	7 SS	conditions not great for EF, deep, fast flowing & turbid water
Jul16-10	Geona Creek above KZ-7	28/07/2016 17:17	255	30	12	429	1 AG	2 more AG observed but not captured (1 adult, 1 juvenile)
Jul16-11	Geona Creek below KZ-7	28/07/2016 17:35	255	30	12	229	0	
Oct16-1	Finlayson Creek just d/s of culvert (KZ-26)	01/10/2016 15:00	195	30	12	347	6 SS	
Oct16-2	Finlayson Creek just u/s of culvert (KZ-26)	01/10/2016 15:15	195	30	12	329	4 SS	
Oct16-3	Finlayson Creek just below Geona confluence (KZ-15)	02/10/2016 8:30	270	30	12	369	1 SS	
Oct16-4	Finlayson Creek at access road bridge (KZ-16)	02/10/2016 11:00	335	30	12	529	19 SS	turned voltage down to 300V at 402 s.
Oct16-5	Upper Geona Creek at ABM culvert	02/10/2016 13:00	270	30	12	811	2 AG	1 more AG observed but not captured

**SS = Slimy sculpin (Cottus Cognatus); AG = Arctic grayling (Thymallus arcticus); BB = Burbot (Lota lota)*
u/s=upstream; d/s=downstream; btw= between;

FISH DATA

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
Jun15-4	EF	22/06/2015	1	AG		83	4.22	
MT1-06-15	MT	23/06/2015	2	SS	100		7.4	
MT12-06-15	MT	23/06/2015	3	AG		83	4.25	Likely same individual that was captured by EF on June 22
MT13-06-15	MT	23/06/2015	4	AG		86	5.92	
Aug15-1	EF	26/06/2015	5	SS	31			
			6	SS	34			
			7	BB	114			
Aug15-2	EF	26/08/2015	8	SS	92			
			9	SS	65			
			10	SS	66			
Aug15-4	EF	26/08/2015	11	AG	82	75		
			12	AG	215	205		
Aug15-6	EF	26/08/2015	13	SS	56			
			14	SS	48			
			15	SS	76			
			16	SS	49			
			17	SS	47			
Aug15-7	EF	27/08/2015	18	AG	73	68		
			19	AG	76	71		
			20	AG	89	81		
			21	AG	75	70		
			22	AG	79	73		
Aug15-11	EF	27/08/2015	23	AG	53	49		
			24	AG	67	63		
MT1-08-15	MT	27/08/2015	25	AG	80	75		

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
MT6-08-15	MT	27/08/2015	26	SS	73			
MT13-08-15	MT	27/08/2015	27	SS	68			
MT18-08-15	MT	28/08/2015	28	BB	149			
			29	BB	77			
			30	BB	77			
MT21-08-15	MT	28/08/2015	31	AG	142	135		
MT23-08-15	MT	28/08/2015	32	AG	115	107		
MT24-08-15	MT	28/08/2015	33	AG	63	59		
			34	AG	74	67		
			35	AG	64	60		
			36	AG	66	62		
			37	AG	62	57		
Oct15-1	EF	14/10/2015	38	AG	49	46	0.74	YOY, Fish obviously slowed down, little fighting
			39	AG	71	69	2.81	YOY, Fish obviously slowed down, little fighting
			40	AG	57	53	1.42	YOY, Fish obviously slowed down, little fighting
			41	AG	70	65	2.50	YOY, Fish obviously slowed down, little fighting
			42	AG	66	61	1.97	YOY, Fish obviously slowed down, little fighting
			43	AG	66	61	2.11	YOY, Fish obviously slowed down, little fighting
MT5-10-15	MT	15/10/2015	44	AG	66	61	2.31	YOY, Fish obviously slowed down, little fighting
			45	AG	66	62	2.68	YOY, Fish obviously slowed down, little fighting
			46	AG	66	60	1.63	YOY, Fish obviously slowed down, little fighting
			47	AG	62	58	1.37	YOY, Fish obviously slowed down, little fighting
			48	AG	64	59	2.12	YOY, Fish obviously slowed down, little fighting
MT6-10-15	MT	15/10/2015	49	AG	65	60	2.27	YOY, Fish obviously slowed down, little fighting
MT3-06016	MT	14/06/2016	1	SS	93			
			2	SS	113			
			3	SS	65			

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
			4	SS	74			
MT6-06-16	MT	14/06/2016	5	SS	100			
			6	SS	81			
MT8-06-16	MT	14/06/2016	7	SS	79			
			8	SS	84			
Jun16-1	EF	15/06/2016	9	SS	68			2 SS observed but not captured
			10	SS	97			
			11	SS	35			
Jun16-3	EF	15/06/2016	12	SS	34			
MT1-07-16	MT	26/07/2016	13	AG		114		
			14	AG		132		
			15	AG		133		
			16	SS	65			
MT2-07-16	MT	26/07/2016	17	AG		143		
			18	AG		125		
			19	AG		130		
MT3-0716	MT	26/07/2016	20	SS	84			
			21	SS	62			
			22	SS	65			
			23	SS	54			
MT4-07-16	MT	26/07/2016	24	AG		136		
MT8-07-16	MT	26/07/2016	25	SS	82			
MT9-07-16	MT	16/07/2016	26	SS	67			
			27	SS	69			
MT13-07-16	MT	27/07/2016	28	SS	82			
MT22-07-16	MT	28/07/2016	29	AG		110	10.36	
MT23-07-16	MT	28/07/2016	30	AG		50	1.33	

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
			31	AG		49	1.45	
MT24-07-16	MT	28/07/2016	32	AG		50	1.18	
			33	AG		51	1.5	
Jul16-1	EF	26/07/26016	34	SS	61		0.82	
			35	SS	71		3.26	
			36	SS	101		9.74	
			37	SS	64		2.8	
			38	SS	78		4.2	
			39	SS	57		1.54	
			40	SS	54		1.14	
			41	SS	68		3.09	
			42	SS	57		1.34	
			43	SS	51		1.28	
			44	SS	78			
			45	SS	45			
			46	SS	54			
			47	SS	61			
			48	SS	53			
			49	SS	50			
			50	SS	55			
			51	SS	50			
			52	SS	49			
			53	SS	41			
Jul16-2	EF	26/07/2016	54	SS	87			
			55	SS	54			dead
			56	SS	53			
Jul16-3	EF	27/07/2016	57	SS	36			

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
			58	SS	50			
			59	SS	66			
			60	SS	37			
			61	SS	32			
			62	SS	34			
Jul16-5	EF	28/07/2016	63	AG		38	0.34	
			64	AG		36	0.46	
Jul16-6	EF	28/07/2016	65	AG		51	1.57	
			66	AG		52	1.63	
Jul16-7	EF	28/07/2016	67	AG		52	1.53	
			68	AG		67	2.67	
			69	AG		44	1.08	
			70	AG		68	2.96	
			71	AG		41	0.57	
			72	AG		115	13.66	
Jul16-8	EF	28/07/2016	73	SS	73			
Jul16-9	EF	28/07/2016	74	SS	32			
			75	SS	47			
			76	SS	40			
			77	SS	35			
			78	SS	38			
			79	SS	38			
			80	SS	32			
Jul16-10	EF	28/07/2016	81	AG		215		
MT4-07-16	MT	01/10/2016	82	AG		89	5.36	
MT8-07-16	MT	01/10/2016	83	SS	47		0.77	retained for tissue analysis
MT8-10-16	MT	02/10/2016	84	SS	77		3.95	retained for tissue analysis

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
			85	SS	71		3.61	retained for tissue analysis
MT10-10-16	MT	02/10/2016	86	SS	71		2.71	retained for tissue analysis
Oct16-1	EF	01/10/2016	87	SS	87		4.97	
			88	SS	71		3.18	
			89	SS	62		1.84	
			90	SS	51		1.11	
			91	SS	39		0.58	
			92	SS	41		0.76	
Oct16-2	EF	01/10/2016	93	SS	68		2.6	
			94	SS	57		1.55	
			95	SS	42		0.78	
			96	SS	40		0.53	
Oct16-3	EF	02/10/2016	97	SS	96		7.29	retained for tissue analysis
Oct16-4	EF	02/10/2016	98	SS	61		1.84	
			99	SS	76		4.21	
			100	SS	75		4.6	
			101	SS	101		11.04	
			102	SS	76		4.64	
			103	SS	85		6.23	
			104	SS	76		3.9	
			105	SS	59		2.94	
			106	SS	55		1.76	
			107	SS	54		1.27	
			108	SS	61		2.3	
			109	SS	74		3.37	retained for tissue analysis
			110	SS	56		1.96	
			111	SS	56		1.52	

Location	Method	Date	Fish ID#	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Notes
			112	SS	60		1.93	
			113	SS	62		1.98	
			114	SS	53		1.23	
			115	SS	46		0.8	
			116	SS	21		0.15	
Oct16-5	EF	02/10/2016	117	AG		129	17.99	
			118	AG		51	0.97	

**MT = Minnow trapping; EF = Electrofishing*

***SS = Slimy sculpin (Cottus Cognatus); AG = Arctic grayling (Thymallus arcticus); BB = Burbot (Lota lota)*

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APPENDIX B

REACH ASSESSMENT PHOTOLOG

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PHOTOS

Photo 1: Geona reach 1 looking across.

Photo 2: Geona Reach 1 looking downstream.

Photo 3: Geona Reach 1 looking upstream.

Photo 4: Geona Reach 1 looking upstream further up on reach.

Photo 5: Aerial view of Reach 1.

Photo 6: Aerial view of Reach 1.

Photo 7: Geona Reach 1 substrate.

Photo 8: Geona Reach 2 looking across.

Photo 9: Geona Reach 2 looking downstream.

Photo 10: Geona Reach 2 looking upstream.

Photo 11: Geona Reach 2 moss conditions.

Photo 12: Geona Reach 2 substrate.

Photo 13: Geona Reach 2 Aerial view.

Photo 14: Geona Reach 2 Aerial View.

Photo 15: Geona Reach 3 looking across.

Photo 16: Geona Reach 3 moss conditions.

Photo 17: Geona Reach 3 looking downstream.

Photo 18: Geona Creek Reach 3 looking upstream.

Photo 19: Geona Reach 3 substrate.

Photo 20: Geona Reach 3 moss on right bank.

Photo 21: Geona Reach 4 looking across.

Photo 22: Geona Creek looking downstream.

Photo 23: Geona Reach 4 looking upstream.

Photo 24: Geona Reach 4 overview.

Photo 25: Geona Reach 4 substrate.

Photo 26: Geona Reach 4 aerial view and Geona Creek headwater ponds.

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APPENDIX C

2016 OVERWINTERING FISH HABITAT CHARACTERIZATION DATA

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	February 9, 2016						
Pond ID	**Temp (°C)**	**D.O. (mg/L)**	**D.O. % saturation**	**Conductivity (µS/cm)**	**pH**	**ORP (mV)**	**Comments**
2-1	Not Sampled						
4-1	No water encountered						3 holes drilled, no water, ice 1.2 m thick
4-4	0	6.1	50	305.5	7.16	132	3 holes drilled only 1 with water, depth below ice approx 15 cm
4-6	0.1	0.3	3	373.1	7.3	113.4	5 holes drill, only one with water, ice down to bottom organics
South Lake	Not Sampled						

	March 23, 2016						
Pond ID	**Temp (°C)**	**D.O. (mg/L)**	**D.O. % saturation**	**Conductivity (µS/cm)**	**pH**	**ORP (mV)**	**Comments**
2-1	No water encountered						
4-1	0.7	6.3	53	347.5	6.89		ice approx 1.2 thick, bottom organics immediately below ice
4-4	0	0.5	4.1	336	6.89	-84.2	ice 1.12 m thick, bottom organics immediately below ice
4-6	No water encountered						3 holes drilled, no water encountered
South Lake	2.6	3.22	20	248.3	7.06	10.2	ice approx 0.9 m thick, 3 m liquid water below ice, clear water w/o visible organics

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APPENDIX D

2015 AND 2016 STREAM SEDIMENT DATA

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411758

Attention:KAI WOLOSHYN

ALEXCO ENVIRONMENTAL GROUP INC.
Unit 3 Calcite Business Centre
151 Industrial Road
WHITEHORSE, BC
Canada Y1A 2V3

Report Date: 2015/10/07
Report #: R2054458
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B580173
Received: 2015/09/15, 10:10

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	7	2015/09/17	2015/09/19	BBY7SOP-00001	EPA 6020a R1 m
Elements by ICPMS (total)	1	2015/09/30	2015/10/06	BBY7SOP-00001	EPA 6020a R1 m
Elements by ICPMS (total)	2	2015/10/06	2015/10/06	BBY7SOP-00001	EPA 6020a R1 m
pH (2:1 DI Water Extract)	7	2015/09/17	2015/09/18	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	1	2015/09/30	2015/10/06	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	2	2015/10/06	2015/10/06	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Particle Size - Dry Sieve (Custom) (1)	10	2015/09/29	2015/09/17	WIN SOP-00039	Carter SSMA 47.4
Particle Size - Dry Sieve (Custom) (1)	10	2015/09/30	2015/09/22	WIN SOP-00039	Carter SSMA 47.4
Particle Size - Wet Sieve (Custom) (1)	10	2015/09/30	2015/09/22	WIN SOP-00039	Carter SSMA 47.4
Particle Size - Wet Sieve (Custom) (1)	10	2015/09/30	2015/09/22	WIN SOP-00039	Carter SSMA 47.4

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Winnipeg

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Morgan Melnychuk, Burnaby Project Manager
Email: MMelnychuk@maxxam.ca
Phone# (604)638-8034 Ext:8034

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

CUSTOM PARTICLE SIZE DISTRIBUTION (SOIL)

Maxxam ID		ND0654	ND0655	ND0656	ND0657	ND0658	ND0659	ND0660		
Sampling Date		2015/09/11 14:35	2015/09/11 08:20	2015/09/10 16:45	2015/09/11 11:25	2015/09/09 14:50	2015/09/10 16:00	2015/09/09 17:08		
COC Number		08411758	08411758	08411758	08411758	08411758	08411758	08411758		
	UNITS	KZ-2	KZ-7	KZ-9	KZ-13	KZ-15	KZ-16	KZ-17	RDL	QC Batch
Percent Retained										
Sieve - #10 (>2.00mm)	%	43.20	27.07	71.77	66.94	30.09	32.37	52.65	0.01	8055878
Sieve - #20 (>0.85mm)	%	71.42	68.12	74.89	71.24	70.25	71.84	71.11	0.01	8056285
Sieve - #40 (>0.425mm)	%	85.19	81.46	77.46	74.62	86.34	88.91	80.38	0.01	8056285
Sieve - #60 (>0.25 mm)	%	92.48	87.37	81.39	79.96	93.86	96.09	86.85	0.01	8056285
Sieve - #100(>0.15mm)	%	96.46	91.16	88.68	88.87	97.23	98.34	90.79	0.01	8056285
Sieve - #140 (>0.106mm)	%	97.82	93.08	92.55	93.31	98.28	98.86	92.37	0.01	8056285
Sieve - #270 (>0.053mm)	%	99.03	95.97	97.09	97.96	99.21	99.26	96.25	0.01	8056285
Percent Passing										
<2.00mm, Sieve #10	%	56.80	72.93	28.23	33.06	69.91	67.63	47.35	0.01	8055123
<0.850mm, Sieve #20	%	28.58	31.88	25.11	28.76	29.75	28.16	28.89	0.01	8055911
<0.425mm, Sieve #40	%	14.81	18.54	22.54	25.38	13.66	11.09	19.62	0.01	8055911
<0.250mm, Sieve #60	%	7.52	12.63	18.61	20.04	6.14	3.91	13.15	0.01	8055911
<0.150mm, Sieve #100	%	3.54	8.84	11.32	11.13	2.77	1.66	9.21	0.01	8055911
<0.106mm, Sieve #140	%	2.18	6.92	7.45	6.69	1.72	1.14	7.63	0.01	8055911
<0.053mm, Sieve #270	%	0.97	4.03	2.91	2.04	0.79	0.74	3.75	0.01	8055911

