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Site Assessment for Treatment Wetlands at Kudz Ze Kayah Site

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Executive Summary

Introduction

The Kudz Ze Kayah (KZK) project is located approximately 260 km northwest of Watson Lake, 110 km southeast of Ross River and 24 km South of Finlayson Lake in southeast Yukon, Canada.

In anticipation that some measure of water treatment will be desired at KZK in closure, Contango Strategies Limited (Contango) undertook a feasibility assessment of conditions at KZK to:

- Characterize the conditions of natural wetlands in the project area;
- Evaluate the natural treatment capacity of any natural wetlands in the project area;
- Evaluate the feasibility of the use of Constructed Wetland Treatment Systems (CWTS) at the site; and
- Determine design parameters necessary for the conceptual design of potential wetland areas and eventual costing of their implementation.

Approach

The CWTS feasibility site assessment was conducted on August 25 – 28th, 2015. The site assessment focused on natural wetland and creek areas at KZK. Sampling locations were selected based on presence of potentially beneficial wetland plants, information from long-term monitoring, in situ measurements, and other visible features (that suggested the location might inform strategies for water quality improvement by CWTS). Eleven locations were sampled in situ, and included the collection of 10 water, 5 soil, 9 vegetation, and 15 microbiological samples for off-site analytical testing. The native microbial communities were characterized to identify site treatment potential. Plant species collected included the emergent macrophyte *Carex aquatilis* (commonly known as aquatic sedge), and aquatic bryophytes (aquatic moss) from multiple locations at KZK for comparison purposes.

Key Findings

- Passive and/or semi-passive water treatment is theoretically feasible at the KZK site.
- Native plants and beneficial microbial communities were identified at multiple locations at the KZK site that are capable of contributing to desirable water treatment activities.
- Wetland plant species *C. aquatilis* (water sedge) and aquatic mosses are abundant at the KZK site, host natural beneficial microbes, and promote conditions conducive to water treatment.
- Wetland plant *Schoenoplectus* (bulrush) is abundant in the nearby area as a secondary option if necessary.
- Natural beneficial microbes were found in abundance in wetlands, seeps, and creeks at the KZK site. These microbes are capable of water treatment processes such as reduction of nitrate, nitrite, selenium, and sulphate.

- Further characterization and determination of final water chemistry and usage objectives must be clearly defined in order to appropriately and accurately suggest a CWTS design.

- Deterrence of local wildlife should be incorporated into the CWTS design given the evidence of both beaver and moose at KZK wetland and creek areas.

- Willows and alders may need to be considered in a long-term management plan as they alter wetland hydrology by promoting channeling of water and could also encourage beaver activity.

Recommendations

There is good theoretical potential for passive or semi-passive water treatment systems, particularly CWTSs, to be considered as a component of a water treatment strategy at the KZK site. Should BMC Minerals (No.) Ltd. (BMC) and the planning and design teams decide to consider this potential further, there are some information gaps needing to be filled to be able for more fulsomely consider these report findings. It is recommended that the following information be developed, at a preliminary level at least, to support this further work:

- Quality, volume, and periodicity of water to be treated.

- Receiving environment water quality objectives.

- Site water balance and water management plans to develop plan most suitable to passive closure water treatment.

- Objectives for degree of operational passiveness and acceptable frequency and intensity of long-term maintenance required.

- Periodicity or seasonality of treatment needed and capacity for water storage if necessary.

- Project timelines, including date when needed to be online, and anticipated duration of operation.

Once these key information gaps are addressed, conceptual CWTS designs could be developed. Conceptual designs are for planning purposes and ideally are followed by pilot-scale testing and optimization to develop site-specific treatment rate coefficients and operational boundaries, and to determine maximum extent of removal. Accordingly, sizing estimates and performance expectancies would be refined as the planning for CWTS progressed through phased development.

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Abbreviations and Definitions

BMC Minerals – BMC Minerals (No.1) Ltd.

Carex – Genus of grassy plants, including aquatic macrophytes commonly known as sedges.

Carex aquatilis – A plant (emergent macrophyte) commonly known as water sedge.

Carex utriculata – A plant (emergent macrophyte) commonly known as beaked sedge.

Calamogrostis canadensis – Bluejoint reedgrass.

CCME – Canadian Council of Ministers of the Environment.

Contango – Contango Strategies Ltd.

CWTS(s) – Constructed Wetland Treatment System(s).

DNA (deoxyribonucleic acid) – is the hereditary material in almost all living organisms. This can be used to identify organisms.

DO – Dissolved Oxygen.

Heterotroph(ic) – an organism deriving its nutritional requirements from complex organic substances.

KZK – Kudz Ze Kayah Project.

Microbiome – the microbial community in a particular environment, which can be identified through genetic studies.

Microbes – microscopic organisms which may be uni- or multi-cellular. Including algae, bacteria, fungi, viruses, and yeast.

MPN (Most Probable Number) – a statistical value representing the viable population of microbes in a sample through use of dilution and multiple inoculations.

ORP – Oxidation-reduction potential (in water), a measure of the tendency of a chemical species to acquire or donate electrons, thus becoming reduced or oxidized, respectively, measured in millivolts.

Oxidation – the loss of electrons, or increase in valence state, by a molecule, atom, or ion. Can be driven by microbes. Process is complementary to chemical reduction.

Redox – Oxidation-reduction potential (in sediment), measured in millivolts.

Reduction (chemical) – the gain of electrons, or a decrease in valence state, by a molecule, atom, or ion. Can be catalyzed by microbes. Process is complementary to chemical oxidation.

Salix – Genus of deciduous trees and shrubs, including willows.

Schoenoplectus – Genus of grassy plant, including aquatic macrophytes commonly known as Bulrush.

SPC – Specific Conductivity is a measurement of electrical conductivity in water that is typically expressed in µs/cm.

Species – one of the basic units of biological classification and a taxonomic rank. Rank in the classification of organisms below genus and above strain.

TSS – Total Suspended Solids.

1. Introduction and Background

The Kudz Ze Kayah (KZK) project is located approximately 260 km northwest of Watson Lake, 110 km southeast of Ross River and 24 km South of Finlayson Lake in southeast Yukon, Canada. The KZK project is in the development planning and engineering design stage. Design and permitting work was completed in the late 1990's. This included water chemistry characterization and water quality predictions. Closure water chemistry predictions have not yet been updated, and as such, treatment needs for this site have not yet been fully characterized. Despite this, it is possible to assess the latent potential for passive and semi-passive treatment at the site, based on available biogeochemical processes that can improve water quality through means such as a constructed wetland treatment system (CWTS; also known as a treatment wetland). In anticipation that some measure of water treatment will be desired at KZK in closure, Contango Strategies Limited (Contango) undertook a feasibility assessment of conditions at the KZK site to:

- Characterize the conditions of natural wetlands in the project area;
- Evaluate the natural treatment capacity of any natural wetlands in the project area;
- Evaluate the feasibility of the use of CWTS at the site; and
- Determine design parameters necessary for the conceptual design of potential wetland areas and eventual costing of their implementation.

In this study, vegetation, sediment, and associated beneficial microbes were explored in the context of water chemistry ranges naturally present at the KZK site. This information provides a conceptual framework for how existing processes in the natural environment at KZK may respond to, and/or be beneficial to the long-term remediation and improvement of water quality.

Should site conditions be amenable and the planning team decide to pursue further evaluation of treatment wetland potential, information gathered through this CWTS feasibility assessment would guide a phased approach to design and test passive water treatment options that are likely to be successful in the context of the KZK site. Future phases could include pilot-scale and demonstration-scale testing to ensure efficient, predictable, and optimized, site-specific systems are developed.

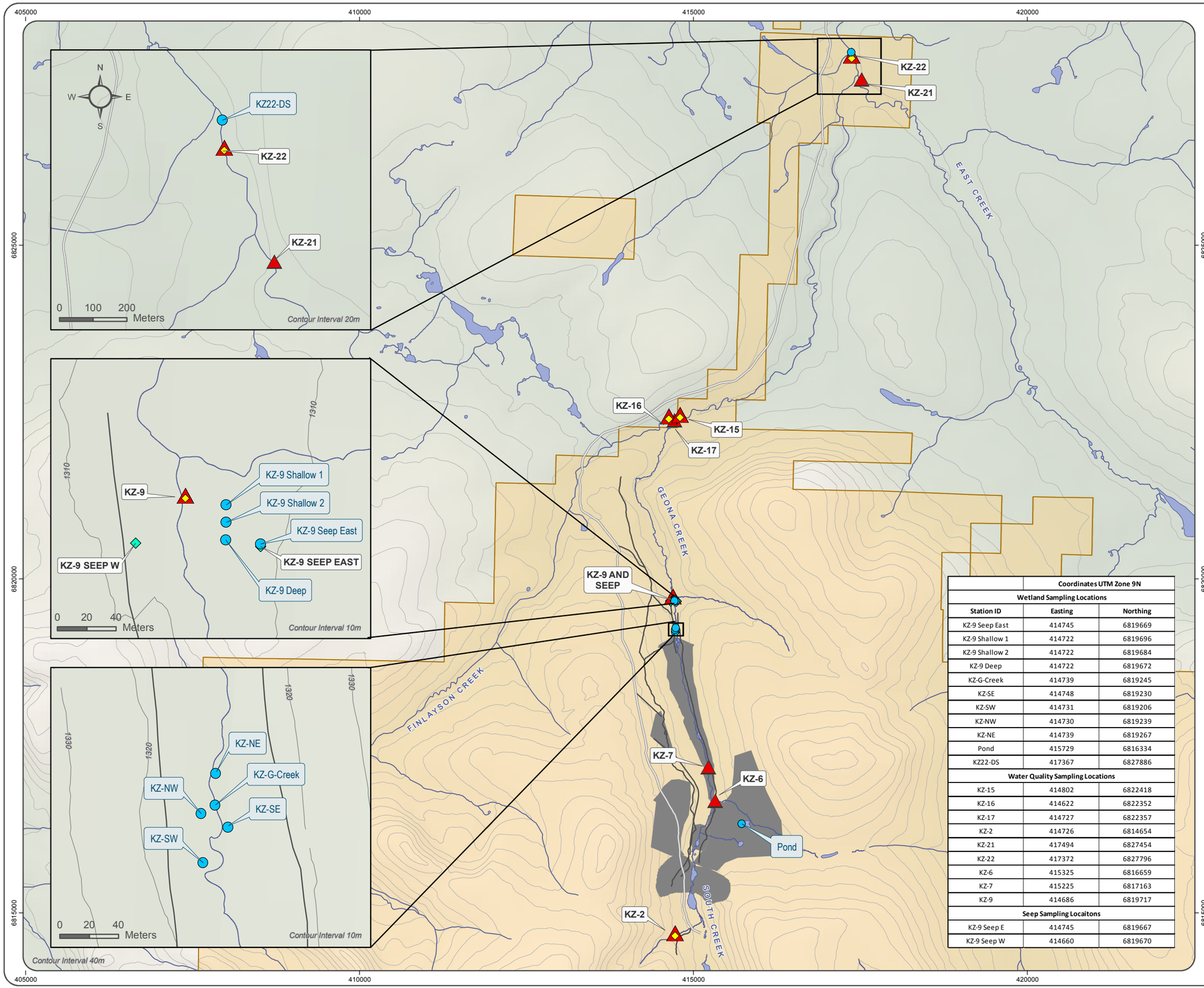
2. Site Assessment Methods

Methods are briefly described here, with detailed information provided in Appendix A.

The CWTS feasibility site assessment was conducted on August 25 – 28th, 2015. Figure 1 depicts the current KZK project site map with proposed site facilities and indicates sampling locations. Eleven locations were sampled in situ, resulting in the collection of 10 water, 5 soil, 9 vegetation, and 15 microbiological samples for off-site analytical testing (Table 1 and Table 2; also outlined in Appendix A). The above ground biomass from emergent macrophytes were collected for analytical because these are indicative of plant uptake, and also because they are of concern to the cycling of elements and nutrients through decomposition. The below ground biomass were sampled to assess associated microbial populations to determine which plants host beneficial microbes. Plant species collected included the emergent macrophyte *Carex aquatilis* (commonly known as aquatic sedge), and aquatic bryophytes (aquatic moss) from multiple locations at KZK for comparison purposes (Table 1).

A total of 15 microbial samples were collected (Table 1 and Table 2) and analyzed for beneficial microbes in the context of water remediation in a CWTS to identify latent potential for treatment associated with sampling sites. Microbial samples consisted of plant roots, soils/sediments, mosses, and biofilms.

A YSI ProPlus meter was used in the field to measure temperature, dissolved oxygen (DO), conductivity (and specific conductivity; SPC), pH, and oxidation-reduction potential (ORP). Additionally, relative soil redox potential measurements (redox) were taken using platinum tip probes and Calomel electrodes to measure the flux of electrons between the sediment/soil/pore water and overlying water column (Faulkner et al., 1989; Huddleston & Rodgers, 2008).



	Coordinates UTM Zone 9N	
Wetland Sampling Locations		
Station ID	**Easting**	**Northing**
KZ-9 Seep East	414745	6819669
KZ-9 Shallow 1	414722	6819696
KZ-9 Shallow 2	414722	6819684
KZ-9 Deep	414722	6819672
KZ-G-Creek	414739	6819245
KZ-SE	414748	6819230
KZ-SW	414731	6819206
KZ-NW	414730	6819239
KZ-NE	414739	6819267
Pond	415729	6816334
KZ22-DS	417367	6827886
Water Quality Sampling Locations		
KZ-15	414802	6822418
KZ-16	414622	6822352
KZ-17	414727	6822357
KZ-2	414726	6814654
KZ-21	417494	6827454
KZ-22	417372	6827796
KZ-6	415325	6816659
KZ-7	415225	6817163
KZ-9	414686	6819717
Seep Sampling Locaitons		
KZ-9 Seep E	414745	6819667
KZ-9 Seep W	414660	6819670

BMC MINERALS

KUDZ ZE KAYAH PROJECT

SITE ASSESSMENT FOR TREATMENT WETLANDS AT KUDZ ZE KAYAH SITE

FIGURE 1
KUDZ ZE KAYAH SITE MAP AND SAMPLING LOCATIONS

MAY 2016

- Wetland Sampling Location
- Hydrometric Station
- Water Quality and Hydrometric Station
- Water Quality Sampling Location
- Seep
- Tote Road
- Other/Site Road
- Contour (interval shown on individual map/inset)
- Watercourse
- Waterbody
- Approximate Location of Proposed Mine Infrastructure
- BMC Minerals (No.1) Ltd. Mineral Claim Areas

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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

1:55,000 when printed on 11 x 17 inch paper

0 1 2 3 4 Kilometers

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(Last edited by: amatlashevska; 5/16/2016/11:49 AM)

Table 1 – List of locations and collected samples

Location	Water	Soil	Plant [a]	Microbiology [b]	Corresponding Surface Water Quality Site [c]	Easting	Northing
KZ-G-creek	Yes	No	No	Yes	Between KZ-7 and KZ-9	414739	6819245
KZ-NW	Yes	Yes	Yes	Yes	-	414730	6819239
KZ-SW	Yes	No	Yes	Yes (2)	-	414731	6819206
KZ-NE	Yes	No	Yes	Yes	-	414739	6819267
KZ-SE	Yes	No	Yes	Yes	-	414748	6819230
KZ9-shallow1	Yes	Yes	Yes	Yes	-	414722	6819696
KZ9-shallow2	Yes	Yes	Yes	Yes (2)	-	414722	6819684
KZ9-deep	Yes	No	Yes	Yes (2)	-	414722	6819672
KZ9 east seep	Yes [d]	No	No	Yes	KZ-9 Seep East	414745	6819669
KZ22-DS	Yes	Yes	Yes	Yes (2)	Downstream KZ-22	417367	6827886
Pond	Yes	Yes	Yes	Yes	-	415729	6816334
Quantity	**10**	**5**	**9**	**15**			

[a] *C. aquatilis* above ground biomass was sampled in order to allow for comparison of similar vegetation between diverse sites. Other wetland vegetation species such as *C. utriculata* were found only growing in small amounts at the Pond (Figure 14), while *Calamagrostis canadensis* was abundant, but never submerged in water.

[b] See Table 2 for descriptions.

[c] Long-term surface water quality monitoring location

[d] Only in situ water quality was tested (no sample for off-site analytical testing).

Table 2 – Descriptions of microbial samples

Location	Sample Type
KZ-G-creek	White, filamentous biofilm on rock in fast flowing water
KZ-NW	*C. aquatilis* roots and surrounding sediment
KZ-SW	Red/white biofilm columns
	C. aquatilis roots and surrounding soil
KZ-NE	*C. aquatilis* roots and surrounding soil
KZ-SE	*C. aquatilis* roots and surrounding soil
KZ9-shallow1	*C. aquatilis* roots
KZ9-shallow2	Calcified moss containing orange precipitate
	C. aquatilis roots
KZ9-deep	Aquatic moss
	C. aquatilis roots
KZ9-east seep	Calcified moss from spring
KZ22-DS	Aquatic moss
	C. aquatilis roots (growing in moss)
Pond	*C. aquatilis* roots, surrounding soil, and aquatic moss

3. Sampling Location Descriptions

The site assessment focused on natural wetland and creek areas at KZK. Sampling locations were selected based on presence of potentially beneficial wetland plants, information from long-term monitoring, in situ measurements, and other visible features (that suggested the location might inform strategies for water quality improvement by CWTS).

The 11 areas sampled during the site assessment are indicated in Figure 1 and include:

1) KZ-G-creek – an area of Geona creek upstream of KZ9 monitoring location and downstream of KZ7 monitoring location.
2) KZ-NW, KZ-SW and KZ-NE, KZ-SE – are locations located on the respective west and east side of KZ-G-creek sampling site.
3) KZ9-shallow1, KZ9-shallow2, and KZ9-deep – three locations that receive seepage from the KZ9-east seep groundwater monitoring location.
4) KZ22-DS – an area of Geona creek downstream of KZ22 monitoring location.
5) Pond – a wetland to the northeast of Geona Creek.

A description of each sampled location, as well as rationale for selection follows.

3.1. KZ-G-creek

This sampling location is part of Geona Creek. KZ-G is between surface water monitoring locations KZ9 and KZ7. This location will allow for comparisons to long-term monitoring of water quality data. KZ9 and KZ7 are part of the routine monitoring program and were sampled 25 and 24 times since 1995, respectively with eight (KZ7) and ten (KZ9) samples occurring in April through November of 2015, respectively (Appendix B). Several inactive beaver dams are also present at this site. Figure 2 indicates the sampling location at a fast flowing (2-5 m/s) channel, approximately 0.5-2 m deep and 2-3 m wide. Water samples were taken from this location for analytical testing (Table 1). Rocks were present in this channel with thick, white and filamentous microbial biofilm attached, which were sampled for microbial analysis (Table 2). There were no plants growing in the water channel. However, various sedges, including the wetland plant *Carex aquatilis* (water sedge) and grasses which like moist areas such as *Calamagrostis canadensis* (bluejoint reedgrass) were growing along the banks. Peat-like soil was found in this fast moving channel as well, whereas finer silt was found in slower moving pools surrounding the channel (Figure 2).

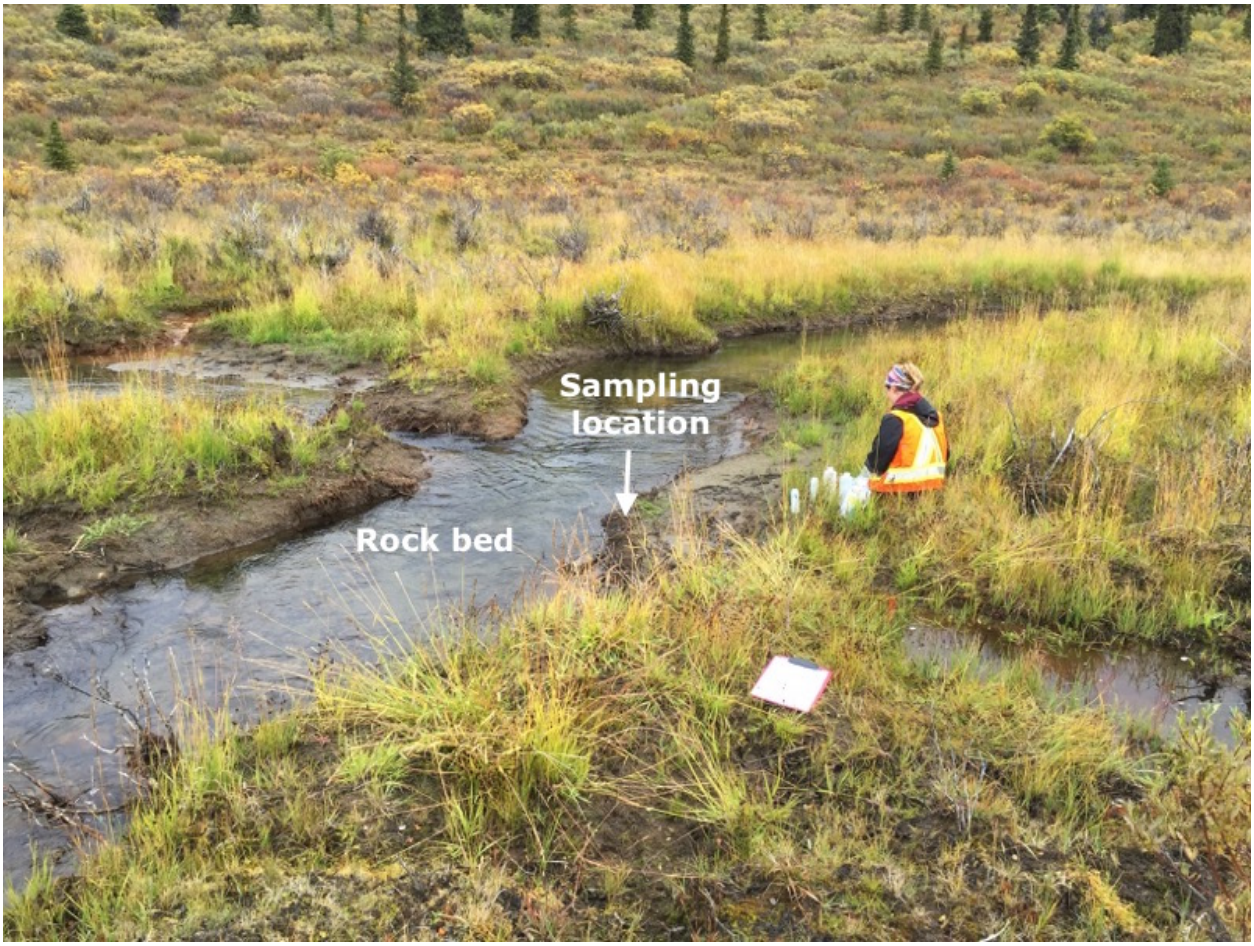


Figure 2 – KZ-G-creek
Sampling location label in the figure indicates the KZ-G-creek sample collection area.

3.2.KZ-NW

KZ-NW is a small puddle approximately 10 – 15 cm deep produced by a seep and is located on the west side of the sampling location of KZ-G-creek (Figure 1) and to the north of a groundwater monitoring well. KZ-NW was selected for sampling because *C. aquatilis, C. canadensis*, *Chamerion angustifolium* (fireweed) and moss species were present. Additionally, there was a fine, red precipitate/silt with a gelatinous consistency (suggesting biofilms) at the sediment-water interface and around the roots of the plant specimens. Underneath this precipitate was black silt (Figure 3). The water, *C. aquatilis* roots and surrounding red sediment were collected for analytical testing (Table 1). The roots of *C. aquatilis* and surrounding red sediment were sampled for analysis of beneficial microbial communities (Table 2).

Figure 3 – KZ-NW
Growth of plants in red sediment biofilm with gelatinous consistency.

3.3. KZ-SW

KZ-SW is a seep on the west side of Geona creek to the south of KZ-NW. This seep was deeper than the other nearby sampled site KZ-NW, ranging between 5 cm at the water line to 1.5 m deep, with no visible flow. This site was selected for sampling because along one side of the seep there was no vegetation and the bank was instead rocky and covered in peat (Figure 4), while the other side had moss and *Salix* (willow) as well as *C. aquatilis* species growing with roots extending in water beyond a depth of 20 cm. Water samples and *C. aquatilis* roots were collected for analytical testing (Table 1). Of greatest interest at this site were the underwater reddish columns or "clouds", of microbial biofilm growth (Figure 4). Microbiological samples were taken of the columnar biofilms as well as the *C. aquatilis* roots and surrounding soil (Table 2), as these specimens may harbour beneficial microbial populations.