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

CUSTOM PARTICLE SIZE DISTRIBUTION (SOIL)

Maxxam ID		ND0661	ND0662	ND0663		
Sampling Date		2015/09/11 18:00	2015/09/09 12:30	2015/09/09 09:40		
COC Number		08411758	08411758	08411758		
	UNITS	KZ-26	KZ-21	KZ-22	RDL	QC Batch
Percent Retained						
Sieve - #10 (>2.00mm)	%	66.31	22.75	14.75	0.01	8055878
Sieve - #20 (>0.85mm)	%	78.34	81.01	80.80	0.01	8056285
Sieve - #40 (>0.425mm)	%	88.78	93.19	92.81	0.01	8056285
Sieve - #60 (>0.25 mm)	%	93.29	96.65	96.32	0.01	8056285
Sieve - #100(>0.15mm)	%	96.27	97.81	97.61	0.01	8056285
Sieve - #140 (>0.106mm)	%	97.73	98.19	98.12	0.01	8056285
Sieve - #270 (>0.053mm)	%	98.70	98.70	98.77	0.01	8056285
Percent Passing						
<2.00mm, Sieve #10	%	33.69	77.25	85.25	0.01	8055123
<0.850mm, Sieve #20	%	21.66	18.99	19.20	0.01	8055911
<0.425mm, Sieve #40	%	11.22	6.81	7.19	0.01	8055911
<0.250mm, Sieve #60	%	6.71	3.35	3.68	0.01	8055911
<0.150mm, Sieve #100	%	3.73	2.19	2.39	0.01	8055911
<0.106mm, Sieve #140	%	2.27	1.81	1.88	0.01	8055911
<0.053mm, Sieve #270	%	1.30	1.30	1.23	0.01	8055911
RDL = Reportable Detection Limit						

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		ND0654	ND0655		ND0656	ND0657		ND0658		
Sampling Date		2015/09/11 14:35	2015/09/11 08:20		2015/09/10 16:45	2015/09/11 11:25		2015/09/09 14:50		
COC Number		08411758	08411758		08411758	08411758		08411758		
	UNITS	KZ-2	KZ-7	QC Batch	KZ-9	KZ-13	QC Batch	KZ-15	RDL	QC Batch
Physical Properties										
Soluble (2:1) pH	pH	7.73	7.68	8041580	7.68	6.71	8063204	7.77	N/A	8041580
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	4360	12200	8041578	7780	7810	8063200	7160	100	8041578
Total Antimony (Sb)	mg/kg	1.58	0.24	8041578	0.33	<0.10	8063200	0.59	0.10	8041578
Total Arsenic (As)	mg/kg	7.85	16.4	8041578	14.7	5.55	8063200	24.8	0.50	8041578
Total Barium (Ba)	mg/kg	43.7	252	8041578	109	135	8063200	99.2	0.10	8041578
Total Beryllium (Be)	mg/kg	<0.40	<0.40	8041578	<0.40	<0.40	8063200	<0.40	0.40	8041578
Total Bismuth (Bi)	mg/kg	0.30	0.15	8041578	0.11	0.12	8063200	0.11	0.10	8041578
Total Cadmium (Cd)	mg/kg	1.33	5.96	8041578	1.19	0.223	8063200	0.974	0.050	8041578
Total Calcium (Ca)	mg/kg	2510	5040	8041578	5230	2950	8063200	3930	100	8041578
Total Chromium (Cr)	mg/kg	10.5	28.3	8041578	23.1	23.0	8063200	30.1	1.0	8041578
Total Cobalt (Co)	mg/kg	5.98	21.3	8041578	9.45	7.11	8063200	12.0	0.30	8041578
Total Copper (Cu)	mg/kg	28.6	59.4	8041578	16.6	12.2	8063200	21.9	0.50	8041578
Total Iron (Fe)	mg/kg	13700	40600	8041578	30900	16800	8063200	24200	100	8041578
Total Lead (Pb)	mg/kg	24.1	16.6	8041578	14.1	9.27	8063200	12.5	0.10	8041578
Total Lithium (Li)	mg/kg	5.4	9.0	8041578	10.6	13.8	8063200	8.5	5.0	8041578
Total Magnesium (Mg)	mg/kg	3040	9330	8041578	5250	4950	8063200	5500	100	8041578
Total Manganese (Mn)	mg/kg	266	4240	8041578	831	307	8063200	1030	0.20	8041578
Total Mercury (Hg)	mg/kg	<0.050	<0.050	8041578	0.078	0.074	8063200	<0.050	0.050	8041578
Total Molybdenum (Mo)	mg/kg	1.70	3.18	8041578	2.12	0.89	8063200	2.49	0.10	8041578
Total Nickel (Ni)	mg/kg	9.82	51.9	8041578	25.3	16.6	8063200	37.8	0.80	8041578
Total Phosphorus (P)	mg/kg	445	1710	8041578	1570	706	8063200	1230	10	8041578
Total Potassium (K)	mg/kg	1270	700	8041578	676	1110	8063200	490	100	8041578
Total Selenium (Se)	mg/kg	0.58	1.02	8041578	0.82	<0.50	8063200	0.63	0.50	8041578
Total Silver (Ag)	mg/kg	0.126	0.097	8041578	0.228	<0.050	8063200	0.067	0.050	8041578
Total Sodium (Na)	mg/kg	<100	<100	8041578	<100	<100	8063200	<100	100	8041578
Total Strontium (Sr)	mg/kg	8.38	19.6	8041578	24.6	12.2	8063200	16.7	0.10	8041578
Total Thallium (Tl)	mg/kg	0.095	0.106	8041578	0.074	0.113	8063200	<0.050	0.050	8041578
Total Tin (Sn)	mg/kg	0.26	0.24	8041578	0.27	0.40	8063200	0.29	0.10	8041578
Total Titanium (Ti)	mg/kg	342	244	8041578	339	632	8063200	282	1.0	8041578
Total Uranium (U)	mg/kg	1.56	1.09	8041578	1.12	1.09	8063200	0.860	0.050	8041578
Total Vanadium (V)	mg/kg	14.9	51.3	8041578	30.6	32.2	8063200	31.7	2.0	8041578
Total Zinc (Zn)	mg/kg	335	827	8041578	198	99.8	8063200	168	1.0	8041578
Total Zirconium (Zr)	mg/kg	3.68	2.67	8041578	1.49	0.90	8063200	1.74	0.50	8041578

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		ND0659		ND0660	ND0661	ND0662	ND0663		
Sampling Date		2015/09/10 16:00		2015/09/09 17:08	2015/09/11 18:00	2015/09/09 12:30	2015/09/09 09:40		
COC Number		08411758		08411758	08411758	08411758	08411758		
	UNITS	KZ-16	QC Batch	KZ-17	KZ-26	KZ-21	KZ-22	RDL	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	7.81	8063204	7.60	7.98	7.88	8.30	N/A	8041580
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	8800	8063200	8680	8460	5930	8020	100	8041578
Total Antimony (Sb)	mg/kg	0.35	8063200	0.86	1.49	0.95	0.52	0.10	8041578
Total Arsenic (As)	mg/kg	30.2	8063200	33.7	29.8	45.7	26.4	0.50	8041578
Total Barium (Ba)	mg/kg	174	8063200	186	246	198	122	0.10	8041578
Total Beryllium (Be)	mg/kg	<0.40	8063200	<0.40	<0.40	<0.40	<0.40	0.40	8041578
Total Bismuth (Bi)	mg/kg	0.14	8063200	0.14	0.19	<0.10	<0.10	0.10	8041578
Total Cadmium (Cd)	mg/kg	1.77	8063200	1.92	0.874	0.491	0.669	0.050	8041578
Total Calcium (Ca)	mg/kg	4880	8063200	7180	9730	8010	7930	100	8041578
Total Chromium (Cr)	mg/kg	29.9	8063200	38.5	35.6	25.9	24.3	1.0	8041578
Total Cobalt (Co)	mg/kg	18.8	8063200	15.3	12.6	12.0	13.0	0.30	8041578
Total Copper (Cu)	mg/kg	28.5	8063200	31.3	34.6	16.5	17.5	0.50	8041578
Total Iron (Fe)	mg/kg	31100	8063200	30700	26200	28500	26400	100	8041578
Total Lead (Pb)	mg/kg	17.8	8063200	16.4	13.9	5.80	7.06	0.10	8041578
Total Lithium (Li)	mg/kg	11.0	8063200	10.1	10.6	8.7	10.8	5.0	8041578
Total Magnesium (Mg)	mg/kg	6340	8063200	7340	7720	7670	7310	100	8041578
Total Manganese (Mn)	mg/kg	2220	8063200	2760	1130	1870	1610	0.20	8041578
Total Mercury (Hg)	mg/kg	0.092	8063200	<0.050	0.076	0.060	<0.050	0.050	8041578
Total Molybdenum (Mo)	mg/kg	1.92	8063200	3.44	1.63	2.27	1.62	0.10	8041578
Total Nickel (Ni)	mg/kg	46.3	8063200	60.7	51.0	52.5	41.2	0.80	8041578
Total Phosphorus (P)	mg/kg	1020	8063200	1770	1080	1090	1660	10	8041578
Total Potassium (K)	mg/kg	824	8063200	701	1090	453	361	100	8041578
Total Selenium (Se)	mg/kg	0.88	8063200	1.41	1.39	0.98	<0.50	0.50	8041578
Total Silver (Ag)	mg/kg	0.118	8063200	0.190	0.220	0.077	<0.050	0.050	8041578
Total Sodium (Na)	mg/kg	<100	8063200	<100	<100	<100	<100	100	8041578
Total Strontium (Sr)	mg/kg	24.1	8063200	34.0	39.7	34.7	31.0	0.10	8041578
Total Thallium (Tl)	mg/kg	0.058	8063200	0.074	0.096	0.052	<0.050	0.050	8041578
Total Tin (Sn)	mg/kg	0.27	8063200	0.37	0.33	0.26	0.16	0.10	8041578
Total Titanium (Ti)	mg/kg	407	8063200	322	263	193	197	1.0	8041578
Total Uranium (U)	mg/kg	1.13	8063200	1.95	1.11	0.739	0.680	0.050	8041578
Total Vanadium (V)	mg/kg	39.1	8063200	34.1	32.5	24.8	38.3	2.0	8041578
Total Zinc (Zn)	mg/kg	154	8063200	293	145	125	96.0	1.0	8041578
Total Zirconium (Zr)	mg/kg	1.33	8063200	0.86	2.21	2.24	2.68	0.50	8041578

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: ND0654
Sample ID: KZ-2
Matrix: Soil

Collected: 2015/09/11
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0655
Sample ID: KZ-7
Matrix: Soil

Collected: 2015/09/11
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0656
Sample ID: KZ-9
Matrix: Soil

Collected: 2015/09/10
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8063200	2015/09/30	2015/10/06	David Jung
pH (2:1 DI Water Extract)	PH/PH	8063204	2015/09/30	2015/10/06	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0657
Sample ID: KZ-13
Matrix: Soil

Collected: 2015/09/11
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8063200	2015/10/06	2015/10/06	David Jung
pH (2:1 DI Water Extract)	PH/PH	8063204	2015/10/06	2015/10/06	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

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Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: ND0658 **Collected:** 2015/09/09
Sample ID: KZ-15 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0658 Dup **Collected:** 2015/09/09
Sample ID: KZ-15 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou

Maxxam ID: ND0659 **Collected:** 2015/09/10
Sample ID: KZ-16 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8063200	2015/10/06	2015/10/06	David Jung
pH (2:1 DI Water Extract)	PH/PH	8063204	2015/10/06	2015/10/06	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0660 **Collected:** 2015/09/09
Sample ID: KZ-17 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0661 **Collected:** 2015/09/11
Sample ID: KZ-26 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou

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Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: ND0661 **Collected:** 2015/09/11
Sample ID: KZ-26 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0662 **Collected:** 2015/09/09
Sample ID: KZ-21 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

Maxxam ID: ND0663 **Collected:** 2015/09/09
Sample ID: KZ-22 **Shipped:**
Matrix: Soil **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8041578	2015/09/17	2015/09/19	Gary Smith
pH (2:1 DI Water Extract)	PH/PH	8041580	2015/09/17	2015/09/18	William Zou
Particle Size - Dry Sieve (Custom)	SIEV	8055123	2015/09/17	2015/09/17	Erin Santos
Particle Size - Dry Sieve (Custom)	SIEV	8055878	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8055911	2015/09/22	2015/09/22	Erin Santos
Particle Size - Wet Sieve (Custom)	SIEV	8056285	2015/09/22	2015/09/22	Erin Santos

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Maxxam Job #: B580173
Report Date: 2015/10/07

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C

Results relate only to the items tested.