Figure 4 – KZ-SW
Underwater columns of microbial biofilm growth, with *C. aquatilis*, mosses, and *Salix* growth on some surrounding edges.

3.4. KZ-NE

KZ-NE is a pool on the east side of Genoa creek approximately 2 m deep that appeared stagnant, however, may have low in and out flow. This site was of interest for sampling because there was evidence of an old beaver dam, with very abundant, tall *C. aquatilis* plants, indicating these plants as being very mature. The *C. aquatilis* was growing into the water, at depths between 1 – 10 cm (Figure 5). Willow (*Salix*) was also growing in this area. The water had an oily/organic surface layer, with areas of a red precipitate or film both on the water surface and the sediment/water interface. Water and *C. aquatilis* roots were both collected for analytical testing (Table 1). In deeper water, there were reddish "cloudy" columns of growth that could potentially be microbial biofilms or algae formations (Figure 5 and Figure 6). The fine sediment along the edges of the water and the *C. aquatilis* roots growing in them were taken as microbial samples for analysis (Table 2).

Figure 5 – KZ-NE Sampling Location
Erosion of organics where the inactive beaver dam has deteriorated, with mature plant growth on embankments.

Figure 6 – KZ-NE microbial biofilms
Underwater blooms of microbial growth with mature plant growth on embankments.

3.5. KZ-SE

KZ-SE is a pooled seep and tributary on the SE side of Genoa creek (to the SE of the KZ-G-creek location Figure 1). This site was approximately 30 cm deep with no measurable flow (potentially small in and out flow; Figure 7). This site was selected for sampling because in addition to the presence of cloudy and floating red precipitate on the water surface, there were also bubbles rising to the surface and the smells indicative of reducing conditions (e.g., sulphides, methane). Further, the soil was red on top, but black approximately 1 cm below and very fine (Figure 8; top panel). *C. aquatilis* were present, at approximately 20 cm depth, and other *Carex* grass species were growing along with *C. canadensis* higher up away from the waterline. *C. aquatilis* roots in this sediment were also black. These observations taken together suggest that the plant species present are capable of creating conditions conducive to sulphate reduction and/or support sulphide-producing microbes. Thus, the *C. aquatilis* plant roots and the red organic sediment were collected for analysis of microbial populations (Table 2), and the *C. aquatilis* roots and water were collected for analytical testing (Table 1).

Figure 7 – KZ-SE
Photograph depicts the red microbial biofilm growth floating on top of the water and at the water line, as well as the presence of plant growth.

Figure 8 – KZ-SE sediment
This site features black sediment indicating sulphides present below the shallow red top layer.

3.6.KZ9-east seep

KZ9-east seep is present near lower Geona creek (Figure 1). KZ9-east seep is part of the routine monitoring program and was sampled three times in June through October of 2015 (Appendix B). This site is of interest to potential CWTS design as the sediment of the seep is bright orange, and there are *C. aquatilis* and aquatic mosses growing in the water that flows from the seep (Figure 9). The seep daylights in a small pool approximately 20 cm deep and there is consistent production and appearance of bubbles at the surface of the spring and hard/calcified moss. The moss was collected for microbial analysis (Table 2). In situ water chemistry was tested, however no sample was collected for further analytical testing.

Figure 9 – KZ9-east seep
KZ9-east seep with characteristic orange sediment. Nearby sites of KZ9-shallow1, KZ9-shallow2, and KZ9-deep are indicated. Green moss can be seen growing at the seep (above the KZ9-east seep arrow in picture), and *C. aquatilis* at bottom left of picture and where KZ9-shallow1 label is written.

3.7. KZ9-shallow1

This area is found on the outskirts of the KZ9-east-seep (Figure 9) and is approximately 1 – 5 cm deep with no visible flow (Figure 10); however, a flow direction was suggested by the

depth gradient and distance from the seep/spring at KZ9-east seep. This location was of interest because it received water directly from KZ9-east seep, and had *C. aquatilis* plants growing in the water. The orange-white calcified precipitate growing in between the plant roots further suggested that the water was likely to be mineralized. Water, *C. aquatilis* roots and sediment were all collected from this area for analytical testing (Table 1). It should be noted that these *C. aquatilis* are shorter than those in other sampled areas, and have begun to turn yellow, suggesting the plants may be stressed; however, it is unclear what the cause may be (e.g., could be water chemistry, or perhaps the area is intermittently dry). The water chemistry in the area at the time of sampling was not beyond expected toxicity thresholds of the plants; however, plant stress tolerance can be both multifactorial and cumulative, and as such it is not possible to directly ascertain the relative contributions in the field. If determined to be relevant to closure water treatment, plant tolerance to a range of water chemistry, drying, or other stress-related factors could be tested in a controlled setting at pilot-scale. The plant roots growing in the precipitate were collected for microbial analysis (Table 2).

Figure 10 – KZ9-shallow1
C. aquatilis growing in orange precipitate of the shallow area receiving water from seep.

3.8. KZ9-shallow2

The KZ9-shallow2 area is located a few meters south of the KZ9-shallow1 location (Figure 9) and was 2 – 10 cm deep. Like KZ9-shallow1, no water flow was visible; however, a flow direction was suggested by the depth gradient and distance from the seep/spring at KZ9-east seep. This location was selected for sampling because it received water directly from KZ9-east seep, and was similar to KZ9-shallow1 with *C. aquatilis* growing in an orange-white precipitate. Water, the orange-white sediment and *C. aquatilis* roots were collected for analytical testing (Table 1). Very hard (calcified) moss containing this orange precipitate was also growing in this area. Samples of moss containing the orange precipitate and *C. aquatilis* roots were collected for microbial analysis (Table 2).

3.9. KZ9-deep

This pool is located a few meters south of KZ9-shallow2 (Figure 9), was 50 cm deep with steep sides, and fed by the same KZ9-east seep as the other KZ9 locations. This site had no discernable flow; however, a flow direction was suggested by the slope of the hill and the distance from the seep/spring at KZ9-east seep. This site was selected for sampling as *C. aquatilis* with black roots and aquatic moss were growing in the edges of the water and into deeper areas than the other locations at KZ9. There was also an orange/white precipitate present in between the plants and a thick orange/white "biofilm" floating near the edges of the seep. Water samples and the black *C. aquatilis* roots were collected for analytical testing (Table 1), and moss and the *C. aquatilis* roots were collected for analysis of microbial populations (Table 2).

3.10. KZ22-DS

Site KZ22 runs into Finlayson Creek downstream of East Creek (Figure 1). KZ22 is part of the routine surface water monitoring program and was sampled four times in April through September of 1995 and again in April through November of 2015 (Appendix B). Interestingly, one of the tributaries to this area is a natural subsurface flow wetland, with rocks and underwater moss, and very clear water (Figure 11). A location slightly downstream of the KZ22 site (KZ22-DS) was selected for sampling because the channel was full of deep aquatic moss (> 1 m) (Figure 12). The moss alongside the creek had *C. aquatilis* growing through it with a fine red precipitate/sediment trapped between plant specimens. In contrast to all other locations where *C. aquatilis* was rooted in the soil, at the KZ22-DS location *C. aquatilis* was rooted only in the moss and the roots did not make contact with the underlying soils. Water, plant root and sediment samples were all collected for analytical testing (Table 1). The *C. aquatilis* roots and the moss were sampled for microbial analysis (Table 2).

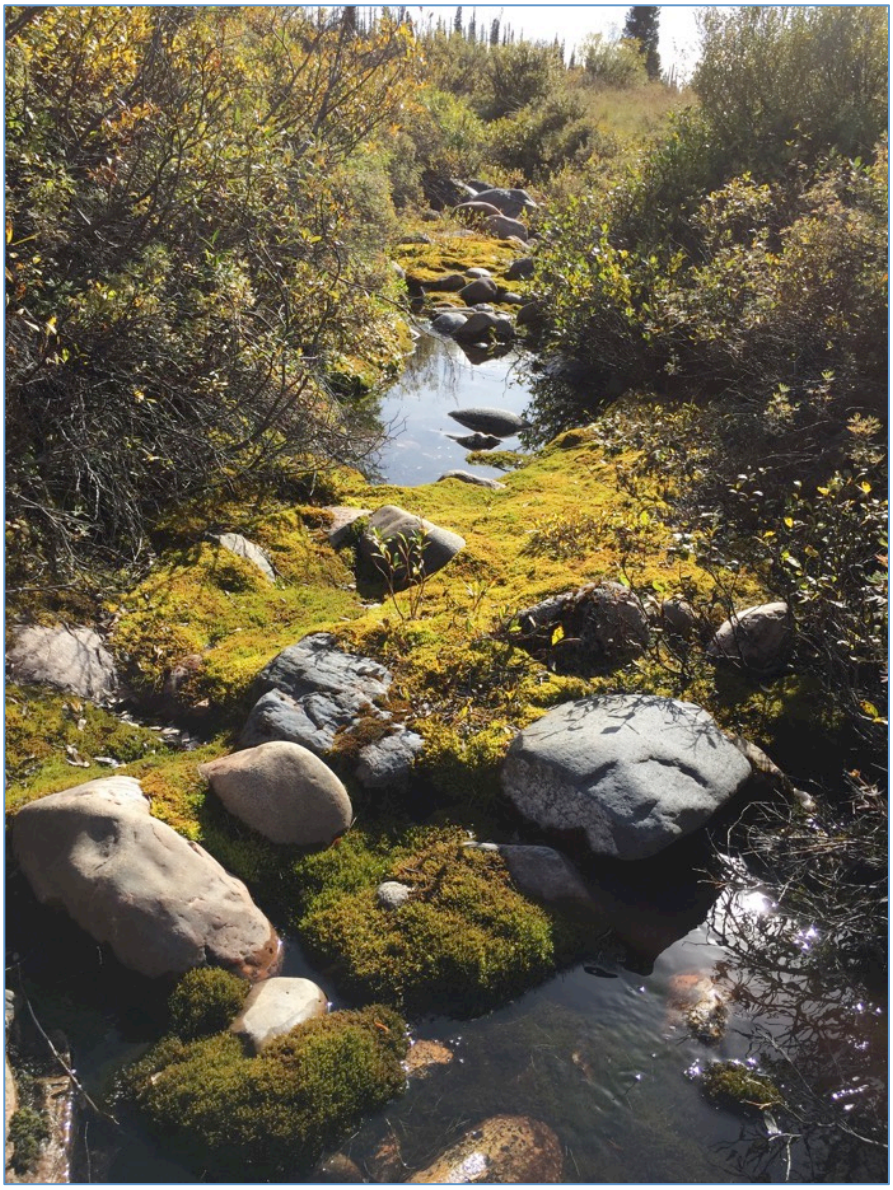


Figure 11 – Natural subsurface flow wetland tributary of KZ22-DS
Example of naturally occurring subsurface flow wetland system occurring at KZK.

Figure 12 – KZ22-DS
Clear water in KZ22-DS channel with *C. aquatilis* plants growing in underwater moss. This location is downstream of natural subsurface flow wetland system in Figure 11.

3.11. Pond

The "Pond" is located south of Geona Creek and southeast of KZ-G-creek sampling location (Figure 1). This site was of interest given the presence of abundant aquatic mosses and tall (i.e., mature) *C. aquatilis* growing far into the water. The moss and sediment samples were located in approximately 20 cm of water with no visible flow (Figure 13). Further, several isolated stands of *C. utriculata*, and *Calamagrostis* (Bluejoint grass) were growing in the wetland (Figure 14). Underwater, stringy moss that appeared blue-green out of the water was taken for analytical and microbial sampling. White *C. aquatilis* roots and surrounding soil/peat, which covered a white clay base, were also sampled (Table 1 and Table 2). Water samples were also collected for analytical testing (Table 1). The depth of the pond appears to have fluctuated over a long period of time, as there are exposed beaches with what used to be submergent aquatic vegetation, and also what seemed to be drowned Alder plants (Figure 13 and Figure 14). There was evidence of moose grazing plants in the water.

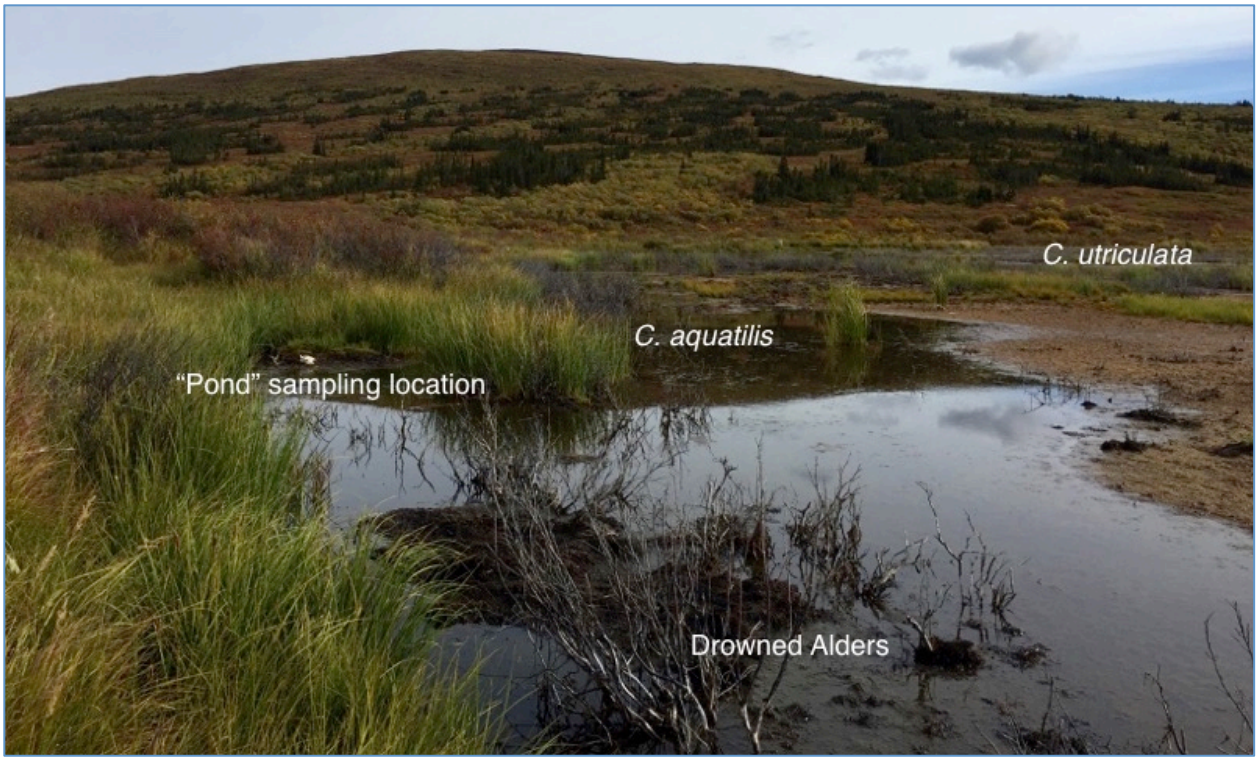


Figure 13 – Pond sampling location
Exposed beaches with dried aquatic vegetation and drowned alder plants in foreground suggest water depth fluctuations have occurred. *C. utriculata* is same as in Figure 14.

Figure 14 – *C. utriculata* at Pond site
Closer view of recently exposed beaches and drowned alders. *C. utriculuata* is same as in Figure 13.

4. Results and Discussion

Results of water, plant, hydrosoil, and microbial analyses are presented in this section.

4.1. Results of Consultation with Design Team Members

4.1.1. *Specific project objectives and goals*

The guiding objectives and goals of this site assessment and initial CWTS feasibility analysis are to evaluate the natural conditions and water treatment capacity. The data will inform the decision making process for water treatment options for the reclamation and closure plan associated with the KZK project.

The goal of this report is to inform the closure water treatment planning process with respect to the consideration and potential development of passive water treatment for the site. Once predicted site water quality and flows are updated, this report can contribute to water treatment technology selection and conceptual passive treatment design by informing about the plants, microbes, and conditions observed at the KZK project site that would be beneficial to treating potential constituents of concern.

4.1.2. *Timelines*

Timelines for the overall KZK project have been identified at a preliminary level, but closure schedules and water treatment needs remain undefined. As such, timelines for passive or semi-passive water treatment implementation such as a CWTS are uncertain. Therefore, it is presently assumed that the CWTS will be required for closure, and to operate in perpetuity. It may also be beneficial to the project to have functional CWTSs contributing to water treatment during mining operations. Regardless of the implementation period (closure *vs* operations), consideration of development of the CWTSs should be undertaken as early as is both feasible and appropriate, should the site meet criteria that make it a good candidate for the use of these systems. For example, adequately modelled water chemistry is necessary for pilot-scale testing, and on-site demonstration-scale testing requires water of similar chemistry to that predicted for treatment to be available.

In general, progression from site assessment through to bringing the full-scale CWTS online normally takes between 2 – 6 years to complete. In some cases, certain phases are not deemed necessary due to site-specific considerations and the timeline may be shortened, or in other instances, may require multiple iterations, thereby increasing the time for development beyond the usual estimate of 6 years.

4.1.3. *Site-specific restrictions*

The KZK site is home to several natural ponds, wetlands, and aquatic vegetation in creeks. It is therefore expected to be generally conducive to the implementation of treatment wetlands. The KZK site is hilly, and therefore the catchment areas often result in formation

of creeks rather than large flat wetland areas. However, there are several examples of large natural wetlands in the area (e.g., "Pond" site).

Beaver dams were observed at KZK, with numerous inactive (no longer inhabited) dams along Geona Creek. Beavers will need to be considered in the CWTS design and long-term maintenance for the KZK site. For example, the design may consider building multiple treatment systems in parallel instead of a single treatment system (in case a beaver builds a dam on one), or a plan may be developed for removal of potential construction sources in the vicinity of the treatment wetlands (e.g., woody plants).

4.2. Characterization of water in context of CWTS

Several sampling locations selected in this assessment had relevant long-term monitoring data available. This monitoring data allows for comparison of the current study's samples to evaluate whether water chemistry was within ranges established from long-term monitoring. For this comparison, monitoring data was available for location(s):

- KZ-22 which is upstream of KZ22-DS;
- KZ-7 and KZ-9, which are upstream and downstream of KZ-G-creek, respectively; and
- KZ9-East seep which feeds KZ9-shallow1, KZ9-shallow2 and KZ9-deep.

Analysis of water samples collected in this assessment (i.e., between August 25th – 29th of 2015) fall within ranges and trends of long-term monitoring that has occurred from 1995 – 2015 (Alexco Environmental Group, 2015). A comparison is provided in Appendix B. Results of in situ field measurements and selected analytical testing for water collected during this study are provided in Tables 3 through 6. Full results are provided in Appendix C.

All locations were purposefully selected to be shallow (i.e., <1 metre, to be representative of potential areas where passive treatment could occur). The overlaying surface waters at all sites tested in this assessment are invariably oxidizing (i.e., positive ORP; Table 3). These waters are also naturally low in sulphate and most metals, although six of the nine samples contained iron concentrations above the Canadian Council of Ministers of the Environment (CCME) guidelines for the Protection of Freshwater Aquatic Life (>0.3 mg/L; Table 5) (CCME, 2015). Temperatures ranged between +5°C to +12.2°C. Tables 4 through 6 have an abbreviated list of constituents, which are important in the context of passive water treatability.

Most locations were pH, with the exception being KZ9-east seep which was slightly lower at pH 5.74, but quickly neutralized by reaching the nearby KZ9-shallow1 (7.12), KZ9-shallow2 (6.61), and KZ9-deep (6.35) sampling locations (Table 3).

Table 3 – In situ Water Measurements

Site	Temp (°C)	DO (mg/L)	SPC (µs /cm)	pH	ORP (mV)
KZ-G-creek	7.1	10.7	276.1	7.65	+200.3
KZ-NW	8.1	6.8	215.8	7.31	+238.1
KZ-SW	7.5	6.6	263.3	6.96	+237.3
KZ-NE	9.1	5.3	244.5	6.66	+154.6
KZ-SE	8.7	4.6	282.9	6.34	+127.2
KZ9-shallow1	10.5	8.3	1252	7.12	+274.1
KZ9-shallow2	12.2	7.6	1429	6.61	+259.8
KZ9-deep	6.5	7.3	1206	6.35	+298.9
KZ9-east seep	5.0	4.2	1558	5.74	+209.5
KZ22-DS	7.0	7.1	630.0	7.78	+200.0
Pond	11.1	7.6	133.7	7.64	+217.2

DO – Dissolved Oxygen; SPC – Specific Conductivity; ORP – Oxidation-Reduction Potential; NT – Not Tested

[a] Relative Redox values as mV; oxidation-reduction potential in soil.

Table 4 – Results of Water Laboratory Analyses

Site	TSS	Alk	NH_3	NO_3	TKN	SO_4	TOC	COD
KZ-G-creek	2.6	108	0.028	0.0397	0.060	30.8	1.9	<10
KZ-NW	3.8	104	0.050	0.0038	0.295	0.71	5.7	18
KZ-SW	3.6	135	0.043	0.0080	0.313	5.04	5.6	20
KZ-NE	8.0	121	0.045	0.0051	0.426	4.53	7.9	27
KZ-SE	12.3	124	0.036	0.0055	0.323	8.13	3.3	<10
KZ9-shallow1	12.5	712	0.0087	0.0042	0.047	20.7	0.96	<10
KZ9-shallow2	33.5	822	0.036	1.17	<0.020	19.8	1.3	<10
KZ9-deep	<1.0	687	0.044	0.0742	0.153	16.9	3.0	<10
KZ22-DS	<1.0	169	0.042	0.0129	0.115	27.2	2.4	<10
Pond	16.8	60.7	0.046	0.0216	1.09	<0.5	12	46

All values reported as mg/L. Table includes abbreviated list of constituents which are important in the context of passive water treatability. Data from all constituents tested at all sites is provided in Appendix C.

TSS – Total Suspended Solids; Alk – Alkalinity; Alkalinity is reported as total $CaCO_3$; NH_3 – Total Ammonia as N; NO_3 - Nitrate as N; TKN – Total Kjeldahl Nitrogen; TOC – Total Organic Carbon; COD – Chemical Oxygen Demand.

Table 5 – Results of Water Laboratory Analyses for Total Elements

Site[a]	Al	Cd	Cu	Fe	Mn	Pb	S	Se	Zn
KZ-G-creek	0.00727	0.0000730	0.000634	0.154	0.0233	0.0000840	11.2	0.000711	0.0106
KZ-NW	0.0085	0.0000420	0.00105	0.14	0.0105	<0.000050	<15	0.000063	0.0058
KZ-SW	0.0089	0.0000220	0.00105	1.75	0.459	0.000050	<15	0.000091	0.0038
KZ-NE	0.0163	0.0000730	0.00143	2.46	0.528	0.000141	<15	0.000175	0.0118
KZ-SE	0.0145	0.0000330	0.000247	5.70	0.591	0.0000740	3.6	0.000107	0.0129
KZ9-shallow1	0.0163	0.0000150	0.000214	2.24	1.55	0.0000620	7.7	<0.000040	0.00641
KZ9-shallow2	0.0222	0.0000300	0.00038	1.65	0.796	<0.000050	<15	<0.000040	0.0161
KZ9-deep	0.0096	0.0000140	0.00070	0.0423	0.0549	<0.000050	<15	0.000158	0.0050
KZ22-DS	0.00253	0.0000330	0.000994	0.126	0.0157	0.0000120	9.6	0.000547	0.00069
Pond	0.0656	0.0000080	0.00066	1.10	0.185	0.000121	<15	0.000140	0.0040

All values reported as mg/L. Table includes abbreviated list of constituents which are important in the context of passive water treatability. Data from all constituents tested at all sites is provided in Appendix C. Cells shaded in grey indicate values that surpass the CCME Water Quality Guidelines for Protection of Freshwater Aquatic Life (CCME, 2015).

[a] KZ-G-creek, KZ-SE, KZ9-shallow1, and KZ22-DS were processed with ICPMS Low Level (which does not include digestion) for total elements, while all others were processed by ICPMS Low Level Digested by Maxxam Analytics (Appendix C).