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Maxxam Job #: B580173
Report Date: 2015/10/07

QUALITY ASSURANCE REPORT

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8041578	Total Aluminum (Al)	2015/09/19					<100	mg/kg	2.1	35	96	70 - 130
8041578	Total Antimony (Sb)	2015/09/19	101	75 - 125	99	75 - 125	<0.10	mg/kg	5.6	30	100	70 - 130
8041578	Total Arsenic (As)	2015/09/19	97	75 - 125	104	75 - 125	<0.50	mg/kg	0.31	30	104	70 - 130
8041578	Total Barium (Ba)	2015/09/19	NC	75 - 125	94	75 - 125	<0.10	mg/kg	13	35	109	70 - 130
8041578	Total Beryllium (Be)	2015/09/19	97	75 - 125	93	75 - 125	<0.40	mg/kg	NC	30		
8041578	Total Bismuth (Bi)	2015/09/19					<0.10	mg/kg	NC	30		
8041578	Total Cadmium (Cd)	2015/09/19	102	75 - 125	97	75 - 125	<0.050	mg/kg	0.63	30	92	70 - 130
8041578	Total Calcium (Ca)	2015/09/19					<100	mg/kg	5.9	30	99	70 - 130
8041578	Total Chromium (Cr)	2015/09/19	NC	75 - 125	110	75 - 125	<1.0	mg/kg	0.55	30	111	70 - 130
8041578	Total Cobalt (Co)	2015/09/19	105	75 - 125	108	75 - 125	<0.30	mg/kg	1.8	30	97	70 - 130
8041578	Total Copper (Cu)	2015/09/19	105	75 - 125	109	75 - 125	<0.50	mg/kg	2.2	30	97	70 - 130
8041578	Total Iron (Fe)	2015/09/19					<100	mg/kg	6.7	30	95	70 - 130
8041578	Total Lead (Pb)	2015/09/19	100	75 - 125	93	75 - 125	<0.10	mg/kg	5.9	35	99	70 - 130
8041578	Total Lithium (Li)	2015/09/19	98	75 - 125	92	75 - 125	<5.0	mg/kg	NC	30		
8041578	Total Magnesium (Mg)	2015/09/19					<100	mg/kg	3.5	30	96	70 - 130
8041578	Total Manganese (Mn)	2015/09/19	NC	75 - 125	109	75 - 125	<0.20	mg/kg	0.67	30	102	70 - 130
8041578	Total Mercury (Hg)	2015/09/19	98	75 - 125	93	75 - 125	<0.050	mg/kg	NC	35	102	70 - 130
8041578	Total Molybdenum (Mo)	2015/09/19	100	75 - 125	100	75 - 125	<0.10	mg/kg	8.0	35	104	70 - 130
8041578	Total Nickel (Ni)	2015/09/19	NC	75 - 125	109	75 - 125	<0.80	mg/kg	2.7	30	99	70 - 130
8041578	Total Phosphorus (P)	2015/09/19					<10	mg/kg	0.87	30	91	70 - 130
8041578	Total Potassium (K)	2015/09/19					<100	mg/kg	NC	35		
8041578	Total Selenium (Se)	2015/09/19	109	75 - 125	110	75 - 125	<0.50	mg/kg	NC	30		
8041578	Total Silver (Ag)	2015/09/19	86	75 - 125	91	75 - 125	<0.050	mg/kg	NC	35	84	60 - 140
8041578	Total Sodium (Na)	2015/09/19					<100	mg/kg	NC	35		
8041578	Total Strontium (Sr)	2015/09/19	107	75 - 125	96	75 - 125	<0.10	mg/kg	8.4	35	95	70 - 130
8041578	Total Thallium (Tl)	2015/09/19	98	75 - 125	92	75 - 125	<0.050	mg/kg	NC	30	90	70 - 130
8041578	Total Tin (Sn)	2015/09/19	104	75 - 125	97	75 - 125	<0.10	mg/kg	NC	35		
8041578	Total Titanium (Ti)	2015/09/19	NC	75 - 125	99	75 - 125	<1.0	mg/kg	6.5	35	105	70 - 130
8041578	Total Uranium (U)	2015/09/19	101	75 - 125	94	75 - 125	<0.050	mg/kg	2.7	30	107	70 - 130
8041578	Total Vanadium (V)	2015/09/19	NC	75 - 125	107	75 - 125	<2.0	mg/kg	2.6	30	107	70 - 130

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Maxxam Job #: B580173
Report Date: 2015/10/07

QUALITY ASSURANCE REPORT(CONT'D)

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8041578	Total Zinc (Zn)	2015/09/19	NC	75 - 125	112	75 - 125	2.3, RDL=1.0 (1)	mg/kg	2.6	30	95	70 - 130
8041578	Total Zirconium (Zr)	2015/09/19					<0.50	mg/kg	NC	30		
8041580	Soluble (2:1) pH	2015/09/18			100	97 - 103			0.39	N/A		
8063200	Total Aluminum (Al)	2015/10/06					<100	mg/kg	1.1	35	91	70 - 130
8063200	Total Antimony (Sb)	2015/10/06	85	75 - 125	88	75 - 125	<0.10	mg/kg	NC	30	90	70 - 130
8063200	Total Arsenic (As)	2015/10/06	91	75 - 125	102	75 - 125	0.68, RDL=0.50	mg/kg	3.7	30	89	70 - 130
8063200	Total Barium (Ba)	2015/10/06	NC	75 - 125	99	75 - 125	<0.10	mg/kg	1.3	35	99	70 - 130
8063200	Total Beryllium (Be)	2015/10/06	94	75 - 125	101	75 - 125	<0.40	mg/kg	NC	30		
8063200	Total Bismuth (Bi)	2015/10/06					<0.10	mg/kg	NC	30		
8063200	Total Cadmium (Cd)	2015/10/06	93	75 - 125	94	75 - 125	<0.050	mg/kg	1.4	30	94	70 - 130
8063200	Total Calcium (Ca)	2015/10/06					<100	mg/kg	3.1	30	91	70 - 130
8063200	Total Chromium (Cr)	2015/10/06	92	75 - 125	99	75 - 125	<1.0	mg/kg	2.4	30	96	70 - 130
8063200	Total Cobalt (Co)	2015/10/06	91	75 - 125	101	75 - 125	<0.30	mg/kg	0.19	30	90	70 - 130
8063200	Total Copper (Cu)	2015/10/06	97	75 - 125	104	75 - 125	<0.50	mg/kg	0.17	30	89	70 - 130
8063200	Total Iron (Fe)	2015/10/06					<100	mg/kg	0.43	30	87	70 - 130
8063200	Total Lead (Pb)	2015/10/06	98	75 - 125	105	75 - 125	<0.10	mg/kg	0.19	35	100	70 - 130
8063200	Total Lithium (Li)	2015/10/06	98	75 - 125	101	75 - 125	<5.0	mg/kg	NC	30		
8063200	Total Magnesium (Mg)	2015/10/06					<100	mg/kg	0.70	30	87	70 - 130
8063200	Total Manganese (Mn)	2015/10/06	NC	75 - 125	100	75 - 125	<0.20	mg/kg	1.3	30	93	70 - 130
8063200	Total Mercury (Hg)	2015/10/06	NC	75 - 125	95	75 - 125	<0.050	mg/kg	5.9	35	99	70 - 130
8063200	Total Molybdenum (Mo)	2015/10/06	98	75 - 125	93	75 - 125	<0.10	mg/kg	0.18	35	104	70 - 130
8063200	Total Nickel (Ni)	2015/10/06	99	75 - 125	99	75 - 125	<0.80	mg/kg	4.5	30	89	70 - 130
8063200	Total Phosphorus (P)	2015/10/06					<10	mg/kg	1.0	30	85	70 - 130
8063200	Total Potassium (K)	2015/10/06					<100	mg/kg	1.5	35		
8063200	Total Selenium (Se)	2015/10/06	90	75 - 125	106	75 - 125	<0.50	mg/kg	NC	30		
8063200	Total Silver (Ag)	2015/10/06	93	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35	83	60 - 140
8063200	Total Sodium (Na)	2015/10/06					<100	mg/kg	2.2	35		
8063200	Total Strontium (Sr)	2015/10/06	NC	75 - 125	100	75 - 125	<0.10	mg/kg	0.014	35	94	70 - 130
8063200	Total Thallium (Tl)	2015/10/06	89	75 - 125	101	75 - 125	<0.050	mg/kg	NC	30	88	70 - 130
8063200	Total Tin (Sn)	2015/10/06	88	75 - 125	89	75 - 125	<0.10	mg/kg	NC	35		

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QUALITY ASSURANCE REPORT(CONT'D)

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8063200	Total Titanium (Ti)	2015/10/06	NC	75 - 125	97	75 - 125	<1.0	mg/kg	0.35	35	99	70 - 130
8063200	Total Uranium (U)	2015/10/06	101	75 - 125	102	75 - 125	<0.050	mg/kg	1.6	30	107	70 - 130
8063200	Total Vanadium (V)	2015/10/06	NC	75 - 125	98	75 - 125	<2.0	mg/kg	0.63	30	100	70 - 130
8063200	Total Zinc (Zn)	2015/10/06	NC	75 - 125	99	75 - 125	<1.0	mg/kg	0.16	30	83	70 - 130
8063200	Total Zirconium (Zr)	2015/10/06					<0.50	mg/kg	NC	30		
8063204	Soluble (2:1) pH	2015/10/06			100	97 - 103			0	N/A		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Method Blank exceeds acceptance limits for Zn. Sample values for Zn are >20x the concentration of the method blank and the contamination is considered irrelevant.

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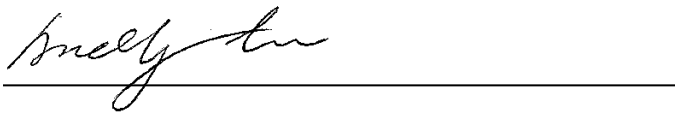
ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Data Validation Coordinator

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

CHAIN OF CUSTODY RECORD

08411758

BBY FCD-0C

Page ____

Invoice Information		Report Information (if differs from invoice)		Project Informa		Turnaround Time (TAT) Required
Company Name:	BMC Minerals	Company Name:	Alexco Environmental	Quotation #:	B50743	[x] Regular TAT 5 days (Most anal
Contact Name:		Contact Name:	Kai Woloshyn	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH
Address:	530-1130 WEST PENDER ST	Address:	Unit 3 151 Industrial Road	Project #:	BMC-15-01	Rush TAT (Surcharges will be appli
	Vancouver, BC PC: V6E 4A4		Whitehorse, YK PC: Y1A 2V3	Site Location:	Kudz Ze Kayah	[ ] Same Day [ ] 2 D
Phone:		Phone:	867-668-6463	Site #:		[ ] 1 Day [ ] 3 D
Email:		Email:	kwoloshyn@alexcoresource.com	Sampled By:	A. Bier, A. MacPhail	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
[ ] BC CSR Soil [ ] BC CSR Water	[ ] Return Cooler	
[ ] CCME (Specify) [ ] Other (Specify)	[ ] Ship Sample Bottles (Please Specify)	
[ ] Drinking Water [ ] BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Group 10 Sediment Sieve	Metals in Soil	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	KZ-2	ND0654	11/09/2015	14:35	Sediment	x	x	3	
2	KZ-7	ND0655	11/09/2015	8:20	Sediment	x	x	3	
3	KZ-9	ND0656	10/09/2015	16:45	Sediment	x	x	3	
4	KZ-13	ND0657	11/09/2015	11:25	Sediment	x	x	3	
5	KZ-15	ND 0658	09/09/2015	14:50	Sediment	x	x	3	
6	KZ-16	ND0659	10/09/2015	16:00	Sediment	x	x	3	
7	KZ-17	ND0660	09/09/2015	17:08	Sediment	x	x	3	
	KZ-26	ND0661	11/09/2015	18:00	Sediment	x	x	3	
9	KZ-21	ND0662	09/09/2015	12:30	Sediment	x	x	3	
10	KZ-22	ND0663	09/09/2015	9:40	Sediment	x	x	3	

B580173

LABORATORY USE ONLY

CUSTODY SEAL Y / (N)		COOLI TEMPERA
Present	Intact	
NA		6.5 6

COOLING MEDIA PRESENT (Y) /

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
A. MacPhail	14/09/2015		Laurel Beattie	2015/09/15	10:10	B580173

APPENDIX E

2015 BENTHIC INVERTEBRATE DATA

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Whole Sample Data

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0
Ameletus	2	6	16	0	0	60	6	40	0
| Family: Baetidae	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	4
Baetis	0	23	2	240	200	260	94	60	100
Baetis bicaudatus	7	4	0	60	17	20	156	400	178
| Family: Ephemerellidae	8	1	0	240	150	160	13	120	17
Drunella doddsii	0	0	0	0	0	0	0	20	4
| Family: Heptageniidae	6	14	8	320	67	40	63	340	104
Epeorus	1	3	0	0	0	0	6	0	0
Rhithrogena	5	19	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	6	0	0
| Family: Capniidae	3	0	0	80	33	140	38	180	43
| Family: Chloroperlidae	28	23	32	20	0	0	6	0	13
Haploperla sp.	3	17	4	0	0	40	0	0	0
Paraperla sp.	12	1	0	0	0	0	0	0	0
Suwallia	12	33	4	0	0	0	0	0	4
Sweltsa sp.	0	2	1	0	17	0	0	0	0
| Family: Leuctridae	2	4	2	0	17	0	6	0	26
| Family: Nemouridae	0	4	0	0	0	0	0	0	0
Zapada	2	1	0	520	383	560	256	780	130
Zapada cinctipes	1	0	0	0	33	60	0	60	13
Zapada columbiana	4	21	1	20	0	0	0	0	4
Zapada frigida	0	0	0	40	0	0	6	20	0
Zapada oregonensis group	4	10	2	0	0	0	0	0	0
| Family: Perlodidae	1	0	0	0	17	20	0	0	4
| Family: Taeniopterygidae	0	0	0	0	0	40	19	60	4
Taenionema	0	0	0	60	0	0	6	0	26
	0	0	0	0	0	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0	0	0	40	0	0	13	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0
Rhyacophila	0	0	1	20	0	0	0	80	4

Whole Sample Data

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
Rhyacophila vofixa group	2	0	0	20	33	0	6	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	4
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	20	0	20	0
| Family: Chironomidae	0	0	1	0	0	0	0	0	4
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0
Micropsectra	5	9	16	2340	1733	2080	119	420	213
Rheotanytarsus	0	0	0	2220	1333	1900	0	0	0
Stempellina sp.	1	2	0	0	100	100	0	0	0
| Subfamily: Diamesinae	0	0	1	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0
Diamesa	1	0	0	0	0	0	0	60	0
Pagastia	6	10	7	220	150	80	138	700	57
Pseudodiamesa sp.	0	0	0	0	0	0	0	40	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	6	80	9
Corynoneura	0	0	1	0	0	0	0	0	0
Cricotopus	0	0	0	80	0	0	0	0	0
Eukiefferiella	7	8	4	540	67	20	631	140	183
Heleniella sp.	0	0	0	0	17	0	0	0	4
Hydrobaenus	0	0	0	0	0	0	0	80	0
Krenosmittia sp.	0	0	0	0	0	0	0	20	0
Orthocladius	0	0	3	680	400	0	88	2900	39
Parakiefferiella	5	0	1	0	0	740	206	0	0
Rheocricotopus	8	90	80	20	0	120	6	40	0
Thienemanniella	0	0	2	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	1	11	0	1120	367	660	6	0	9
Tvetenia tshernovskii	0	0	0	0	0	0	0	40	0
| Subfamily: Podonominae	0	0	0	0	0	0	0	0	0
| Tribe: Boreochlini	0	0	0	0	0	0	0	0	0
Boreochlus sp.	0	0	2	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	100	0	0	0
| Family: Empididae	0	0	0	0	0	0	0	0	0
Chelifera/ Metachela	0	0	0	40	50	0	19	20	0
Clinocera sp.	1	1	5	0	0	0	0	0	0
Oreogeton sp.	33	37	18	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	6	0	0
Helodon sp.	0	0	0	0	0	0	6	0	4
Simulium	0	0	0	0	0	0	0	0	96
| Family: Tipulidae	0	0	0	0	0	0	0	0	0
Dicranota	12	4	4	40	0	0	19	40	9
Gonomyodes sp.	0	0	3	0	0	0	0	0	0

Whole Sample Data

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	1	0	1	20	0	0	0	20	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0
Aturus	19	5	14	60	50	160	6	40	4
| Family: Feltriidae	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	6	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	6	0	0
Hygrobates	0	0	0	0	0	60	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0
Lebertia	0	0	0	80	50	60	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0
Sperchon	1	2	1	360	250	200	0	0	9
Sperchonopsis sp.	0	0	0	20	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0
Oribatida	1	0	0	20	0	20	0	0	0
	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	2	0	0	0	6	80	0
Totals:	**205**	**368**	**245**	**9540**	**5534**	**7720**	**1974**	**6900**	**1322**

Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	1	0	1	20	17	20	0	20	4
| Class: Branchiopoda	0	0	0	0	0	0	0	0	0
| Order: Cladocera	1	0	0	0	0	0	0	0	4
	0	0	0	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0	0	0
| Class: Copepoda	0	0	0	20	17	0	0	0	0
	0	0	0	0	0	0	0	0	0
Phylum: Nemata	1	1	1	20	17	0	6	20	4
Totals:	**3**	**1**	**2**	**60**	**51**	**20**	**6**	**40**	**12**

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7
Sample:	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618
Richness Measures						
Species Richness	33	29	31	29	23	26
EPT Richness	18	18	12	13	11	11
Ephemeroptera Richness	6	7	4	4	4	5
Plecoptera Richness	11	10	7	6	6	6
Trichoptera Richness	1	1	1	3	1	
Chironomidae Richness	8	6	11	8	8	9
Oligochaeta Richness			1			
Non-Chiro. Non-Olig. Richness						
Abundance Measures						
Corrected Abundance	205	368	245	9540	5534	7720
EPT Abundance	103	189	79	1680	966	1400
Dominance Measures						
1st Dominant Taxon	Oreogeton sp.	Rheocricotopus	Rheocricotopus	Micropsectra	Micropsectra	Micropsectra
1st Dominant Abundance	33	90	80	2340	1733	2080
2nd Dominant Taxon	Chloroperlidae	Oreogeton sp.	Chloroperlidae	Rheotanytarsus	Rheotanytarsus	Rheotanytarsus
2nd Dominant Abundance	28	37	32	2220	1333	1900
3rd Dominant Taxon	Aturus	Suwallia	Oreogeton sp.	Tvetenia bavarica group	Orthocladius	Parakiefferiella
3rd Dominant Abundance	19	33	18	1120	400	740
% 1 Dominant Taxon	16.10%	24.46%	32.65%	24.53%	31.32%	26.94%
% 2 Dominant Taxa	13.66%	10.05%	13.06%	23.27%	24.09%	24.61%
% 3 Dominant Taxa	9.27%	8.97%	7.35%	11.74%	7.23%	9.59%

Metrics

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7
Sample:	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618
Community Composition						
% Ephemeroptera	14.15%	19.02%	13.06%	9.01%	7.82%	6.99%
% Plecoptera	35.12%	31.52%	18.78%	7.76%	9.04%	11.14%
% Trichoptera	0.98%	0.82%	0.41%	0.84%	0.60%	
% EPT	50.24%	51.36%	32.24%	17.61%	17.46%	18.13%
% Diptera	39.02%	46.74%	60.41%	76.52%	76.20%	75.39%
% Oligochaeta			0.82%			
% Baetidae	3.41%	7.34%	0.82%	3.14%	3.92%	3.63%
% Chironomidae	16.59%	35.33%	48.16%	75.68%	75.30%	75.13%
% Odonata						
Functional Group Composition						
% Predators	61.46%	33.97%	34.69%	7.76%	8.44%	8.81%
% Shredder-Herbivores	7.80%	10.87%	2.04%	6.92%	8.42%	9.84%
% Collector-Gatherers	13.66%	17.66%	22.86%	49.69%	53.92%	51.81%
% Scrapers	2.93%	6.79%	2.45%			
% MH						
% CF				23.27%	24.09%	24.61%
% OM	7.32%	26.63%	34.29%	6.50%	1.21%	1.81%
% PA						
% Piercer-Herbivore						
% Gatherer						
% Unclassified	6.83%	4.08%	3.67%	5.87%	3.92%	3.11%
Functional Group Richness						
Predators Richness	13	10	11	12	7	9
Shredder-Herbivores Richness	6	5	3	4	4	3
Collector-Gatherers Richness	8	7	12	7	8	8
Scrapers Richness	2	3	1			
MH Richness						
CF Richness				1	1	1
OM Richness	2	2	2	3	1	2
PA Richness						

Metrics

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7
Sample:	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618
Piercer-Herbivore Richness						
Gatherer Richness						
Unclassified	2	2	2	2	2	3
Diversity/Evenness Measures						
Shannon-Weiner H' (log 10)	1.29	1.19	1.10	1.03	0.96	1.00
Shannon-Weiner H' (log 2)	4.28	3.96	3.67	3.41	3.18	3.32
Shannon-Weiner H' (log e)	2.96	2.75	2.54	2.37	2.20	2.30
Simpson's Index (D)	0.07	0.10	0.14	0.14	0.18	0.16
Simpson's Index of Diversity (1 - D)	0.93	0.90	0.86	0.86	0.82	0.84
Simpson's Reciprocal Index (1/D)	14.37	10.26	7.03	6.94	5.67	6.30
Biotic Indices						
Hilsenhoff Biotic Index	2.90	3.39	3.94	5.44	5.47	5.21

Cordillera Consulting

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Alexco - Access, Kai Woloshyn; Andre
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Site:	KZ-17	KZ-17	KZ-17
Sample:	A	B	C
CC#:	CC160619	CC160620	CC160621
Richness Measures			
Species Richness	32	29	31
EPT Richness	16	12	17
Ephemeroptera Richness	6	6	6
Plecoptera Richness	8	5	10
Trichoptera Richness	2	1	1
Chironomidae Richness	8	11	8
Oligochaeta Richness	1	1	
Non-Chiro. Non-Olig. Richness			
Abundance Measures			
Corrected Abundance	1974	6900	1322
EPT Abundance	701	2160	682
Dominance Measures			
1st Dominant Taxon	Eukiefferiella	Orthocladius	Micropsectra
1st Dominant Abundance	631	2900	213
2nd Dominant Taxon	Zapada	Zapada	Eukiefferiella
2nd Dominant Abundance	256	780	183
3rd Dominant Taxon	Parakiefferiella	Pagastia	Baetis bicaudatus
3rd Dominant Abundance	206	700	178
% 1 Dominant Taxon	31.97%	42.03%	16.11%
% 2 Dominant Taxa	12.97%	11.30%	13.84%
% 3 Dominant Taxa	10.44%	10.14%	13.46%

Metrics

Site:	KZ-17	KZ-17	KZ-17
Sample:	A	B	C
CC#:	CC160619	CC160620	CC160621
Community Composition			
% Ephemeroptera	17.12%	14.20%	30.94%
% Plecoptera	17.43%	15.94%	20.35%
% Trichoptera	0.96%	1.16%	0.30%
% EPT	35.51%	31.30%	51.59%
% Diptera	63.32%	66.67%	47.66%
% Oligochaeta	0.30%	1.16%	
% Baetidae	12.66%	6.67%	21.41%
% Chironomidae	60.79%	65.51%	39.11%
% Odonata			
Functional Group Composition			
% Predators	4.10%	3.19%	3.56%
% Shredder-Herbivores	15.81%	16.23%	17.02%
% Collector-Gatherers	41.49%	70.43%	45.99%
% Scrapers	0.30%		
% MH			
% CF	0.61%		7.56%
% OM	32.57%	2.61%	15.81%
% PA			
% Piercer-Herbivore			
% Gatherer			
% Unclassified	5.12%	7.54%	10.06%
Functional Group Richness			
Predators Richness	8	6	7
Shredder-Herbivores Richness	5	5	6
Collector-Gatherers Richness	9	13	9
Scrapers Richness	1		
MH Richness			
CF Richness	2		2
OM Richness	3	2	2
PA Richness			

Metrics

Site:	KZ-17	KZ-17	KZ-17
Sample:	A	B	C
CC#:	CC160619	CC160620	CC160621
Piercer-Herbivore Richness			
Gatherer Richness			
Unclassified	4	3	5
Diversity/Evenness Measures			
Shannon-Weiner H' (log 10)	1.04	0.97	1.15
Shannon-Weiner H' (log 2)	3.45	3.21	3.82
Shannon-Weiner H' (log e)	2.39	2.22	2.65
Simpson's Index (D)	0.15	0.21	0.09
Simpson's Index of Diversity (1 - D)	0.85	0.79	0.91
Simpson's Reciprocal Index (1/D)	6.65	4.73	10.56
Biotic Indices			
Hilsenhoff Biotic Index	4.80	4.24	4.29

Raw Data

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
Sieve Size:	250	250	250	250	250	250	250	250	250
SubSample %:	100	100	100	5	6	5	16	5	23
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0
Ameletus	2	6	16	0	0	3	1	2	0
| Family: Baetidae	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	1
Baetis	0	23	2	12	12	13	15	3	23
Baetis bicaudatus	7	4	0	3	1	1	25	20	41
| Family: Ephemerellidae	8	1	0	12	9	8	2	6	4
Drunella doddsii	0	0	0	0	0	0	0	1	1
| Family: Heptageniidae	6	14	8	16	4	2	10	17	24
Epeorus	1	3	0	0	0	0	1	0	0
Rhithrogena	5	19	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	1	0	0
| Family: Capniidae	3	0	0	4	2	7	6	9	10
| Family: Chloroperlidae	28	23	32	1	0	0	1	0	3
Haploperla sp.	3	17	4	0	0	2	0	0	0
Paraperla sp.	12	1	0	0	0	0	0	0	0
Suwallia	12	33	4	0	0	0	0	0	1
Sweltsa sp.	0	2	1	0	1	0	0	0	0
| Family: Leuctridae	2	4	2	0	1	0	1	0	6
| Family: Nemouridae	0	4	0	0	0	0	0	0	0
Zapada	2	1	0	26	23	28	41	39	30
Zapada cinctipes	1	0	0	0	2	3	0	3	3
Zapada columbiana	4	21	1	1	0	0	0	0	1
Zapada frigida	0	0	0	2	0	0	1	1	0
Zapada oregonensis group	4	10	2	0	0	0	0	0	0
| Family: Perlodidae	1	0	0	0	1	1	0	0	1
| Family: Taeniopterygidae	0	0	0	0	0	2	3	3	1
Taenionema	0	0	0	3	0	0	1	0	6
	0	0	0	0	0	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0	0	0	2	0	0	2	0	0

Raw Data

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
Sieve Size:	250	250	250	250	250	250	250	250	250
SubSample %:	100	100	100	5	6	5	16	5	23
| **Family: Rhyacophilidae**	0	0	0	0	0	0	0	0	0
Rhyacophila	0	0	1	1	0	0	0	4	1
Rhyacophila vofixa group	2	0	0	1	2	0	1	0	0
| **Family: Uenoidae**	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| **Order: Diptera**	0	0	0	0	0	0	0	0	1
| **Family: Ceratopogonidae**	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	1	0	1	0
| **Family: Chironomidae**	0	0	1	0	0	0	0	0	1
| **Subfamily: Chironominae**	0	0	0	0	0	0	0	0	0
| **Tribe: Tanytarsini**	0	0	0	0	0	0	0	0	0
Micropsectra	5	9	16	117	104	104	19	21	49
Rheotanytarsus	0	0	0	111	80	95	0	0	0
Stempellina sp.	1	2	0	0	6	5	0	0	0
| **Subfamily: Diamesinae**	0	0	1	0	0	0	0	0	0
| **Tribe: Diamesini**	0	0	0	0	0	0	0	0	0
Diamesa	1	0	0	0	0	0	0	3	0
Pagastia	6	10	7	11	9	4	22	35	13
Pseudodiamesa sp.	0	0	0	0	0	0	0	2	0
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	1	4	2
Corynoneura	0	0	1	0	0	0	0	0	0
Cricotopus	0	0	0	4	0	0	0	0	0
Eukiefferiella	7	8	4	27	4	1	101	7	42
Heleniella sp.	0	0	0	0	1	0	0	0	1
Hydrobaenus	0	0	0	0	0	0	0	4	0
Krenosmittia sp.	0	0	0	0	0	0	0	1	0
Orthocladius	0	0	3	34	24	0	14	145	9
Parakiefferiella	5	0	1	0	0	37	33	0	0
Rheocricotopus	8	90	80	1	0	6	1	2	0
Thienemanniella	0	0	2	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	1	11	0	56	22	33	1	0	2
Tvetenia tshernovskii	0	0	0	0	0	0	0	2	0
| **Subfamily: Podonominae**	0	0	0	0	0	0	0	0	0
| **Tribe: Boreochlini**	0	0	0	0	0	0	0	0	0
Boreochlus sp.	0	0	2	0	0	0	0	0	0
| **Subfamily: Tanypodinae**	0	0	0	0	0	0	0	0	0
| **Tribe: Pentaneurini**	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	5	0	0	0
| **Family: Empididae**	0	0	0	0	0	0	0	0	0
Chelifera/ Metachela	0	0	0	2	3	0	3	1	0
Clinocera sp.	1	1	5	0	0	0	0	0	0
Oreogeton sp.	33	37	18	0	0	0	0	0	0
| **Family: Simuliidae**	0	0	0	0	0	0	1	0	0
Helodon sp.	0	0	0	0	0	0	1	0	1

Raw Data

Site:	KZ-2	KZ-2	KZ-2	KZ-7	KZ-7	KZ-7	KZ-17	KZ-17	KZ-17
Sample:	A	B	C	A	B	C	A	B	C
CC#:	CC160613	CC160614	CC160615	CC160616	CC160617	CC160618	CC160619	CC160620	CC160621
Sieve Size:	250	250	250	250	250	250	250	250	250
SubSample %:	100	100	100	5	6	5	16	5	23
Simulium	0	0	0	0	0	0	0	0	22
| Family: Tipulidae	0	0	0	0	0	0	0	0	0
Dicranota	12	4	4	2	0	0	3	2	2
Gonomyodes sp.	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	1	0	1	1	0	0	0	1	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0
Aturus	19	5	14	3	3	8	1	2	1
| Family: Feltriidae	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	1	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	1	0	0
Hygrobates	0	0	0	0	0	3	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0
Lebertia	0	0	0	4	3	3	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0
Sperchon	1	2	1	18	15	10	0	0	2
Sperchonopsis sp.	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0
Oribatida	1	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	2	0	0	0	1	4	0
Totals:	**205**	**368**	**245**	**477**	**332**	**386**	**316**	**345**	**305**

Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	1	0	1	1	1	1	0	1	1
| Class: Branchiopoda	0	0	0	0	0	0	0	0	0
| Order: Cladocera	1	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0	0	0
| Class: Copepoda	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0
Phylum: Nemata	1	1	1	1	1	0	1	1	1
Totals:	**3**	**1**	**2**	**3**	**3**	**1**	**1**	**2**	**3**

Raw Data - Flat

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Site - KZ-2 Sample - A, CC# - CC160613, Percent sampled = 100, Sieve size = 250

Dicranota	Larvae	12
Oreogeton sp.	Larvae	33
Clinocera sp.	Larvae	1
Rhyacophila vofixa group	Larvae	2
Suwallia	Larvae	12
Paraperla sp.	Larvae	12
Zapada	Juvenile/Damaged	2
Chloroperlidae	Juvenile/Damaged	28
Haploperla sp.	Larvae	3
Leuctridae	Juvenile/Damaged	2
Zapada columbiana	Larvae	4
Zapada cinctipes	Larvae	1
Zapada oregonensis group	Larvae	4
Capniidae	Juvenile/Damaged	3
Perlodidae	Juvenile/Damaged	1
Oribatida	Juvenile/Damaged	1
Sperchon	Adult	1
Trombidiformes	Juvenile/Damaged	1
Aturus	Adult	19
Rhithrogena	Larvae	5
Baetis bicaudatus	Larvae	7
Epeorus	Larvae	1
Heptageniidae	Juvenile/Damaged	6
Ameletus	Larvae	2
Ephemerellidae	Juvenile/Damaged	8
Pagastia	Larvae	6
Rheocricotopus	Larvae	8
Eukiefferiella	Larvae	7
Micropsectra	Larvae	5
Stempellina sp.	Larvae	1
Diamesa	Larvae	1
Parakiefferiella	Larvae	5
Tvetenia bavarica group	Larvae	1
Total:		**205**

Raw Data - Flat

Site - KZ-2 Sample - B, CC# - CC160614, Percent sampled = 100, Sieve size = 250		
Tvetenia bavarica group	Larvae	11
Pagastia	Larvae	10
Eukiefferiella	Larvae	8
Micropsectra	Larvae	9
Stempellina sp.	Larvae	2
Rheocricotopus	Larvae	90
Zapada	Juvenile/Damaged	1
Zapada columbiana	Larvae	21
Zapada oregonensis group	Larvae	10
Sweltsa sp.	Larvae	2
Suwallia	Larvae	33
Chloroperlidae	Juvenile/Damaged	23
Haploperla sp.	Larvae	17
Leuctridae	Juvenile/Damaged	4
Paraperla sp.	Larvae	1
Nemouridae	Juvenile/Damaged	4
Rhithrogena	Larvae	19
Heptageniidae	Juvenile/Damaged	14
Baetis	Juvenile/Damaged	23
Baetis bicaudatus	Larvae	4
Ephemerellidae	Juvenile/Damaged	1
Epeorus	Larvae	3
Ameletus	Larvae	6
Sperchon	Adult	2
Aturus	Adult	5
Oligophlebodes	Larvae	3
Dicranota	Larvae	4
Oreogeton sp.	Larvae	37
Clinocera sp.	Larvae	1
Total:		**368**

Site - KZ-2 Sample - C, CC# - CC160615, Percent sampled = 100, Sieve size = 250		
Zapada columbiana	Larvae	1
Zapada oregonensis group	Larvae	2
Suwallia	Larvae	4
Chloroperlidae	Juvenile/Damaged	32
Haploperla sp.	Larvae	4
Leuctridae	Juvenile/Damaged	2
Sweltsa sp.	Larvae	1
Rhithrogena	Larvae	6
Heptageniidae	Juvenile/Damaged	8
Baetis	Juvenile/Damaged	2
Ameletus	Larvae	16
Rhyacophila	Juvenile/Damaged	1
Sperchon	Adult	1

Aturus	Adult	14
Trombidiformes	Juvenile/Damaged	1
Oreogeton sp.	Larvae	18
Dicranota	Larvae	4
Clinocera sp.	Larvae	5
Gonomyodes sp.	Larvae	3
Enchytraeus	None	2
Chironomidae	Pupa	1
Thienemanniella	Larvae	2
Corynoneura	Larvae	1
Pagastia	Larvae	7
Eukiefferiella	Larvae	4
Boreochlus sp.	Larvae	2
Micropsectra	Larvae	16
Parakiefferiella	Larvae	1
Orthocladius	Larvae	3
Diamesinae	Larvae	1
Rheocricotopus	Larvae	80
Total:		**245**

Site - KZ-7 Sample - A, CC# - CC160616, Percent sampled = 5, Sieve size = 250

Tvetenia bavarica group	Larvae	56
Pagastia	Larvae	11
Rheocricotopus	Larvae	1
Eukiefferiella	Larvae	27
Cricotopus	Larvae	4
Orthocladius	Larvae	34
Rheotanytarsus	Larvae	111
Micropsectra	Larvae	117
Parapsyche sp.	Larvae	2
Rhyacophila	Juvenile/Damaged	1
Rhyacophila vofixa group	Larvae	1
Chelifera/ Metachela	Larvae	2
Dicranota	Larvae	2
Heptageniidae	Juvenile/Damaged	16
Baetis	Juvenile/Damaged	12
Ephemerellidae	Juvenile/Damaged	12
Baetis bicaudatus	Larvae	3
Sperchon	Adult	18
Sperchonopsis sp.	Adult	1
Aturus	Adult	3
Oribatida	Juvenile/Damaged	1
Lebertia	Adult	4
Trombidiformes	Juvenile/Damaged	1
Taenionema	Larvae	3
Zapada	Juvenile/Damaged	26

Zapada columbiana	Larvae	1
Zapada frigida	Larvae	2
Capniidae	Juvenile/Damaged	4
Chloroperlidae	Juvenile/Damaged	1
Total:		**477**

Site - KZ-7 Sample - B, CC# - CC160617, Percent sampled = 6, Sieve size = 250

Lebertia	Adult	3
Aturus	Adult	3
Sperchon	Adult	15
Rhyacophila vofixa group	Larvae	2
Chelifera/ Metachela	Larvae	3
Zapada	Juvenile/Damaged	23
Zapada cinctipes	Larvae	2
Capniidae	Juvenile/Damaged	2
Perlodidae	Juvenile/Damaged	1
Sweltsa sp.	Larvae	1
Leuctridae	Juvenile/Damaged	1
Baetis	Juvenile/Damaged	12
Baetis bicaudatus	Larvae	1
Heptageniidae	Juvenile/Damaged	4
Ephemerellidae	Juvenile/Damaged	9
Pagastia	Larvae	9
Stempellina sp.	Larvae	6
Tvetenia bavarica group	Larvae	22
Eukiefferiella	Larvae	4
Orthocladius	Larvae	24
Heleniella sp.	Larvae	1
Rheotanytarsus	Larvae	80
Micropsectra	Larvae	104
Total:		**332**

Site - KZ-7 Sample - C, CC# - CC160618, Percent sampled = 5, Sieve size = 250

Stempellina sp.	Larvae	5
Pagastia	Larvae	4
Rheocricotopus	Larvae	6
Tvetenia bavarica group	Larvae	33
Eukiefferiella	Larvae	1
Thienemannimyia group	Larvae	5
Parakiefferiella	Larvae	37
Rheotanytarsus	Larvae	95
Micropsectra	Larvae	104
Haploperla sp.	Larvae	2
Perlodidae	Juvenile/Damaged	1
Zapada	Juvenile/Damaged	28

Zapada cinctipes	Larvae	3
Capniidae	Juvenile/Damaged	7
Taeniopterygidae	Juvenile/Damaged	2
Sperchon	Adult	10
Lebertia	Adult	3
Hygrobates	Adult	3
Aturus	Adult	8
Oribatida	Juvenile/Damaged	1
Baetis	Juvenile/Damaged	13
Baetis bicaudatus	Larvae	1
Ephemerellidae	Juvenile/Damaged	8
Heptageniidae	Juvenile/Damaged	2
Ameletus	Larvae	3
Probezzia	Larvae	1
Total:		**386**

Site - KZ-17 Sample - A, CC# - CC160619, Percent sampled = 16, Sieve size = 250

Chelifera/ Metachela	Larvae	3
Dicranota	Larvae	3
Aturus	Adult	1
Feltria sp.	Adult	1
Simuliidae	Juvenile/Damaged	1
Rhyacophila vofixa group	Larvae	1
Atractides	Adult	1
Parapsyche sp.	Larvae	2
Helodon sp.	Larvae	1
Heptageniidae	Juvenile/Damaged	10
Ephemerellidae	Juvenile/Damaged	2
Epeorus	Larvae	1
Ameletus	Larvae	1
Baetis	Juvenile/Damaged	15
Baetis bicaudatus	Larvae	25
Zapada	Juvenile/Damaged	41
Zapada frigida	Larvae	1
Plecoptera	Juvenile/Damaged	1
Taenionema	Larvae	1
Taeniopterygidae	Juvenile/Damaged	3
Leuctridae	Juvenile/Damaged	1
Capniidae	Juvenile/Damaged	6
Chloroperlidae	Juvenile/Damaged	1
Enchytraeus	None	1
Pagastia	Larvae	22
Tvetenia bavarica group	Larvae	1
Eukiefferiella	Larvae	101
Micropsectra	Larvae	19
Parakiefferiella	Larvae	33

Brillia sp.	Larvae	1
Rheocricotopus	Larvae	1
Orthocladius	Larvae	14
Total:		**316**

Site - KZ-17 Sample - B, CC# - CC160620, Percent sampled = 5, Sieve size = 250

Enchytraeus	None	4
Pagastia	Larvae	35
Pseudodiamesa sp.	Larvae	2
Brillia sp.	Larvae	4
Diamesa	Larvae	3
Rheocricotopus	Larvae	2
Krenosmittia sp.	Larvae	1
Micropsectra	Larvae	21
Eukiefferiella	Larvae	7
Hydrobaenus	Larvae	4
Tvetenia tshernovskii	Larvae	2
Orthocladius	Larvae	145
Baetis	Juvenile/Damaged	3
Baetis bicaudatus	Larvae	20
Heptageniidae	Juvenile/Damaged	17
Ephemerellidae	Juvenile/Damaged	6
Ameletus	Larvae	2
Drunella doddsii	Larvae	1
Zapada	Juvenile/Damaged	39
Zapada cinctipes	Larvae	3
Zapada frigida	Larvae	1
Capniidae	Juvenile/Damaged	9
Taeniopterygidae	Juvenile/Damaged	3
Aturus	Adult	2
Rhyacophila	Juvenile/Damaged	4
Dicranota	Larvae	2
Trombidiformes	Juvenile/Damaged	1
Chelifera/ Metachela	Larvae	1
Probezzia	Larvae	1
Total:		**345**

Site - KZ-17 Sample - C, CC# - CC160621, Percent sampled = 23, Sieve size = 250

Sperchon	Adult	2
Rhyacophila	Juvenile/Damaged	1
Aturus	Adult	1
Heptageniidae	Juvenile/Damaged	24
Ephemerellidae	Juvenile/Damaged	4
Drunella doddsii	Larvae	1
Baetis	Juvenile/Damaged	23

Raw Data - Flat

Baetis bicaudatus	Larvae	41
Acentrella turbida	Larvae	1
Dicranota	Larvae	2
Diptera	Juvenile/Damaged	1
Helodon sp.	Larvae	1
Simulium	Larvae	22
Zapada	Juvenile/Damaged	30
Zapada cinctipes	Larvae	3
Zapada columbiana	Larvae	1
Perlodidae	Juvenile/Damaged	1
Chloroperlidae	Juvenile/Damaged	3
Leuctridae	Juvenile/Damaged	6
Taenionema	Larvae	6
Taeniopterygidae	Juvenile/Damaged	1
Capniidae	Juvenile/Damaged	10
Suwallia	Larvae	1
Chironomidae	Pupa	1
Pagastia	Larvae	13
Brillia sp.	Larvae	2
Heleniella sp.	Larvae	1
Tvetenia bavarica group	Larvae	2
Orthocladius	Larvae	9
Micropsectra	Larvae	49
Eukiefferiella	Larvae	42
Total:		**305**

Subsample Record

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

Client	Project	Site	Sample	CC#	250 micron fraction	
					% Sampled	# Invertebrates
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-2	A	CC160613	100%	208
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-2	B	CC160614	100%	369
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-2	C	CC160615	100%	247
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-7	A	CC160616	5%	480
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-7	B	CC160617	6%	335
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-7	C	CC160618	5%	387
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-17	A	CC160619	16%	317
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-17	B	CC160620	5%	347
Alexco - Access	Kudz Ze Kayah (BMC-15-01)	KZ-17	C	CC160621	23%	308

Taxa Codes

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
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Reference for feeding codes can be found at http://safit.org/TVFFG.html

	Functional Feeding Groups	ITIS Number	Tolerance	Voltinism
Phylum: Arthropoda	Unclassified	82696		UV
Subphylum: Hexapoda	Unclassified	563886		UV
| Class: Insecta	Unclassified	99208		UV
| Order: Ephemeroptera	Collector-Gatherer	100502		UV
| Family: Ameletidae	Unclassified	568544		UV
Ameletus	Collector-Gatherer	100996		UV
| Family: Baetidae	Collector-Gatherer	100755	4	Unclassified
Acentrella turbida	Collector-Gatherer	568574	4	Unclassified
Baetis	Collector-Gatherer	100800	5	MV
Baetis bicaudatus	Collector-Gatherer	100823	4	Unclassified
| Family: Ephemerellidae	Unclassified	101232		Unclassified
Drunella doddsii	Collector-Gatherer	101365		UV
| Family: Heptageniidae	Unclassified	100504		Unclassified
Epeorus	Scraper	100626		Unclassified
Rhithrogena	Scraper	100572		Unclassified
| Order: Plecoptera	Unclassified	102467		Unclassified
| Family: Capniidae	Shredder-Herbivore	102643		Unclassified
| Family: Chloroperlidae	Predator	103202		Unclassified
Haploperla sp.	Predator	103260		Unclassified
Paraperla sp.	Predator	103233		Unclassified
Suwallia	Predator	103254	1	Unclassified
Sweltsa sp.	Predator	103273	1	SV
| Family: Leuctridae	Shredder-Herbivore	102840		Unclassified
| Family: Nemouridae	Shredder-Herbivore	102517		Unclassified
Zapada	Shredder-Herbivore	102591	2	Unclassified
Zapada cinctipes	Shredder-Herbivore	102594	2	UV
Zapada columbiana	Shredder-Herbivore	102596	2	SV
Zapada frigida	Shredder-Herbivore	102601	2	Unclassified
Zapada oregonensis group	Shredder-Herbivore	102591B	2	Unclassified
| Family: Perlodidae	Predator	102994	2	Unclassified
| Family: Taeniopterygidae	Unclassified	102788		Unclassified
Taenionema	Omnivore	102519	2	Unclassified
| Order: Trichoptera	Unclassified	115095		Unclassified