Table 6 – Results of Water Laboratory Analyses for Dissolved Elements

Site[a]	Al	Cd	Cu	Fe	Mn	Pb	S	Se	Zn
KZ-G-creek	0.00477	0.0000590	0.000728	0.115	0.0210	0.0000310	11.6	0.000687	0.00982
KZ-NW	0.00601	0.0000400	0.000690	0.106	0.0133	0.0000230	<3.0	0.000050	0.00563
KZ-SW	0.00477	0.0000140	0.000647	0.429	0.430	0.0000280	<3.0	0.000079	0.00175
KZ-NE	0.00953	0.0000440	0.000915	1.52	0.850	0.0000580	<3.0	0.000190	0.00786
KZ-SE	0.00943	0.0000150	0.000185	0.420	0.582	0.000124	3.6	0.000083	0.00915
KZ9-shallow1	0.00428	0.0000100	0.000061	0.0526	1.60	0.0000130	7.4	<0.000040	0.00488
KZ9-shallow2	0.00938	0.0000240	0.000181	0.387	0.725	0.0000540	7.0	0.000041	0.0105
KZ9-deep	0.00734	0.0000120	0.000529	0.0239	0.0530	0.0000160	6.0	0.000157	0.00451
KZ22-DS	0.00233	0.0000170	0.000674	0.0474	0.0107	<0.0000050	9.4	0.000530	0.00070
Pond	0.0140	<0.0000050	0.000196	0.0802	0.0136	0.0000200	<3.0	0.000105	0.00157

All values reported as mg/L. Table includes abbreviated list of constituents which are important in the context of passive water treatability. Data from all constituents tested at all sites is provided in Appendix C.

4.3. Characterization of Soils in the Context of CWTS

In some situations, the natural soil chemistries can be used as guidelines for bounds of acceptable elemental loading to sediments, or even to determine appropriate plant habitat. Moreover, the characteristics and properties of the soil can be assessed in the context of beneficial microbes. They can suggest preferred habitats and conditions to encourage specific biogeochemical processes and incorporate these into the CWTS design.

There were notable differences in the color of precipitates and sediment layers. The KZ9-east seep and associated sites (KZ9-shallow1, KZ-shallow2) have bright orange precipitate, calcifications and sediment (Figure 9 and Figure 10). This colour is presumed to be related to oxidized iron (e.g., ferric iron as oxyhydroxides) as concentrations at these sites are elevated in both the water and soil (Table 5 and Table 7).

KZ-SE water is also elevated in iron (Table 5) and the top layer of sediment is red; however, immediately underneath the sediment was black (Figure 7), suggesting a coupled biogeochemical process of iron oxidation and sulphate reduction (to black sulphides). It is also possible that the black colour is oxidized manganese; however, there was a sulphidic smell associated with the exposure of the black colouration.

At the Pond site (Figure 13), a peat layer covers a fine white clay base, possibly explaining why the pond retains water despite being perched above the water level of Geona Creek. This location demonstrates the ability of *C. aquatilis* to grow in both peat and clay soils as the roots extended far below the peat-clay interface.

Some sampling locations had concentrations of Cd, Cu and Zn that are above the interim sediment quality guidelines (ISQGs) set forth by the CCME for the protection of freshwater aquatic life (Table 7) (CCME, 2015). However, these levels are all still below the probable effect level (PEL) outlined by CCME, which indicates that adverse biological effects are unlikely to occur (CCME, 2015).

Synthetic Precipitation Leachate Procedure (SPLP) analysis was performed to understand the availability of metals in soils. Overall the concentrations of leachable elements in soils were low throughout the KZK site with the exceptions of KZ-NW which had elevated concentrations of leachable Fe, Pb, and Zn, and KZ22-DS which had elevated leachable Fe (Table 8).

Wetland treatment capacity could be significantly improved over that naturally observed at the KZK site by using soils with better hydraulic conductivity and microbial habitat properties. For example, a treatment wetland could be built with sand to improve hydraulic conductivity, and amended with organic material to promote microbially catalyzed sulphate reduction and associated metals treatment and alkalinity generation.

Table 7 – Results of Soil Laboratory Analyses

Site	Relative Redox [a]	TOC	CEC	Cond	P	K	Ca	Al	Cd	Cu	Fe	Pb	Mn	S	Se	Zn
Units	NT	%	meq/100g	dS/m	mg/kg											
KZ-NW	-185	8.1	37	0.57	14	140	8900	100000	2.90	25	62000	18	260	1800	2.4	450
KZ9-shallow1	+313	1.2	35	0.33	<5	42	290000	1500	0.47	<4	84000	<2.0	9800	1200	<2.0	140
KZ9-shallow2	NT	1.8	49	0.39	<5	87	230000	3200	0.89	<4	96000	<2.0	24000	940	<2.0	240
KZ22-DS	NT	32.0	74	0.77	11	1700	14000	5800	1.10	12	32000	2.4	750	4600	<2.0	<40
Pond	+138	18.0	47	0.56	130	270	13000	2500	0.34	43	4400	4.4	180	1800	<2.0	41

TOC – Total Organic Carbon; CEC – Cation Exchange Capacity; NO_3 – Available Nitrate as N; P – Available Phosphorus; K – Available Potassium; SAR – Sodium Adsorption Ratio; Cond – conductivity as saturated paste. Cells shaded in grey indicate values that surpass the CCME Sediment Quality Guidelines for Protection of Freshwater Aquatic Life (CCME, 2015).

Table 8 – Results of Soil Laboratory Analyses for Elements Leachable by Synthetic Precipitation Leachate Procedure (SPLP)

Site	Ca	Al	Cd	Cu	Fe	Pb	Mn	Se	Zn
KZ-NW	11.5	0.068	0.000167	0.0035	6.64	0.0498	0.0453	<0.0010	0.388
KZ9-shallow1	56.0	<0.020	<0.0000020	<0.0020	0.684	0.0016	0.267	<0.0010	<0.010
KZ9-shallow2	50.1	<0.020	<0.0000020	<0.0020	0.412	<0.0010	0.0542	<0.0010	<0.010
KZ22-DS	15.2	0.027	0.000364	<0.0020	1.49	0.0018	<0.0050	<0.0010	<0.010
Pond	7.6	0.087	<0.0000020	<0.0020	0.077	<0.0010	0.0185	<0.0010	<0.010

Concentrations reported as mg/L.

4.4.Potential Plant Species for use in CWTS

Wetland plant *Carex* species, and specifically *C. aquatilis*, was thriving at all sites sampled, with only the Pond site having growth of *C. utriculata* (Figure 14). *Carex* roots generally have low radial oxygen loss and can promote reducing zones even at water depths of 20-30 cm (Haakensen et al., 2015). They are also known to be peat forming, with high accretion rates, thus trapping minerals within the soils, decreasing bioavailability and preventing resuspension. As the dominant emergent macrophyte at the KZK site, *C. aquatilis* above water biomass (leaves) were sampled for comparison in future Phases of CWTS development, should they be pursued (Appendix C). Additionally, *C. aquatilis* was found growing in water with flows ranging from stagnant to rapidly flowing (Geona Creek), and in a range of soil substrates, including peat, clay, aquatic moss, sand, cobble, and abandoned beaver dams. These plants have previously been shown to be host to beneficial microbes and can naturally promote conditions for mineralization of a range of elements, with very little plant uptake (Haakensen et al., 2015).

Aquatic mosses have a high sorption and uptake rate of cations (such as copper and zinc) and is also a relatively benign sink for these elements (i.e., is not a food source for invertebrates or higher animals and as such does not contribute greatly to bioaccumulation (Haines & Renwick, 2009; Longton, 1997; Suren & Winterbourn, 1991). Moreover, mosses have a low decomposition rate, and therefore can help prevent toxic accumulation of metals in a wetland, through accretion and therefore peat formation. The presence of aquatic mosses at sites of KZ-SE, KZ9-deep, KZ22-DS, and the Pond, all which all have diverse water quality and sediment characteristics, supports the potential utility of these on-site mosses in a CWTS design.

Carex species and aquatic mosses naturally form wetlands in concert with one another. Most notably, at KZ22-DS the aquatic mosses have formed a floating substrate in which the *C. aquatilis* have colonized and established a robust community, which in turn provides structure and stability to the moss through its root structure (Figure 12).

In addition to *C. aquatilis* and less abundant *C. utriculata* identified at the KZK site, *Schoenoplectus* sp. (bulrushes) were found nearby at Coffee Lake (km 350 of Robert Campbell Highway) and on the access road to Ross River from the highway. *Schoenoplectus* sp. are of interest for CWTS design as they have a greater water depth tolerance than *Carex*, and thus may provide a greater variety of design options. Because they were off the KZK site, the *Schoenoplectus* sp. and associated water and sediments were not sampled as part of this assessment, but could be included at a future time.

Willow (*Salix)* and alder (*Alnus*) were ubiquitous at KZK and can vegetate moist areas and tolerate periodic flooding of short durations. These species are of particular note as they tend to cause channeling of water within treatment wetlands. These may need to be considered as part of a long-term maintenance program to ensure they do not affect hydrology of CWTSs in closure. Maintaining sufficient water depth to prevent germination and establishment may prevent colonization of CWTS by these potentially harmful plants. As

a contingency option, they may also be managed by physical removal (e.g., pulling out by hand when young). Evidence of inactive (historical) beaver dams were found at sites associated with willow and alder (especially KZ-NE), which is a plant type beavers use in their construction, and thus the removal of these plants may be a method of beaver management in the vicinity of CWTS.

4.5. Assessment of Latent Remediation Potential at KZK

Microbes can be considered the driving force of many treatment pathways that are found in CWTSs and other passive and semi-passive water treatment systems. The beneficial microbes in these systems catalyze biogeochemical cycles for remediation of specific constituents of concern. Careful design of water treatment systems can mimic the environmental conditions needed to enhance the abundance and metabolic activity of beneficial microbes. Accordingly, complimentary methods of genetic and growth-based testing were used to characterize the microbial populations associated with a range of microbial habitats (e.g., soils, biofilms, aquatic mosses, and plant roots) in relevant aquatic environments at the KZK site.

Natural microbes that are potentially beneficial to treatment of mine-influenced waters were found in all samples from the KZK site. These were in particularly high abundance on *C. aquatilis* roots, and even moreso when *C. aquatilis* and aquatic mosses were growing together. A summary of the microbial analyses results for the KZK site assessment is provided in Appendix D, with key findings outlined in the following sections.

4.5.1. *Sulphide production*

As anticipated through the Cominco water quality predictions of the late 90s, and as the KZK site is a zinc-copper-lead deposit, it is a reasonable expectation that there will be elevated levels of these elements in mine-associated waters during operations and/or closure which will require treatment prior to release from the site. One potential treatment mechanism for these constituents is complexation as insoluble, stable metal-sulphides, which are then filtered or precipitated from water and have low bioavailability. As such, formation of sulphides is a key biogeochemical treatment mechanism of interest. Sulphides can be created by beneficial microorganisms through the reduction of sulphur-containing compounds, such as sulphate, sulphite, thiosulphate, and elemental sulphur. Sulphides can also complex with other aqueous cations such as cadmium, copper, iron, molybdenum, nickel, lead, and zinc, and are thus a removal mechanism for a variety of elements that might require treatment.

Genetic and growth-based analyses were performed to assess presence, abundance, identity, and diversity of sulphide-producing organisms (including sulphate-reducing bacteria) naturally found at the KZK site (Figures 15 through 17). All samples tested were found to contain bacteria capable of producing sulphides, with the highest proportions of sulphide-producing bacteria associated with the *C. aquatilis* root samples from KZ9-shallow1 and KZ22-DS (Figure 15).

A greater diversity of sulphate-reducing bacteria can be regarded as a measure of robustness, as the different bacteria will be able to carry out the beneficial reaction under a wider range of conditions than a lower diversity of organisms would be capable of. The highest diversity of sulphate-reducing bacteria was associated with samples collected from *C. aquatilis* roots and surrounding soil samples (Figure 15 and Figure 17).

4.5.2. *Selenium*

Despite very low concentrations of selenium in the water at all sampled locations (< 0.0008 mg/L; Appendix C), selenite- and selenate-reducing organisms were found associated with all sample types based on most-probable number (MPN) growth analyses (Figure 18). These beneficial organisms can remove soluble oxidized selenite and selenate from water by creating insoluble elemental selenium which is then sequestered in the soils. If treatment of selenium in water is deemed necessary for the KZK site, these natural beneficial microbes are associated with both plant types that are of interest for further CWTS testing, and can be fostered to have greater abundances or activity with environmental conditions according to the wetland design.