Taxa Codes

	Functional Feeding Groups	ITIS Number	Tolerance	Voltinism
| Family: Hydropsychidae	Collector-Filterer	115398		Unclassified
Parapsyche sp.	Predator	115556		Unclassified
| Family: Rhyacophilidae	Unclassified	115096		Unclassified
Rhyacophila	Predator	115097		Unclassified
Rhyacophila vofixa group	Predator	115097S		Unclassified
| Family: Uenoidae	Unclassified	568757		Unclassified
Oligophlebodes	Scraper	116039		Unclassified
| Order: Diptera	Unclassified	118831		
| Family: Ceratopogonidae	Predator	127076	6	
Probezzia	Predator	127729	6	
| Family: Chironomidae	Unclassified	127917	6	
| Subfamily: Chironominae	Collector-Gatherer	129228	7	
| Tribe: Tanytarsini	Collector-Gatherer	129872	7	
Micropsectra	Collector-Gatherer	129890	7	
Rheotanytarsus	Collector-Filterer	129952	6	
Stempellina sp.	Collector-Gatherer	129962	2	
| Subfamily: Diamesinae	Collector-Gatherer	128341	2	
| Tribe: Diamesini	Collector-Gatherer	128351	5	
Diamesa	Collector-Gatherer	128355	5	
Pagastia	Collector-Gatherer	128401	1	
Pseudodiamesa sp.	Collector-Gatherer	128416	6	
| Subfamily: Orthocladiinae	Unclassified	128457	5	
Brillia sp.	Shredder-Herbivore	128477	5	
Corynoneura	Collector-Gatherer	128563	7	
Cricotopus	Collector-Gatherer	128575	7	
Eukiefferiella	Omnivore	128689	8	
Heleniella sp.	Collector-Gatherer	128730	6	
Hydrobaenus	Collector-Gatherer	128750	8	
Krenosmittia sp.	Collector-Gatherer	128771	1	
Orthocladius	Collector-Gatherer	128874	6	
Parakiefferiella	Collector-Gatherer	128968	4	
Rheocricotopus	Omnivore	129086	6	
Thienemanniella	Collector-Gatherer	129182	6	
Tvetenia	Collector-Gatherer	129197	5	
Tvetenia bavarica group	Collector-Gatherer	129197B	5	
Tvetenia tshernovskii	Collector-Gatherer	129197A	5	
| Subfamily: Podonominae	Collector-Gatherer	127952	6	
| Tribe: Boreochlini	Unclassified	127953	6	
Boreochlus sp.	Collector-Gatherer	127954	6	
| Subfamily: Tanypodinae	Predator	127994	6	
| Tribe: Pentaneurini	Predator	128078	6	
Thienemannimyia group	Predator	127917N	6	
| Family: Empididae	Predator	135830	6	
Chelifera/ Metachela	Predator	135830	6	

Taxa Codes

	Functional Feeding Groups	ITIS Number	Tolerance	Voltinism
Clinocera sp.	Predator	135849	6	
Oreogeton sp.	Predator	136377	6	
| Family: Simuliidae	Collector-Filterer	126640	6	
Helodon sp.	Collector-Filterer	126640		
Simulium	Collector-Filterer	126774	6	
| Family: Tipulidae	Shredder-Herbivore	118840	3	
Dicranota	Predator	121027	3	
Gonomyodes sp.	Collector-Gatherer	120722		
Subphylum: Chelicerata	Unclassified	82697	5	
| Class: Arachnida	Predator	82708	5	
| Order: Trombidiformes	Predator	82769	5	
| Family: Aturidae	Predator	82973	5	Unclassified
Aturus	Predator	82974	5	Unclassified
| Family: Feltriidae	Predator	83313	5	Unclassified
Feltria sp.	Predator	83314	5	Unclassified
| Family: Hygrobatidae	Unclassified	83281	8	Unclassified
Atractides	Predator	83282	8	Unclassified
Hygrobates	Predator	83297	8	Unclassified
| Family: Lebertiidae	Predator	83033	8	Unclassified
Lebertia	Predator	83034	8	Unclassified
| Family: Sperchontidae	Unclassified	895710	8	Unclassified
Sperchon	Predator	83006	8	Unclassified
Sperchonopsis sp.	Predator	83029	8	Unclassified
| Order: Oribatei	Predator	83544	5	
| Family: Oribatidae	Predator	83538	5	
Oribatida	Predator	83538	5	
Phylum: Annelida	Unclassified	64357	10	
Subphylum: Clitellata	Unclassified	568832	10	
| Class: Oligochaeta	Collector-Gatherer	68422	10	
| Order: Tubificida	Unclassified	68498	10	
| Family: Enchytraeidae	Collector-Gatherer	68510	10	
Enchytraeus	Collector-Gatherer	68531	10	

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250-494-7553

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-2	A	CC160613	12	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Oreogeton sp.	136377		P	Larvae	Oreogeton sp.	KZ-2	A	CC160613	33	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Clinocera sp.	135849		P	Larvae	Clinocera sp.	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Suwallia	103254	Unclassified	P	Larvae	Suwallia	KZ-2	A	CC160613	12	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-2	A	CC160613	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-2	A	CC160613	28	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-2	A	CC160613	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada columbiana	102596	SV	SH	Larvae	Zapada columbiana	KZ-2	A	CC160613	4	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada cinctipes	102594	UV	SH	Larvae	Zapada cinctipes	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-2	A	CC160613	3	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae				102994	Unclassified	P	Juvenile/Damaged	Perlodidae	KZ-2	A	CC160613	1	100	250	
Arthropoda	Chelicerata	Arachnida	Oribatei	Oribatidae			Oribatida	83538		P	Juvenile/Damaged	Oribatida	KZ-2	A	CC160613	1	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-2	A	CC160613	1	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes					82769		P	Juvenile/Damaged	Trombidiformes	KZ-2	A	CC160613	1	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-2	A	CC160613	19	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Rhithrogena	100572	Unclassified	SC	Larvae	Rhithrogena	KZ-2	A	CC160613	5	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-2	A	CC160613	7	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Epeorus	100626	Unclassified	SC	Larvae	Epeorus	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-2	A	CC160613	6	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-2	A	CC160613	2	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-2	A	CC160613	8	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-2	A	CC160613	6	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-2	A	CC160613	8	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-2	A	CC160613	7	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-2	A	CC160613	5	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Stempellina sp.	129962		CG	Larvae	Stempellina sp.	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Diamesa	128355		CG	Larvae	Diamesa	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Parakiefferiella	128968		CG	Larvae	Parakiefferiella	KZ-2	A	CC160613	5	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-2	A	CC160613	1	100	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila vofixa group	115097S	Unclassified	P	Larvae	Rhyacophila vofixa group	KZ-2	A	CC160613	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Paraperla sp.	103233	Unclassified	P	Larvae	Paraperla sp.	KZ-2	A	CC160613	12	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Haploperla sp.	103260	Unclassified	P	Larvae	Haploperla sp.	KZ-2	A	CC160613	3	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada oregonensis group	102591B	Unclassified	SH	Larvae	Zapada oregonensis group	KZ-2	A	CC160613	4	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada oregonensis group	102591B	Unclassified	SH	Larvae	Zapada oregonensis group	KZ-2	B	CC160614	10	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Haploperla sp.	103260	Unclassified	P	Larvae	Haploperla sp.	KZ-2	B	CC160614	17	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Paraperla sp.	103233	Unclassified	P	Larvae	Paraperla sp.	KZ-2	B	CC160614	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-2	B	CC160614	11	100	250	

Subsample - Flat

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-2	B	CC160614	10	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-2	B	CC160614	8	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-2	B	CC160614	9	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Stempellina sp.	129962		CG	Larvae	Stempellina sp.	KZ-2	B	CC160614	2	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-2	B	CC160614	90	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-2	B	CC160614	1	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada columbiana	102596	SV	SH	Larvae	Zapada columbiana	KZ-2	B	CC160614	21	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Sweltsa sp.	103273	SV	P	Larvae	Sweltsa sp.	KZ-2	B	CC160614	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Suwallia	103254	Unclassified	P	Larvae	Suwallia	KZ-2	B	CC160614	33	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-2	B	CC160614	23	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-2	B	CC160614	4	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae				102517	Unclassified	SH	Juvenile/Damaged	Nemouridae	KZ-2	B	CC160614	4	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Rhithrogena	100572	Unclassified	SC	Larvae	Rhithrogena	KZ-2	B	CC160614	19	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-2	B	CC160614	14	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-2	B	CC160614	23	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-2	B	CC160614	4	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-2	B	CC160614	1	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Epeorus	100626	Unclassified	SC	Larvae	Epeorus	KZ-2	B	CC160614	3	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-2	B	CC160614	6	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-2	B	CC160614	2	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-2	B	CC160614	5	100	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Uenoidae			Oligophlebodes	116039	Unclassified	SC	Larvae	Oligophlebodes	KZ-2	B	CC160614	3	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-2	B	CC160614	4	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Oreogeton sp.	136377		P	Larvae	Oreogeton sp.	KZ-2	B	CC160614	37	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Clinocera sp.	135849		P	Larvae	Clinocera sp.	KZ-2	B	CC160614	1	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada columbiana	102596	SV	SH	Larvae	Zapada columbiana	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Suwallia	103254	Unclassified	P	Larvae	Suwallia	KZ-2	C	CC160615	4	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-2	C	CC160615	32	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Sweltsa sp.	103273	SV	P	Larvae	Sweltsa sp.	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Rhithrogena	100572	Unclassified	SC	Larvae	Rhithrogena	KZ-2	C	CC160615	6	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-2	C	CC160615	8	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-2	C	CC160615	16	100	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila	115097	Unclassified	P	Juvenile/Damaged	Rhyacophila	KZ-2	C	CC160615	1	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-2	C	CC160615	1	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-2	C	CC160615	14	100	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes					82769		P	Juvenile/Damaged	Trombidiformes	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Oreogeton sp.	136377		P	Larvae	Oreogeton sp.	KZ-2	C	CC160615	18	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-2	C	CC160615	4	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Clinocera sp.	135849		P	Larvae	Clinocera sp.	KZ-2	C	CC160615	5	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Gonomyodes sp.	120722		CG	Larvae	Gonomyodes sp.	KZ-2	C	CC160615	3	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae				127917			Pupa	Chironomidae	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Thienemanniella	129182		CG	Larvae	Thienemanniella	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Corynoneura	128563		CG	Larvae	Corynoneura	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-2	C	CC160615	7	100	250	

Subsample - Flat

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-2	C	CC160615	4	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Podonominae	Boreochlini	Boreochlus sp.	127954		CG	Larvae	Boreochlus sp.	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-2	C	CC160615	16	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Parakiefferiella	128968		CG	Larvae	Parakiefferiella	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae			128341		CG	Larvae	Diamesinae	KZ-2	C	CC160615	1	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-2	C	CC160615	80	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada oregonensis group	102591B	Unclassified	SH	Larvae	Zapada oregonensis group	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Haploperla sp.	103260	Unclassified	P	Larvae	Haploperla sp.	KZ-2	C	CC160615	4	100	250	
Annelida	Clitellata	Oligochaeta	Tubificida	Enchytraeidae			Enchytraeus	68531		CG	None	Enchytraeus	KZ-2	C	CC160615	2	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-2	C	CC160615	3	100	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-7	A	CC160616	34	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila vofixa group	115097S	Unclassified	P	Larvae	Rhyacophila vofixa group	KZ-7	A	CC160616	1	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Lebertiidae			Lebertia	83034	Unclassified	P	Adult	Lebertia	KZ-7	A	CC160616	4	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada frigida	102601	Unclassified	SH	Larvae	Zapada frigida	KZ-7	A	CC160616	2	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-7	A	CC160616	56	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-7	A	CC160616	11	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-7	A	CC160616	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-7	A	CC160616	27	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Cricotopus	128575		CG	Larvae	Cricotopus	KZ-7	A	CC160616	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Rheotanytarsus	129952		CF	Larvae	Rheotanytarsus	KZ-7	A	CC160616	111	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-7	A	CC160616	117	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Hydropsychidae			Parapsyche sp.	115556	Unclassified	P	Larvae	Parapsyche sp.	KZ-7	A	CC160616	2	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila	115097	Unclassified	P	Juvenile/Damaged	Rhyacophila	KZ-7	A	CC160616	1	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Hydropsychidae			Parapsyche sp.	115556	Unclassified	P	Larvae	Parapsyche sp.	KZ-7	A	CC160616	2	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila	115097	Unclassified	P	Juvenile/Damaged	Rhyacophila	KZ-7	A	CC160616	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Chelifera/ Metachela	135830		P	Larvae	Chelifera/ Metachela	KZ-7	A	CC160616	2	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-7	A	CC160616	2	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-7	A	CC160616	16	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-7	A	CC160616	12	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-7	A	CC160616	12	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-7	A	CC160616	3	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-7	A	CC160616	18	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchonopsis sp.	83029	Unclassified	P	Adult	Sperchonopsis sp.	KZ-7	A	CC160616	1	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-7	A	CC160616	3	5	250	
Arthropoda	Chelicerata	Arachnida	Oribatei	Oribatidae			Oribatida	83538		P	Juvenile/Damaged	Oribatida	KZ-7	A	CC160616	1	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes					82769		P	Juvenile/Damaged	Trombidiformes	KZ-7	A	CC160616	1	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae			Taenionema	102519	Unclassified	OM	Larvae	Taenionema	KZ-7	A	CC160616	3	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-7	A	CC160616	26	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada columbiana	102596	SV	SH	Larvae	Zapada columbiana	KZ-7	A	CC160616	1	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-7	A	CC160616	4	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-7	A	CC160616	1	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-7	B	CC160617	3	6	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-7	B	CC160617	15	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Chelifera/ Metachela	135830		P	Larvae	Chelifera/ Metachela	KZ-7	B	CC160617	3	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-7	B	CC160617	23	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada cinctipes	102594	UV	SH	Larvae	Zapada cinctipes	KZ-7	B	CC160617	2	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-7	B	CC160617	2	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae				102994	Unclassified	P	Juvenile/Damaged	Perlodidae	KZ-7	B	CC160617	1	6	250	

Subsample - Flat

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Sweltsa sp.	103273	SV	P	Larvae	Sweltsa sp.	KZ-7	B	CC160617	1	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-7	B	CC160617	1	6	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-7	B	CC160617	12	6	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-7	B	CC160617	1	6	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-7	B	CC160617	4	6	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-7	B	CC160617	9	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-7	B	CC160617	9	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Stempellina sp.	129962		CG	Larvae	Stempellina sp.	KZ-7	B	CC160617	6	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-7	B	CC160617	22	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-7	B	CC160617	4	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Heleniella sp.	128730		CG	Larvae	Heleniella sp.	KZ-7	B	CC160617	1	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Rheotanytarsus	129952		CF	Larvae	Rheotanytarsus	KZ-7	B	CC160617	80	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-7	B	CC160617	104	6	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Lebertiidae			Lebertia	83034	Unclassified	P	Adult	Lebertia	KZ-7	B	CC160617	3	6	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila vofixa group	115097S	Unclassified	P	Larvae	Rhyacophila vofixa group	KZ-7	B	CC160617	2	6	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-7	B	CC160617	24	6	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Haploperla sp.	103260	Unclassified	P	Larvae	Haploperla sp.	KZ-7	C	CC160618	2	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Lebertiidae			Lebertia	83034	Unclassified	P	Adult	Lebertia	KZ-7	C	CC160618	3	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Stempellina sp.	129962		CG	Larvae	Stempellina sp.	KZ-7	C	CC160618	5	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-7	C	CC160618	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-7	C	CC160618	6	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-7	C	CC160618	33	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-7	C	CC160618	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Thienemannimyia group	127917N		P	Larvae	Thienemannimyia group	KZ-7	C	CC160618	5	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Parakiefferiella	128968		CG	Larvae	Parakiefferiella	KZ-7	C	CC160618	37	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Rheotanytarsus	129952		CF	Larvae	Rheotanytarsus	KZ-7	C	CC160618	95	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-7	C	CC160618	104	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae				102994	Unclassified	P	Juvenile/Damaged	Perlodidae	KZ-7	C	CC160618	1	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-7	C	CC160618	28	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada cinctipes	102594	UV	SH	Larvae	Zapada cinctipes	KZ-7	C	CC160618	3	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-7	C	CC160618	7	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae				102788	Unclassified		Juvenile/Damaged	Taeniopterygidae	KZ-7	C	CC160618	2	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-7	C	CC160618	10	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Hygrobatidae			Hygrobates	83297	Unclassified	P	Adult	Hygrobates	KZ-7	C	CC160618	3	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-7	C	CC160618	8	5	250	
Arthropoda	Chelicerata	Arachnida	Oribatei	Oribatidae			Oribatida	83538		P	Juvenile/Damaged	Oribatida	KZ-7	C	CC160618	1	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-7	C	CC160618	13	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-7	C	CC160618	1	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-7	C	CC160618	8	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-7	C	CC160618	2	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-7	C	CC160618	3	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Ceratopogonidae			Probezzia	127729		P	Larvae	Probezzia	KZ-7	C	CC160618	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Chelifera/ Metachela	135830		P	Larvae	Chelifera/ Metachela	KZ-17	A	CC160619	3	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-17	A	CC160619	3	16	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-17	A	CC160619	1	16	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Feltriidae			Feltria sp.	83314	Unclassified	P	Adult	Feltria sp.	KZ-17	A	CC160619	1	16	250	

Subsample - Flat

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Hygrobatidae			Atractides	83282	Unclassified	P	Adult	Atractides	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Hydropsychidae			Parapsyche sp.	115556	Unclassified	P	Larvae	Parapsyche sp.	KZ-17	A	CC160619	2	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Simuliidae			Helodon sp.	126640		CF	Larvae	Helodon sp.	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-17	A	CC160619	10	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-17	A	CC160619	2	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae			Epeorus	100626	Unclassified	SC	Larvae	Epeorus	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-17	A	CC160619	15	16	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-17	A	CC160619	25	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-17	A	CC160619	41	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera					102467	Unclassified		Juvenile/Damaged	Plecoptera	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae			Taenionema	102519	Unclassified	OM	Larvae	Taenionema	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae				102788	Unclassified		Juvenile/Damaged	Taeniopterygidae	KZ-17	A	CC160619	3	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-17	A	CC160619	6	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-17	A	CC160619	22	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-17	A	CC160619	101	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-17	A	CC160619	19	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Parakiefferiella	128968		CG	Larvae	Parakiefferiella	KZ-17	A	CC160619	33	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Brillia sp.	128477		SH	Larvae	Brillia sp.	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Simuliidae				126640		CF	Juvenile/Damaged	Simuliidae	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila vofixa group	115097S	Unclassified	P	Larvae	Rhyacophila vofixa group	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada frigida	102601	Unclassified	SH	Larvae	Zapada frigida	KZ-17	A	CC160619	1	16	250	
Annelida	Clitellata	Oligochaeta	Tubificida	Enchytraeidae			Enchytraeus	68531		CG	None	Enchytraeus	KZ-17	A	CC160619	1	16	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-17	A	CC160619	14	16	250	
Annelida	Clitellata	Oligochaeta	Tubificida	Enchytraeidae			Enchytraeus	68531		CG	None	Enchytraeus	KZ-17	B	CC160620	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-17	B	CC160620	145	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada frigida	102601	Unclassified	SH	Larvae	Zapada frigida	KZ-17	B	CC160620	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-17	B	CC160620	35	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pseudodiamesa sp.	128416		CG	Larvae	Pseudodiamesa sp.	KZ-17	B	CC160620	2	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Brillia sp.	128477		SH	Larvae	Brillia sp.	KZ-17	B	CC160620	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Diamesa	128355		CG	Larvae	Diamesa	KZ-17	B	CC160620	3	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Rheocricotopus	129086		OM	Larvae	Rheocricotopus	KZ-17	B	CC160620	2	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Krenosmittia sp.	128771		CG	Larvae	Krenosmittia sp.	KZ-17	B	CC160620	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-17	B	CC160620	21	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-17	B	CC160620	7	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Hydrobaenus	128750		CG	Larvae	Hydrobaenus	KZ-17	B	CC160620	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia tshernovskii	129197A		CG	Larvae	Tvetenia tshernovskii	KZ-17	B	CC160620	2	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-17	B	CC160620	3	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-17	B	CC160620	20	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-17	B	CC160620	17	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-17	B	CC160620	6	5	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ameletidae			Ameletus	100996	UV	CG	Larvae	Ameletus	KZ-17	B	CC160620	2	5	250	

Subsample - Flat

Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe	Taxonomy	ITIS Code	Voltinism	Functional Feeding Group	Maturity	Name	Site	Sample	CC#	Count	Percent Sampled	Seive Size	Season
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae			Drunella doddsii	101365	UV	CG	Larvae	Drunella doddsii	KZ-17	B	CC160620	1	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-17	B	CC160620	39	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada cinctipes	102594	UV	SH	Larvae	Zapada cinctipes	KZ-17	B	CC160620	3	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-17	B	CC160620	9	5	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae				102788	Unclassified		Juvenile/Damaged	Taeniopterygidae	KZ-17	B	CC160620	3	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-17	B	CC160620	2	5	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila	115097	Unclassified	P	Juvenile/Damaged	Rhyacophila	KZ-17	B	CC160620	4	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-17	B	CC160620	2	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes					82769		P	Juvenile/Damaged	Trombidiformes	KZ-17	B	CC160620	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Empididae			Chelifera/ Metachela	135830		P	Larvae	Chelifera/ Metachela	KZ-17	B	CC160620	1	5	250	
Arthropoda	Hexapoda	Insecta	Diptera	Ceratopogonidae			Probezzia	127729		P	Larvae	Probezzia	KZ-17	B	CC160620	1	5	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae			Sperchon	83006	Unclassified	P	Adult	Sperchon	KZ-17	C	CC160621	2	23	250	
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae			Rhyacophila	115097	Unclassified	P	Juvenile/Damaged	Rhyacophila	KZ-17	C	CC160621	1	23	250	
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Aturidae			Aturus	82974	Unclassified	P	Adult	Aturus	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Heptageniidae				100504	Unclassified		Juvenile/Damaged	Heptageniidae	KZ-17	C	CC160621	24	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae				101232	Unclassified		Juvenile/Damaged	Ephemerellidae	KZ-17	C	CC160621	4	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae			Drunella doddsii	101365	UV	CG	Larvae	Drunella doddsii	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis	100800	MV	CG	Juvenile/Damaged	Baetis	KZ-17	C	CC160621	23	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Baetis bicaudatus	100823	Unclassified	CG	Larvae	Baetis bicaudatus	KZ-17	C	CC160621	41	23	250	
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Baetidae			Acentrella turbida	568574	Unclassified	CG	Larvae	Acentrella turbida	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae			Dicranota	121027		P	Larvae	Dicranota	KZ-17	C	CC160621	2	23	250	
Arthropoda	Hexapoda	Insecta	Diptera					118831			Juvenile/Damaged	Diptera	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Simuliidae			Helodon sp.	126640		CF	Larvae	Helodon sp.	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Simuliidae			Simulium	126774		CF	Larvae	Simulium	KZ-17	C	CC160621	22	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada	102591	Unclassified	SH	Juvenile/Damaged	Zapada	KZ-17	C	CC160621	30	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada cinctipes	102594	UV	SH	Larvae	Zapada cinctipes	KZ-17	C	CC160621	3	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae			Zapada columbiana	102596	SV	SH	Larvae	Zapada columbiana	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae				102994	Unclassified	P	Juvenile/Damaged	Perlodidae	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae				103202	Unclassified	P	Juvenile/Damaged	Chloroperlidae	KZ-17	C	CC160621	3	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Leuctridae				102840	Unclassified	SH	Juvenile/Damaged	Leuctridae	KZ-17	C	CC160621	6	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae			Taenionema	102519	Unclassified	OM	Larvae	Taenionema	KZ-17	C	CC160621	6	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae				102788	Unclassified		Juvenile/Damaged	Taeniopterygidae	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae				102643	Unclassified	SH	Juvenile/Damaged	Capniidae	KZ-17	C	CC160621	10	23	250	
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae			Suwallia	103254	Unclassified	P	Larvae	Suwallia	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae				127917			Pupa	Chironomidae	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini	Pagastia	128401		CG	Larvae	Pagastia	KZ-17	C	CC160621	13	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Brillia sp.	128477		SH	Larvae	Brillia sp.	KZ-17	C	CC160621	2	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Heleniella sp.	128730		CG	Larvae	Heleniella sp.	KZ-17	C	CC160621	1	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Tvetenia bavarica group	129197B		CG	Larvae	Tvetenia bavarica group	KZ-17	C	CC160621	2	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra	129890		CG	Larvae	Micropsectra	KZ-17	C	CC160621	49	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Eukiefferiella	128689		OM	Larvae	Eukiefferiella	KZ-17	C	CC160621	42	23	250	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae		Orthocladius	128874		CG	Larvae	Orthocladius	KZ-17	C	CC160621	9	23	250	

Sorting Efficiency

Cordillera Consulting

Project: Kudz Ze Kayah (BMC-15-01)
Alexco - Access, Kai Woloshyn; Andrew MacPhail; Scott Keesey
Taxonomist: Sue Salter
suesalter@cordilleraconsulting.ca
250-494-7553

		Total from Sample	Percent Efficiency
Site - QC Sample - QC 1, CC# - CC160617, Percent sampled = 6, Sieve size = 250			
Chironomidae	5		
Trombidiformes	1		
Total:	**6**	**335**	**98%**

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APPENDIX F

2015 PERIPHYTON DATA

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ABUNDANCE

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Achnanthes flexella	1,879,167			4,832,143		777,586		1,960,870		
Achnanthes hauckiana						777,586				
Achnanthes lanceolata								980,435	4,510,000	2,505,556
Achnanthes linearis	626,389	81,115		4,832,143	1,073,810		939,583			
Achnanthes minutissima	60,133,333	2,676,799	22,550,000	61,207,143	39,730,952	35,768,966	45,100,000	14,706,522	7,892,500	1,002,222
Amphipleura pellucida			469,792							501,111
Amphora ovalis				1,610,714						501,111
Amphora perpusilla									1,127,500	
Anomoeoneis vitrea	3,131,944			4,832,143			1,879,167			
Caloneis ventricosa				4,832,143						
Caloneis ventricosa minuta	626,389								1,127,500	
Chlamydomonas sp.		81,115								
Cocconeis placentula			939,583	1,610,714				22,550,000	3,382,500	16,035,556
Cymbella affinis			469,792	3,221,429				1,960,870	1,127,500	501,111
Cymbella cesatii	2,505,556			1,610,714						
Cymbella cymbiformes						1,555,172				
Cymbella lunata	1,252,778									
Cymbella microcephala	626,389					1,555,172				
Cymbella minuta	1,252,778		2,348,958	11,275,000	3,221,429	7,775,862	1,879,167	9,804,348	12,402,500	
Cymbella sinuata		81,115				777,586	939,583	980,435		
Cymbella tumida										501,111
Denticula elegans	626,389									
Diatoma hiemale mesodon						777,586		980,435	6,765,000	
Diatoma tenue	1,879,167		40,871,875	4,832,143	9,664,289	3,887,931	939,583	980,435		1,002,222
Diatoma tenue elongatum	1,879,167			3,221,429	5,369,048	3,110,345				
Diatoma vulgare	626,389		2,348,958	1,610,714					3,382,500	
Didymosphenia geminata			469,792		1,073,810		939,583	980,435		
Epithemia turgida								980,435		501,111
Eunotia pectinalis							939,583			
Fragilaria capucina mesolepta			469,792			777,586				
Fragilaria construens				1,610,714					2,255,000	
Fragilaria construens venter				16,107,143	6,442,857	3,887,931	4,697,917		7,892,500	1,002,222
Fragilaria leptostauron				1,610,714		777,586			1,127,500	
Fragilaria pinnata	1,252,778			9,664,286			3,758,333		9,020,000	
Fragilaria vaucheria			4,228,125	11,275,000	10,738,095	5,443,103	13,154,167	24,510,870	9,020,000	8,017,778
Frustulia rhomboides										501,111
Gomphonema angustatum	626,389	811,151	1,879,167	9,664,286	3,221,429	5,443,103	7,516,667	2,941,304	13,530,000	3,006,667

ABUNDANCE

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Gomphonema clevei		81,115								
Gomphonema gracile	626,389									
Gomphonema olivaceum										1,002,222
Gomphonema subclavatum	626,389	324,460	469,792	1,610,714	1,073,810	777,586	939,583	2,941,304	2,255,000	501,111
Gomphonema tenellum							939,583			
Hannaea arcus		4,623,561	469,792	1,610,714	28,992,857	9,331,034	10,335,417	2,941,304	3,382,500	501,111
Melosira italica							939,583			
Melosira varians								2,941,304		4,510,000
Meridion circulare						3,887,931		1,960,870	2,255,000	4,008,889
Navicula anglica					1,073,810					
Navicula cryptocephala	1,252,778			3,221,429	1,073,810	1,555,172	939,583	3,921,739	5,637,500	1,503,333
Navicula cryptocephala veneta	626,389			4,832,143		1,555,172	2,818,750	3,921,739	1,127,500	501,111
Navicula gregaria										501,111
Navicula minuscula						1,555,172				
Navicula mutica										501,111
Navicula pupula					1,073,810					
Navicula radiosa	626,389									
Navicula sp.	1,252,778						939,583	980,435	1,127,500	
Nitzschia acicularis						777,586				
Nitzschia amphibia								980,435		
Nitzschia capitellata						777,586				
Nitzschia constricta				1,610,714						
Nitzschia dissipata									3,382,500	1,002,222
Nitzschia frustulum	2,505,556			4,832,143		777,586	1,879,167	1,960,870	1,127,500	
Nitzschia palea			939,583				939,583	1,960,870		1,002,222
Nitzschia paleacea								1,960,870		1,002,222
Oscillatoria sp.		405,576				777,586				
Pinnularia sp.	626,389			1,610,714	1,073,810		939,583		1,127,500	501,111
Rhoicosphenia curvata								980,435		501,111
Rhopalodia gibba										501,111
Synedra radians	626,389					777,586				
Synedra rumpens	3,131,944		5,167,708	6,442,857	5,369,048	2,332,759	4,697,917	980,435		1,002,222
Synedra ulna	4,384,722	162,230	2,348,958	1,610,714	8,590,476	7,775,862	2,818,750	6,863,043	19,167,500	1,503,333
Tabellaria fenestrata	626,389					777,586	939,583			
Tabellaria flocculosa	1,879,167									
Ulothrix sp.			1,409,375					980,435		
Total Abundance	**97,716,667**	**9,328,237**	**87,851,042**	**186,842,857**	**128,857,146**	**106,529,310**	**112,750,000**	**120,593,478**	**125,152,500**	**56,124,444**