4.5.3. *Nitrate and nitrite*

Nitrate is sometimes a constituent of concern during operations and early closure owing to residuals from blasting activities. Even if not in exceedance of water quality guidelines in terms of receiving environment objectives, nitrate often requires attention in order to achieve treatment of other constituents. The presence of nitrate can interfere with the treatment of certain elements in water (such as selenium). MPN analysis was used to profile the number of organisms capable of reducing nitrate (NO_3) to nitrite (NO_2), and also those capable of fully reducing nitrate to nitric oxide (NO), nitrous oxide (N_2O), dinitrogen (N_2) (Figure 18). Results of the MPN assay indicate that all sites harbor microbial populations capable of reducing nitrate, and the majority of sites have capacity to participate in full nitrogen cycling, removing both nitrate and nitrite from the water.

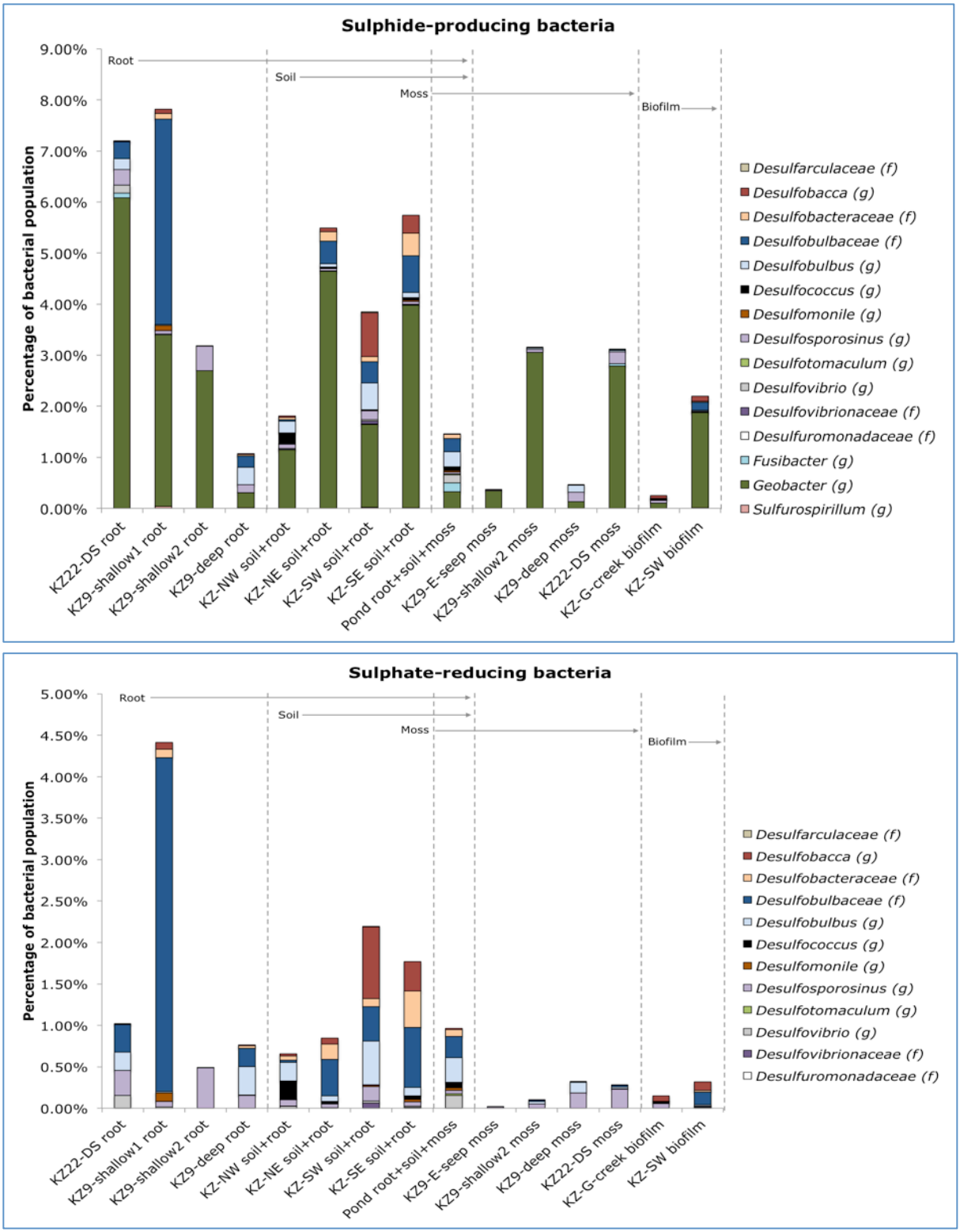


Figure 15 – Comparison of identified sulphide-producing bacteria (top) and sulphate-reducing bacteria (bottom) in different sample types according to genetic analyses

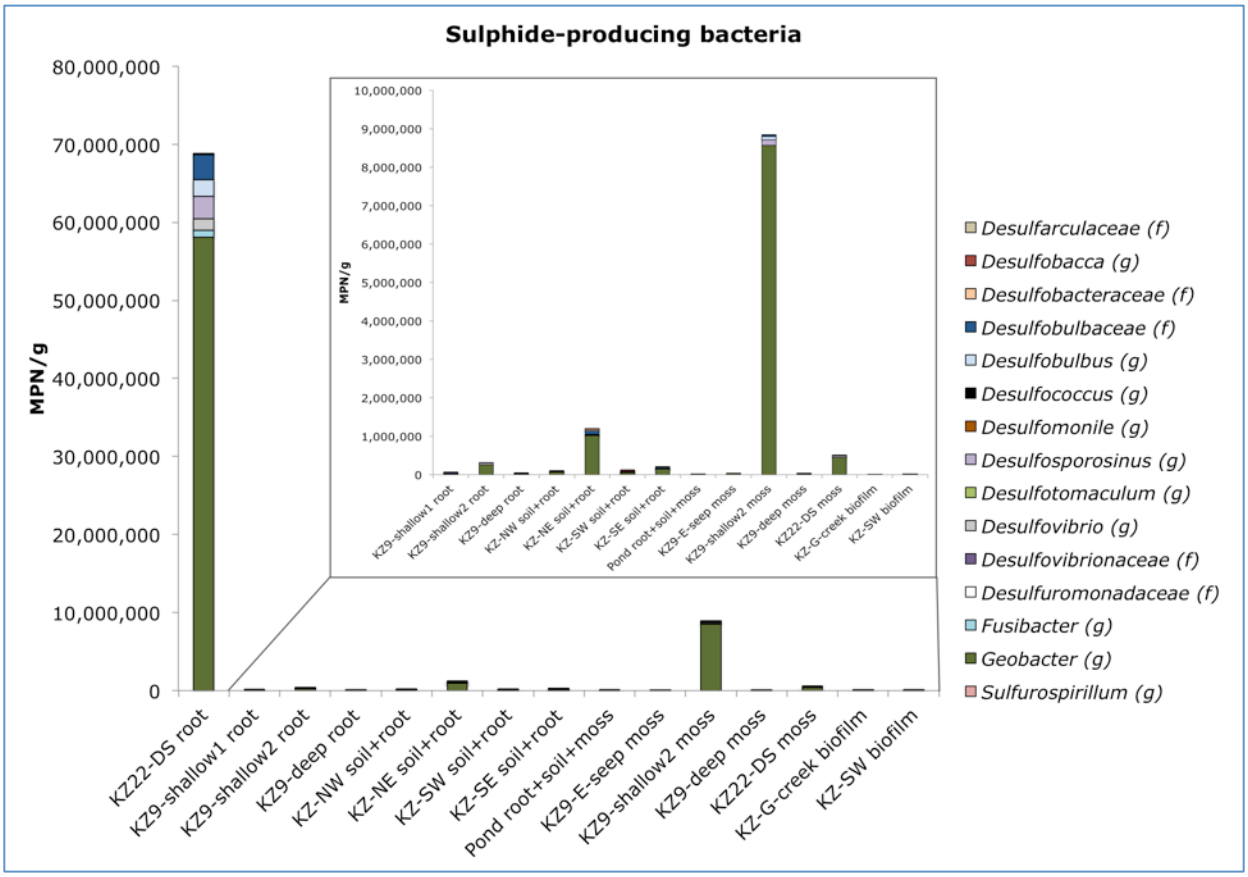


Figure 16 – MPN of sulphide-producing bacteria per gram of sample

Number of organisms are provided per gram of sample, based on growth analyses for total heterotrophic organisms, adjusted by percentage of community that are key sulphide-producing organisms as determined by genetic methods. All samples are ordered according to sample type. In the context of this figure, sulphide-producing organisms are those that can reduce sulphate, sulphite, thiosulphate, or elemental sulphur to sulphide. Names of organisms are either genus (g) or family (f) level classification.

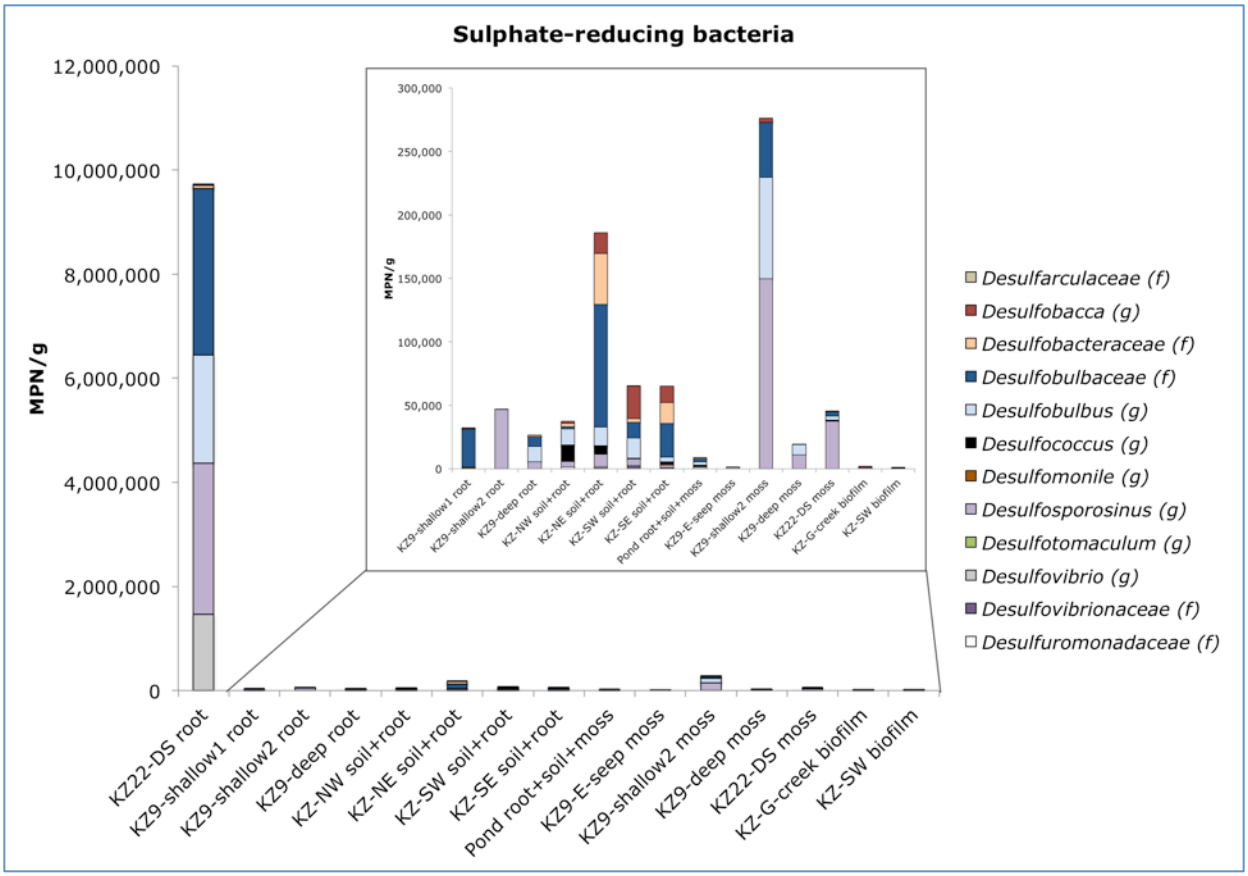


Figure 17 – MPN of sulphate-reducing bacteria per gram of sample

Number of organisms are provided per gram of sample, based on growth analyses for total heterotrophic organisms, adjusted by percentage of community that are key sulphate-reducing bacteria as determined by genetic methods. All samples are ordered according to sample type. Names of organisms are either genus (g) or family (f) level classification.