DENSITY

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Achnanthes flexella	9,198			23,652		3,806		9,598		
Achnanthes hauckiana						3,806				
Achnanthes lanceolata								4,799	22,075	12,264
Achnanthes linearis	3,066	397		23,652	5,256		4,599			
Achnanthes minutissima	294,338	13,102	110,377	299,594	194,474	175,081	220,754	71,985	38,632	4,906
Amphipleura pellucida			2,300							2,453
Amphora ovalis				7,884						2,453
Amphora perpusilla									5,519	
Anomoeoneis vitrea	15,330			23,652			9,198			
Caloneis ventricosa				23,652						
Caloneis ventricosa minuta	3,066								5,519	
Chlamydomonas sp.		397								
Cocconeis placentula			4,599	7,884				110,377	16,557	78,490
Cymbella affinis			2,300	15,768				9,598	5,519	2,453
Cymbella cesatii	12,264			7,884						
Cymbella cymbiformes						7,612				
Cymbella lunata	6,132									
Cymbella microcephala	3,066					7,612				
Cymbella minuta	6,132		11,498	55,188	15,768	38,061	9,198	47,990	60,707	
Cymbella sinuata		397				3,806	4,599	4,799		
Cymbella tumida										2,453
Denticula elegans	3,066									
Diatoma hiemale mesodon						3,806		4,799	33,113	
Diatoma tenue	9,198		200,058	23,652	47,304	19,030	4,599	4,799		4,906
Diatoma tenue elongatum	9,198			15,768	26,280	15,224				
Diatoma vulgare	3,066		11,498	7,884					16,557	
Didymosphenia geminata			2,300		5,256		4,599	4,799		
Epithemia turgida								4,799		2,453
Eunotia pectinalis							4,599			
Fragilaria capucina mesolepta			2,300			3,806				
Fragilaria construens				7,884					11,038	
Fragilaria construens venter				78,841	31,536	19,030	22,995		38,632	4,906
Fragilaria leptostauron				7,884		3,806			5,519	
Fragilaria pinnata	6,132			47,304			18,396		44,151	
Fragilaria vaucheria			20,696	55,188	52,560	26,643	64,387	119,975	44,151	39,245
Frustulia rhomboides										2,453
Gomphonema angustatum	3,066	3,970	9,198	47,304	15,768	26,643	36,792	14,397	66,226	14,717

DENSITY

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Gomphonema clevei		397								
Gomphonema gracile	3,066									
Gomphonema olivaceum										4,906
Gomphonema subclavatum	3,066	1,588	2,300	7,884	5,256	3,806	4,599	14,397	11,038	2,453
Gomphonema tenellum							4,599			
Hannaea arcus		22,631	2,300	7,884	141,913	45,673	50,589	14,397	16,557	2,453
Melosira italica							4,599			
Melosira varians								14,397		22,075
Meridion circulare						19,030		9,598	11,038	19,623
Navicula anglica					5,256					
Navicula cryptocephala	6,132			15,768	5,256	7,612	4,599	19,196	27,594	7,358
Navicula cryptocephala veneta	3,066			23,652		7,612	13,797	19,196	5,519	2,453
Navicula gregaria										2,453
Navicula minuscula						7,612				
Navicula mutica										2,453
Navicula pupula					5,256					
Navicula radiosa	3,066									
Navicula sp.	6,132						4,599	4,799	5,519	
Nitzschia acicularis						3,806				
Nitzschia amphibia								4,799		
Nitzschia capitellata						3,806				
Nitzschia constricta				7,884						
Nitzschia dissipata									16,557	4,906
Nitzschia frustulum	12,264			23,652		3,806	9,198	9,598	5,519	
Nitzschia palea			4,599				4,599	9,598		4,906
Nitzschia paleacea								9,598		4,906
Oscillatoria sp.		1,985				3,806				
Pinnularia sp.	3,066			7,884	5,256		4,599		5,519	2,453
Rhoicosphenia curvata								4,799		2,453
Rhopalodia gibba										2,453
Synedra radians	3,066					3,806				
Synedra rumpens	15,330		25,295	31,536	26,280	11,418	22,995	4,799		4,906
Synedra ulna	21,462	794	11,498	7,884	42,048	38,061	13,797	33,593	93,820	7,358
Tabellaria fenestrata	3,066					3,806	4,599			
Tabellaria flocculosa	9,198									
Ulothrix sp.			6,899					4,799		
Total Density	**478,300**	**45,660**	**430,010**	**914,551**	**630,725**	**521,436**	**551,884**	**590,276**	**612,592**	**274,716**

PROPORTION

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Achnanthes flexella	1.92%			2.59%		0.73%		1.63%		
Achnanthes hauckiana						0.73%				
Achnanthes lanceolata								0.81%	3.60%	4.46%
Achnanthes linearis	0.64%	0.87%		2.59%	0.83%		0.83%			
Achnanthes minutissima	61.54%	28.70%	25.67%	32.76%	30.83%	33.58%	40.00%	12.20%	6.31%	1.79%
Amphipleura pellucida			0.53%							0.89%
Amphora ovalis				0.86%						0.89%
Amphora perpusilla									0.90%	
Anomoeoneis vitrea	3.21%			2.59%			1.67%			
Caloneis ventricosa				2.59%						
Caloneis ventricosa minuta	0.64%								0.90%	
Chlamydomonas sp.		0.87%								
Cocconeis placentula			1.07%	0.86%				18.70%	2.70%	28.57%
Cymbella affinis			0.53%	1.72%				1.63%	0.90%	0.89%
Cymbella cesatii	2.56%			0.86%						
Cymbella cymbiformes						1.46%				
Cymbella lunata	1.28%									
Cymbella microcephala	0.64%					1.46%				
Cymbella minuta	1.28%		2.67%	6.03%	2.50%	7.30%	1.67%	8.13%	9.91%	
Cymbella sinuata		0.87%				0.73%	0.83%	0.81%		
Cymbella tumida										0.89%
Denticula elegans	0.64%									
Diatoma hiemale mesodon						0.73%		0.81%	5.41%	
Diatoma tenue	1.92%		46.52%	2.59%	7.50%	3.65%	0.83%	0.81%		1.79%
Diatoma tenue elongatum	1.92%			1.72%	4.17%	2.92%				
Diatoma vulgare	0.64%		2.67%	0.86%					2.70%	
Didymosphenia geminata			0.53%		0.83%		0.83%	0.81%		
Epithemia turgida								0.81%		0.89%
Eunotia pectinalis							0.83%			
Fragilaria capucina mesolepta			0.53%			0.73%				
Fragilaria construens				0.86%					1.80%	
Fragilaria construens venter				8.62%	5.00%	3.65%	4.17%		6.31%	1.79%
Fragilaria leptostauron				0.86%		0.73%			0.90%	
Fragilaria pinnata	1.28%			5.17%			3.33%		7.21%	
Fragilaria vaucheria			4.81%	6.03%	8.33%	5.11%	11.67%	20.33%	7.21%	14.29%
Frustulia rhomboides										0.89%
Gomphonema angustatum	0.64%	8.70%	2.14%	5.17%	2.50%	5.11%	6.67%	2.44%	10.81%	5.36%
Gomphonema clevei		0.87%								
Gomphonema gracile	0.64%									
Gomphonema olivaceum										1.79%

PROPORTION

Species	KZ-16	KZ-2	KZ-26	KZ-9	KZ-13	KZ-15	KZ-7	KZ-22	KZ-17	KZ-21
Gomphonema subclavatum	0.64%	3.48%	0.53%	0.86%	0.83%	0.73%	0.83%	2.44%	1.80%	0.89%
Gomphonema tenellum							0.83%			
Hannaea arcus		49.57%	0.53%	0.86%	22.50%	8.76%	9.17%	2.44%	2.70%	0.89%
Melosira italica							0.83%			
Melosira varians								2.44%		8.04%
Meridion circulare						3.65%		1.63%	1.80%	7.14%
Navicula anglica					0.83%					
Navicula cryptocephala	1.28%			1.72%	0.83%	1.46%	0.83%	3.25%	4.50%	2.68%
Navicula cryptocephala veneta	0.64%			2.59%		1.46%	2.50%	3.25%	0.90%	0.89%
Navicula gregaria										0.89%
Navicula minuscula						1.46%				
Navicula mutica										0.89%
Navicula pupula					0.83%					
Navicula radiosa	0.64%									
Navicula sp.	1.28%						0.83%	0.81%	0.90%	
Nitzschia acicularis						0.73%				
Nitzschia amphibia								0.81%		
Nitzschia capitellata						0.73%				
Nitzschia constricta				0.86%						
Nitzschia dissipata									2.70%	1.79%
Nitzschia frustulum	2.56%			2.59%		0.73%	1.67%	1.63%	0.90%	
Nitzschia palea			1.07%				0.83%	1.63%		1.79%
Nitzschia paleacea								1.63%		1.79%
Oscillatoria sp.		4.35%				0.73%				
Pinnularia sp.	0.64%			0.86%	0.83%		0.83%		0.90%	0.89%
Rhoicosphenia curvata								0.81%		0.89%
Rhopalodia gibba										0.89%
Synedra radians	0.64%					0.73%				
Synedra rumpens	3.21%		5.88%	3.45%	4.17%	2.19%	4.17%	0.81%		1.79%
Synedra ulna	4.49%	1.74%	2.67%	0.86%	6.67%	7.30%	2.50%	5.69%	15.32%	2.68%
Tabellaria fenestrata	0.64%					0.73%	0.83%			
Tabellaria flocculosa	1.92%									
Ulothrix sp.			1.60%					0.81%		

Dominant Taxon	Achnanthes minutissima	Hannaea arcus	Diatoma tenue	Achnanthes minutissima	Achnanthes minutissima	Achnanthes minutissima	Achnanthes minutissima	Fragilaria vaucheria	Synedra ulna	Cocconeis placentula

APPENDIX G

2015 CHLOROPHYLL *A* DATA

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411757

Attention:KAI WOLOSHYN

ALEXCO ENVIRONMENTAL GROUP INC.
Unit 3 Calcite Business Centre
151 Industrial Road
WHITEHORSE, BC
Canada Y1A 2V3

Report Date: 2015/09/17
Report #: R2043350
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B580250
Received: 2015/09/15, 10:10

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chlorophyll A (water)(sin)	10	2015/09/16	2015/09/17	BBY6SOP-00002	SM 22 10200 H m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Morgan Melnychuk, Burnaby Project Manager
Email: MMelnychuk@maxxam.ca
Phone# (604)638-8034 Ext:8034
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580250
Report Date: 2015/09/17

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		ND1071	ND1072	ND1073	ND1074	ND1075	ND1076	ND1077		
Sampling Date		2015/09/11 14:35	2015/09/11 08:20	2015/09/10 16:45	2015/09/11 11:25	2015/09/09 14:50	2015/09/10 16:00	2015/09/09 17:08		
COC Number		08411757	08411757	08411757	08411757	08411757	08411757	08411757		
	UNITS	KZ-2	KZ-7	KZ-9	KZ-13	KZ-15	KZ-16	KZ-17	RDL	QC Batch
Parameter										
Chlorophyll a	ug/L	0.59	1.14	0.81	1.11	0.67	<0.50	1.86	0.50	8038919
RDL = Reportable Detection Limit										

Maxxam ID		ND1078	ND1079	ND1080		
Sampling Date		2015/09/11 18:00	2015/09/09 12:30	2015/09/09 09:40		
COC Number		08411757	08411757	08411757		
	UNITS	KZ-26	KZ-21	KZ-22	RDL	QC Batch
Parameter						
Chlorophyll a	ug/L	1.17	1.33	1.76	0.50	8038919
RDL = Reportable Detection Limit						

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Maxxam Job #: B580250
Report Date: 2015/09/17

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: ND1071 **Collected:** 2015/09/11
Sample ID: KZ-2 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1072 **Collected:** 2015/09/11
Sample ID: KZ-7 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1073 **Collected:** 2015/09/10
Sample ID: KZ-9 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1074 **Collected:** 2015/09/11
Sample ID: KZ-13 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1075 **Collected:** 2015/09/09
Sample ID: KZ-15 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1076 **Collected:** 2015/09/10
Sample ID: KZ-16 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1077 **Collected:** 2015/09/09
Sample ID: KZ-17 **Shipped:**
Matrix: Water **Received:** 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580250
Report Date: 2015/09/17

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: ND1078
Sample ID: KZ-26
Matrix: Water

Collected: 2015/09/11
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1079
Sample ID: KZ-21
Matrix: Water

Collected: 2015/09/09
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam ID: ND1080
Sample ID: KZ-22
Matrix: Water

Collected: 2015/09/09
Shipped:
Received: 2015/09/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorophyll A (water)(sin)	SPEC/COL	8038919	2015/09/16	2015/09/17	Prabhleen Sodhi

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580250
Report Date: 2015/09/17

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B580250
Report Date: 2015/09/17

QUALITY ASSURANCE REPORT

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
8038919	Chlorophyll a	2015/09/17	108	80 - 120	<0.50	ug/L

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Rob Reinert, Data Validation Coordinator

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

CHAIN OF CU[illegible]

08411757

BBY FCD-00077/05

Page ____ of ____

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	BMC Minerals	Company Name:	Alexco Environmental	Quotation #:	B50743	[x] Regular TAT 5 days (Most analyses)
Contact Name:		Contact Name:	Kai Woloshyn	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	530-1130 WEST PENDER ST	Address:	Unit 3 151 Industrial Road	Project #:	BMC-15-01	Rush TAT (Surcharges will be applied)
	Vancouver, BC PC: V6E 4A4		Whitehorse, YK PC: Y1A 2V3	Site Location:	Kudz Ze Kayah	[ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3 Days
Phone:		Phone:	867-668-6463	Site #:		
Email:		Email:	kwoloshyn@alexcoresource.com	Sampled By:	A. Bier, A. MacPhail	Date Required:

Regulatory Criteria	Special Instructions
[ ] BC CSR Soil [ ] BC CSR Water	[ ] Return Cooler
[ ] CCME (Specify) [ ] Other (Specify)	[ ] Ship Sample Bottles (Please Specify)
[ ] Drinking Water [ ] BC Water Quality	

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / (N) — Present: NA — Intact:

COOLER TEMPERATURES: 4.3 | 1.1

COOLING MEDIA PRESENT (Y) / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Chlorophyll-a analysis	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	KZ-2	ND1071	11/09/2015	14:35	Chlorophyll-a	x	1		Frozen, two samples in each bag
2	KZ-7	ND1072	11/09/2015	8:20	Chlorophyll-a	x	1		Frozen, two samples in each bag
3	KZ-9	ND1073	10/09/2015	16:45	Chlorophyll-a	x	1		Frozen, two samples in each bag
4	KZ-13	ND1074	11/09/2015	11:25	Chlorophyll-a	x	1		Frozen, two samples in each bag
5	KZ-15	ND1075	09/09/2015	14:50	Chlorophyll-a	x	1		Frozen, two samples in each bag
6	KZ-16	ND1076	10/09/2015	16:00	Chlorophyll-a	x	1		Frozen, two samples in each bag
7	KZ-17	ND1077	09/09/2015	17:08	Chlorophyll-a	x	1		Frozen, two samples in each bag
	KZ-26	ND1078	11/09/2015	18:00	Chlorophyll-a	x	1		Frozen, two samples in each bag
9	KZ-21	ND1079	09/09/2015	12:30	Chlorophyll-a	x	1		Frozen, two samples in each bag
10	KZ-22	ND1080	09/09/2015	9:40	Chlorophyll-a	x	1		Frozen, two samples in each bag

B580250

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
A. MacPhail	14/09/2015		Laurel Berthier	2015/09/15	10:10	B580250