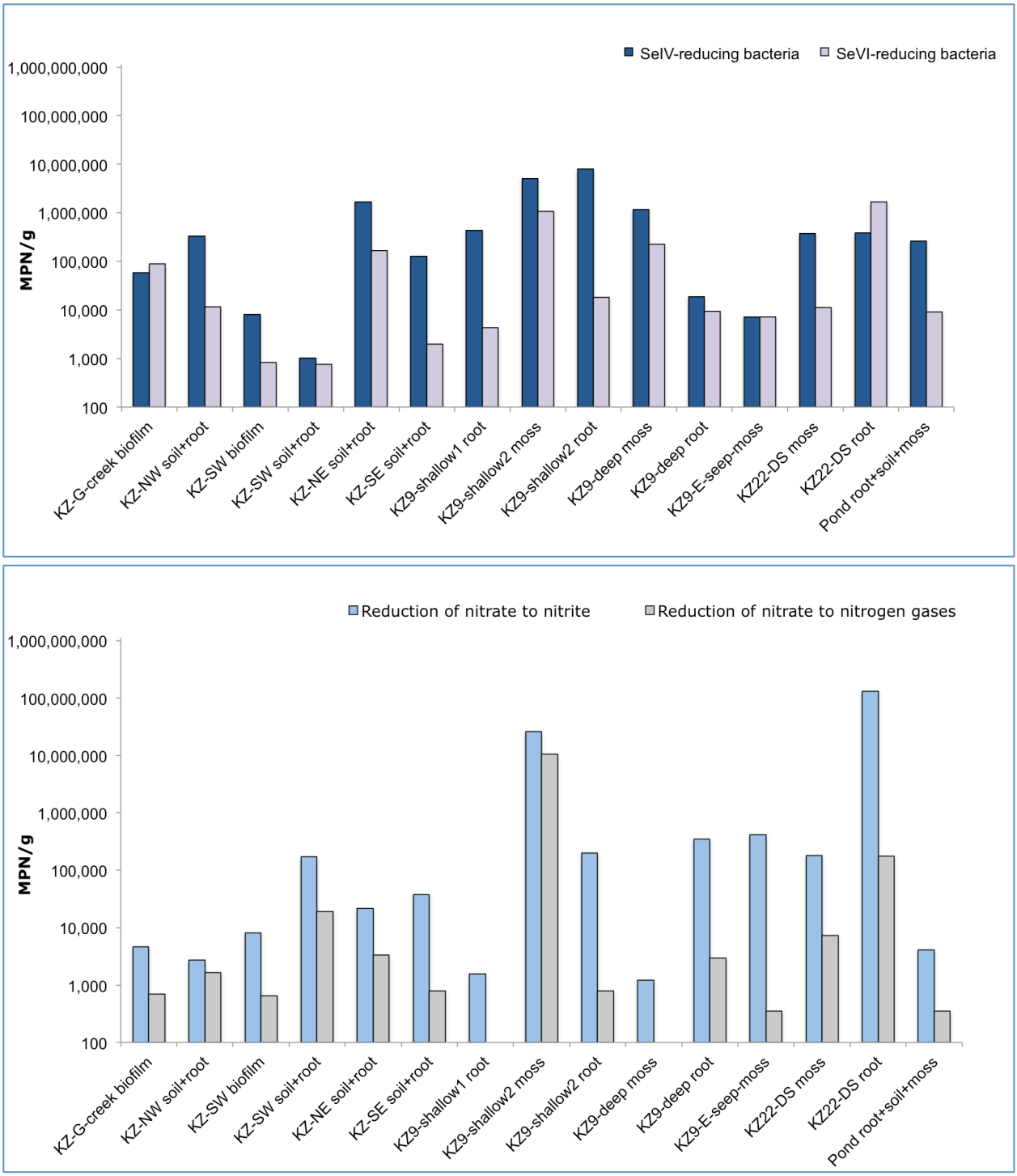


Figure 18 – Results of growth-based 'most-probable number' (MPN) assay for selenium and nitrate reducing organisms in each sample

The detection range is approximately 270 to 1,121,300,000 MPN/g for both assays. SeIV – organisms capable of reducing selenite; SeVI – organisms capable of reducing selenate; Nitrate to Nitrite – organisms capable of reducing nitrate to nitrite; N2 production – organisms capable of reducing nitrate to nitric oxide, nitrous oxide, or dinitrogen gas.

5. Summary

The findings of this site assessment suggest that passive or semi-passive water treatment is feasible at the KZK site. Native plants and beneficial microbial communities were identified at multiple locations at the KZK site that are capable of contributing to desirable water treatment activities.

This study provided a comprehensive assessment of the latent natural capacity for passive water treatment KZK

Highlights of the CWTS feasibility assessment for the KZK site include:

- Passive and/or semi-passive water treatment is theoretically feasible at the KZK site.
- Native plants and beneficial microbial communities were identified at multiple locations at the KZK site that are capable of contributing to desirable water treatment activities
- Wetland plant species *C. aquatilis* (water sedge) and aquatic mosses are abundant at the KZK site, host natural beneficial microbes, and promote conditions conducive to water treatment.
- Wetland plant *Schoenoplectus* (bulrush) is abundant in the nearby area as a secondary option if necessary.
- Naturally occurring microbes were found in abundance in wetlands, seeps, and creeks at the KZK site, capable of beneficial processes such as reduction of nitrate, nitrite, selenium, and sulphate.
- Further characterization and determination of final water chemistry and usage objectives must be clearly defined in order to appropriately and accurately suggest CWTS design.
- Deterrence of local wildlife should be incorporated into the CWTS design given the evidence of both beaver and moose at KZK wetland and creek areas.
- Periodic removal of willows and alders may need to be incorporated into a long-term management plan as they alter hydrology by promoting channeling of water and encourage beaver activity.

6. Recommendations

There is good theoretical potential for passive or semi-passive water treatment systems, particularly CWTSs, to be considered as a component of a water treatment strategy at the KZK site. Should BMC and the planning and design teams decide to consider this potential further, there are some information gaps needing to be filled to be able for more fulsomely consider these report findings. It is recommended that the following information be developed, at a preliminary level at least, to support this further work:

- Quality, volume, and periodicity of water to be treated.
- Receiving environment water quality objectives.
- Site water balance and water management plans to develop plan most suitable to passive closure water treatment.
- Objectives for degree of operational passiveness and acceptable frequency and intensity of long-term maintenance required.
- Periodicity or seasonality of treatment needed and capacity for water storage if necessary.
- Project timelines, including date when needed to be online, and anticipated duration of operation.

Once these key information gaps are addressed, conceptual CWTS designs could be developed. Conceptual designs are for planning purposes and ideally are followed by pilot-scale testing and optimization to develop site-specific treatment rate coefficients and operational boundaries, and to determine maximum extent of removal. Accordingly, sizing estimates and performance expectancies would be refined as the planning for CWTS progressed through phased development.

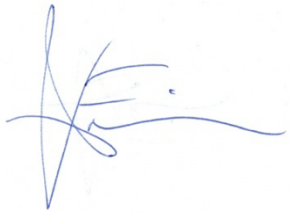
7. Closure

We trust the information herein satisfies your present requirements. Should you have any questions, please contact the persons listed below. We appreciate the opportunity to provide the services detailed in this report, and look forward to discussing any comments you may have.

Respectfully submitted,

Contango Strategies Ltd.

Monique Haakensen, PhD, RPBio, PBiol, EP



Vanessa Friesen (Pittet), PhD

8. References

Alexco Environmental Group. (December 7, 2015) File 'KZK-WC-1994-Nov2015_ActiveSites.xlsx' provided by Nichole Speiss.

Canadian Council of Ministers of the Environment (CCME). (2015) Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg.

Faulkner SP, Patrick Jr. WH, Gambrell RP. (1989) Field techniques for measuring wetland soil parameters. Soil Sci. Soc. Am. J. 53:883-890.

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Appendix A – Methods

A site assessment for CWTS feasibility was undertaken from August 25th to 28th, 2015 and 11 sites were selected for further analysis. To define site-specific design aspects, sampling sites were selected and characterized by analysis of water, soil, and plants. The native microbial communities were also characterized to identify latent potential for treatment associated with sampling sites. In all cases, water samples were collected then microbiological samples, prior to collection of soil and plant samples. In situ water and soil measurements were also taken as described in Section A1.

A1. Explanatory Parameters

Explanatory parameters are quantifiable aspects of a CWTS environment that can be used to assess feasibility of treatment for a range of constituents, and therefore 'explain' the performance of a CWTS. These parameters, which often include acidity, alkalinity, conductivity, dissolved oxygen (DO), pH, oxidation reduction potential (ORP), ion balance, available electrons donors (e.g., organic carbon, reduced elements), and temperature, can be used to predict, promote, and/or optimize the ability of the system to treat different constituents. This information can be used to help identify which plants, soil types, or structural features may be the most beneficial to establish the desired conditions in a CWTS (Haakensen et al., 2015).

A YSI ProPlus meter was used in the field to test for temperature, DO, conductivity (and specific conductivity; SPC), pH, and ORP.

Additionally, soil redox potential measurements were taken using platinum tip probes and Calomel electrodes to measure the flux of electrons between the sediment/soil/pore water and overlying water column (Faulkner et al., 1989; Huddleston and Rodgers, 2008)

A2. Water sampling

Water samples were collected by grab method and as appropriate to the analysis type, were filtered and/or preserved in the field. A total of 10 water samples were collected (described in Table 1 of the Report) and analyzed for parameters as outlined in Table A1. Water samples were stored outdoors in insulated coolers until shipping off site for analysis by Maxxam Analytics. At the time of the site visit, outdoor temperatures reached highs of +12°C to +18°C and dropped to around +4°C overnight.

Table A1 – Water analyses

Water Analysis
In Situ
Conductivity
Dissolved Oxygen
Oxidation Reduction Potential
pH
Temperature
Laboratory
Alkalinity
Ammonia (as N)
Anions and Cations (and Ion Balance)
Biological Oxygen Demand
Chemical Oxygen Demand
Elements scan by ICP-MS (Total and Dissolved): Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, S, Tl, Sn, Ti, U, V, Zn, Zr [1]
Hardness
Nitrate/Nitrite
pH
Sulphate
Total Kjeldahl Nitrogen
Total and Organic Carbon
Total Dissolved and Suspended Solids

[1] Elements were analyzed either by ICPMS Low Level (which does not include digestion) for samples without visible particulate, or ICPMS Low Level Digested for samples with particulate matter (list of samples for each method are provided in Table 4 of Report).

A3. Soil Sampling

Soil samples were collected to an average depth of approximately 5 to 7 cm in order to collect the zone that is normally most biologically active and also representative of recent sedimentation. Samples were collected by grab method, and depending on consistency of the soil, were collected either by hand with a sterile glove, or using a sterile collection container. A total of 5 sediment samples were collected (described in Table 1 of the Report), and analyzed for parameters as outlined in Table A2. Soil samples were collected into plastic bags provided by the analytical service provider and stored in the same insulated coolers as the water samples.

Table A2 – Soil analyses

Soil Analysis
In Situ
Relative Soil Redox
Laboratory
Available N, P, K
Cation Exchange Capacity
Conductivity
Elements by ICP-MS: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Ag, Na, Sr, S, Tl, Sn, U, V, Zn
SPLP Elements: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Na, Ag, Sr, Tl, Ti, U, V, Zn
Physical Properties (% sand, silt, clay and gravel)
Sodium Adsorption Ratio, % saturation, Soluble Ca, Mg, Na, K, SO_4
Total Organic Carbon

A4. Plant Sampling

A total of 9 plant samples were collected consisting of *Carex aquatilis* (aka water sedge) (Table 1 of the Report). Above ground vegetation was collected for analytical analyses as per Table A3, because these are indicative of plant uptake, and also because they are of concern to the cycling of elements and nutrients through decomposition. In some instances, matching root samples were collected for microbial analyses to assess whether they were host to beneficial microbes.

Table A3 – Plant Analyses

Plant Analyses
Laboratory
Elements in Tissue by CRC ICP-MS (dry weight): Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, P, K, Se, Ag, Na, Sr, Tl, Sn, Ti, U, V, Zn

A5. Microbial sample collection

Fifteen microbial samples were collected to be representative of each site, often as a composite (descriptions in Table 1 of the Report). Each sample was analyzed as per Table A4 by growth-based and genetic methods to profile microbial populations. Samples for microbial profiling were collected in sterile tubes with sterile gloves and stored in a cooler with an ice pack in the field during the sampling day. Samples were then put into a freezer at camp that night until transported back to Contango in a cooler on ice for analysis.

Table A4 – Microbial Analyses

Microbial Analyses
Laboratory Growth Based – Most Probable Number (MPN)
Iron oxidation
Nitrate reduction to Nitrite or Nitrogen gases
Selenite and Selenate reduction
Total Heterotrophs (aerobic and anaerobic)
Laboratory Genetic Based – DNA Sequencing
Bacterial community composition and relative abundance
Identification and abundance of sulphide-producing bacteria (including sulphate reducers)

A6. Methods for microbial analyses

A6.1. Growth-based analyses (MPN)

The most-probable number (MPN) of bacteria was determined for all microbial samples. The MPN test allows for an estimation of the number of microbes that can grow in a specific laboratory medium. The media tested in this project were specific for microbes that can reduce nitrate, selenate, selenite, oxidize iron, and grow in R2A heterotrophic medium (HiMedia Labs, 2011).

MPN tests for selenite- and selenate-reduction were performed as per Siddique et al., (2006), and nitrate-reduction as per the Nitrate Reduction Test (supplied by Sigma-Aldrich). MPN for iron-oxidizing organisms was performed as per the NACE International Standard TM0194-2014. MPN of heterotrophic organisms (grown with R2A medium; HiMedia Labs, 2011) were quantified in both aerobic and anaerobic conditions.

In brief, samples were weighed into a 0.1% peptone solution, and then serially diluted along a sterile 96-microwell round-bottom plate containing the respective growth media. Dilutions tested in the MPN plate resulted in a detectable range of 270 to 1,121,381,650 MPN/g of sample. At minimum, all tests were conducted in triplicate. Wells were incubated without light at +10°C to start and then moved to +20°C and assessed for visible growth (formation of a pellet) and/or colour change

specific to the type of media after 34 days. A colour change to red indicated selenite or selenate reduction, from orange to brown for iron oxidation, while nitrate reduction was assessed according to the manufacturer's instructions. The most probable number of microbes capable of each metabolism was then calculated as described by Blodgett (2010).

A6.2. DNA-based analyses

DNA was extracted from all samples using the MO BIO Powersoil Powerlyzer DNA extraction kit. Targeted DNA sequencing was used to identify bacteria present in each sample via polymerase chain reaction (PCR) amplification of the v3/v4 region of the 16S ribosomal RNA gene (Klindworth et al., 2013). Library preparation and sequencing was performed as per the manufacturer's instructions for MiSeq v3 paired-end 300 bp sequencing (Illumina) for all samples and positive and negative controls. After sequencing, the forward and reverse reads were merged and all sequences were quality filtered before processing into Operational Taxonomic Units (OTUs) and classified.

A7. References

Blodgett R. (2010) US Food and Drug Administration Bacteriological Analytical Manual, Appendix 2: Most Probable Number from Serial Dilutions.

Faulkner SP, Patrick Jr. WH, Gambrell RP. (1989) Field techniques for measuring wetland soil parameters. Soil Sci. Soc. Am. J. 53:883-890.

Haakensen M, Pittet V, Spacil MM, Castle JW, Rodgers JH. (2015) Key aspects for successful design and implementation of passive water treatment systems. J. Environ. Sol. Oil, Gas, Mining 1:59-81.

Huddleston GM, and Rodgers JH. (2008) Design of a constructed wetland system for treatment of copper-contaminated wastewater. Environ. Geosci. 15(1):9-19.

Klindworth A, Pruesse E, Schweer T, Peplies J, Quast C, Horn M, Glöckner FO. (2013) Evaluation of general 16S ribosomal RNA gene PCR primers for classical and next-generation sequencing-based diversity studies. Nucleic Acids Res. 41:e1.

NACE International. Standard Test Method, Field Monitoring of Bacterial Growth in Oil and Gas Systems. NACE TM0194-2014.

Siddique T, Zhang Y, Okeke BC, Frankenberger Jr, WT. (2006) Characterization of sediment bacteria involved in selenium reduction. Bioresour. Technol. 97: 1041-9.

Appendix B – Water quality in the context of historical data

Water samples and in situ measurements at KZ22-DS and KZ-G-creek, allowed for comparison of parameters evaluated within this current study to historical data and routine monitoring sites (Alexco Environmental Group, 2015).

KZ22-DS from this assessment is downstream of routine monitoring site KZ22 (Figure 1, main document of this report), and compared here in Figures B1 and B2.

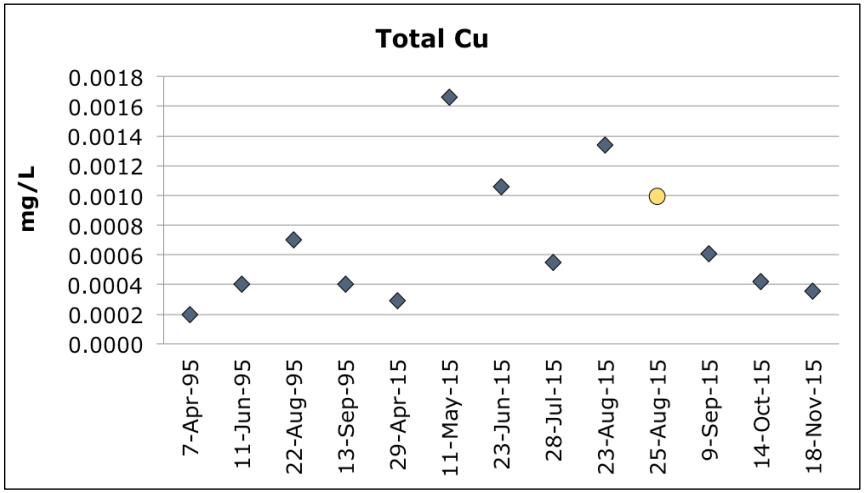
The KZ-G-creek sampling location from this assessment is downstream of KZ7 and upstream of KZ9 routine monitoring sites, and these are compared in Figures B3 and B4.

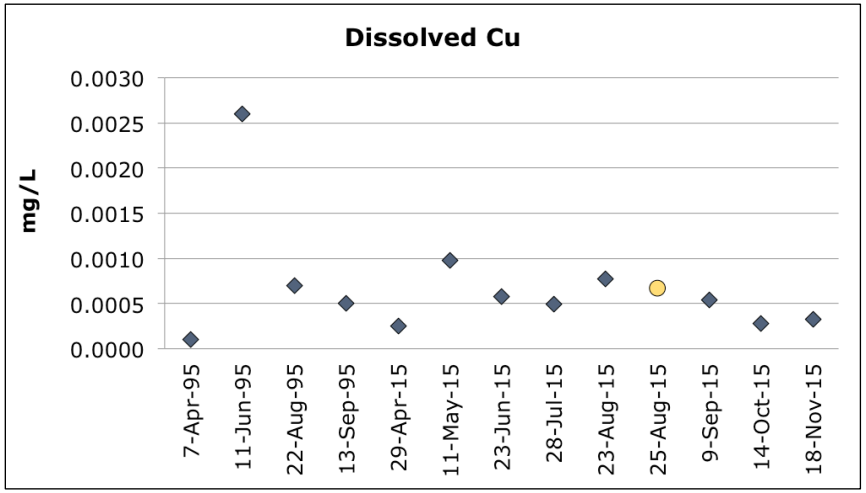
The KZ9-east seep in situ measurements taken during this assessment is compared to this same location sampled in 2015 by Alexco Environmental Group in Figure B5.

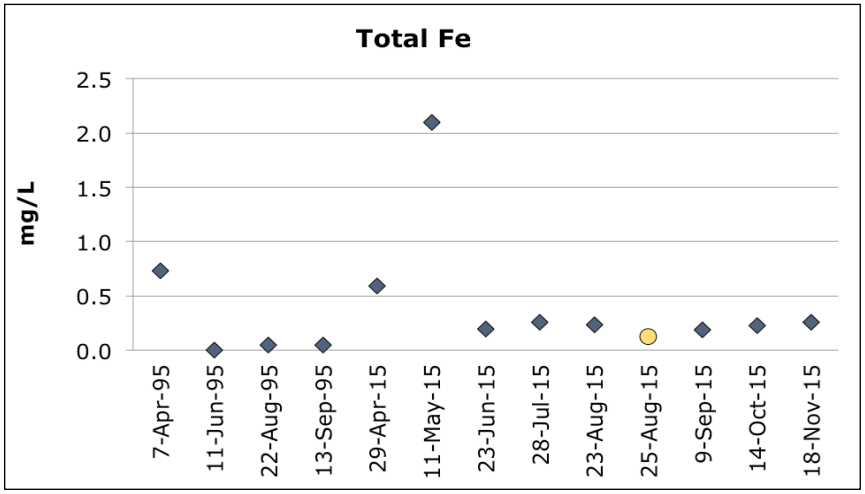
Samples from this treatment wetland feasibility assessment are within normal ranges observed for all parameters that are routinely monitored (Figures B1 and B2). Both total and dissolved metals are historically low, with little fluctuation in concentrations. Levels of dissolved sulphur appear to have increased slightly from original sampling activities in 1995 at site KZ22 (KZ22-DS), however have remained fairly constant at KZ7 and KZ9 (associated sites of Geona creek).

Reference

Alexco Environmental Group. (December 7, 2015). File 'KZK-WC-1994-Nov2015_ActiveSites Summary Report.xlsx'. provided by Nichole Speiss.


Total Cu
mg/L
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
7-Apr-95
11-Jun-95
22-Aug-95
13-Sep-95
29-Apr-15
11-May-15
23-Jun-15
28-Jul-15
23-Aug-15
25-Aug-15
9-Sep-15
14-Oct-15
18-Nov-15


Dissolved Cu
mg/L
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
7-Apr-95
11-Jun-95
22-Aug-95
13-Sep-95
29-Apr-15
11-May-15
23-Jun-15
28-Jul-15
23-Aug-15
25-Aug-15
9-Sep-15
14-Oct-15
18-Nov-15


Total Fe
mg/L
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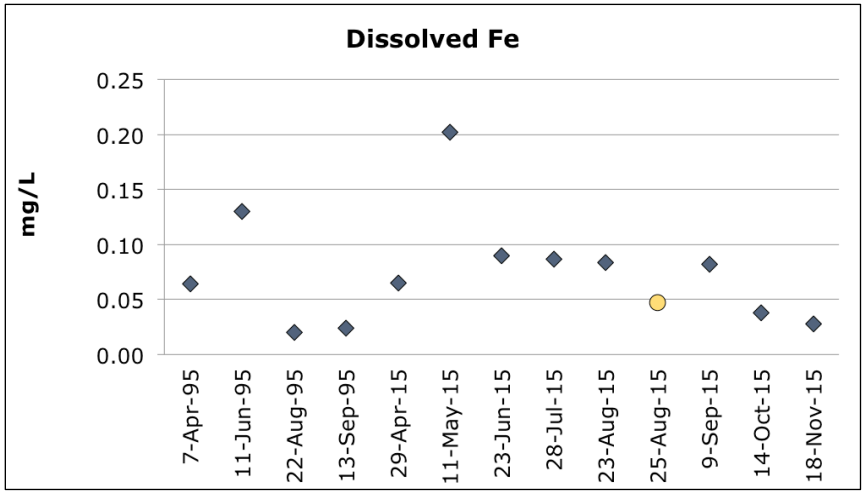
2.0
1.5
1.0
0.5
0.0
7-Apr-95
11-Jun-95
22-Aug-95
13-Sep-95
29-Apr-15
11-May-15
23-Jun-15
28-Jul-15
23-Aug-15
25-Aug-15
9-Sep-15
14-Oct-15
18-Nov-15


Dissolved Fe
mg/L
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0.20
0.15
0.10
0.05
0.00
7-Apr-95
11-Jun-95
22-Aug-95
13-Sep-95
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14-Oct-15
18-Nov-15

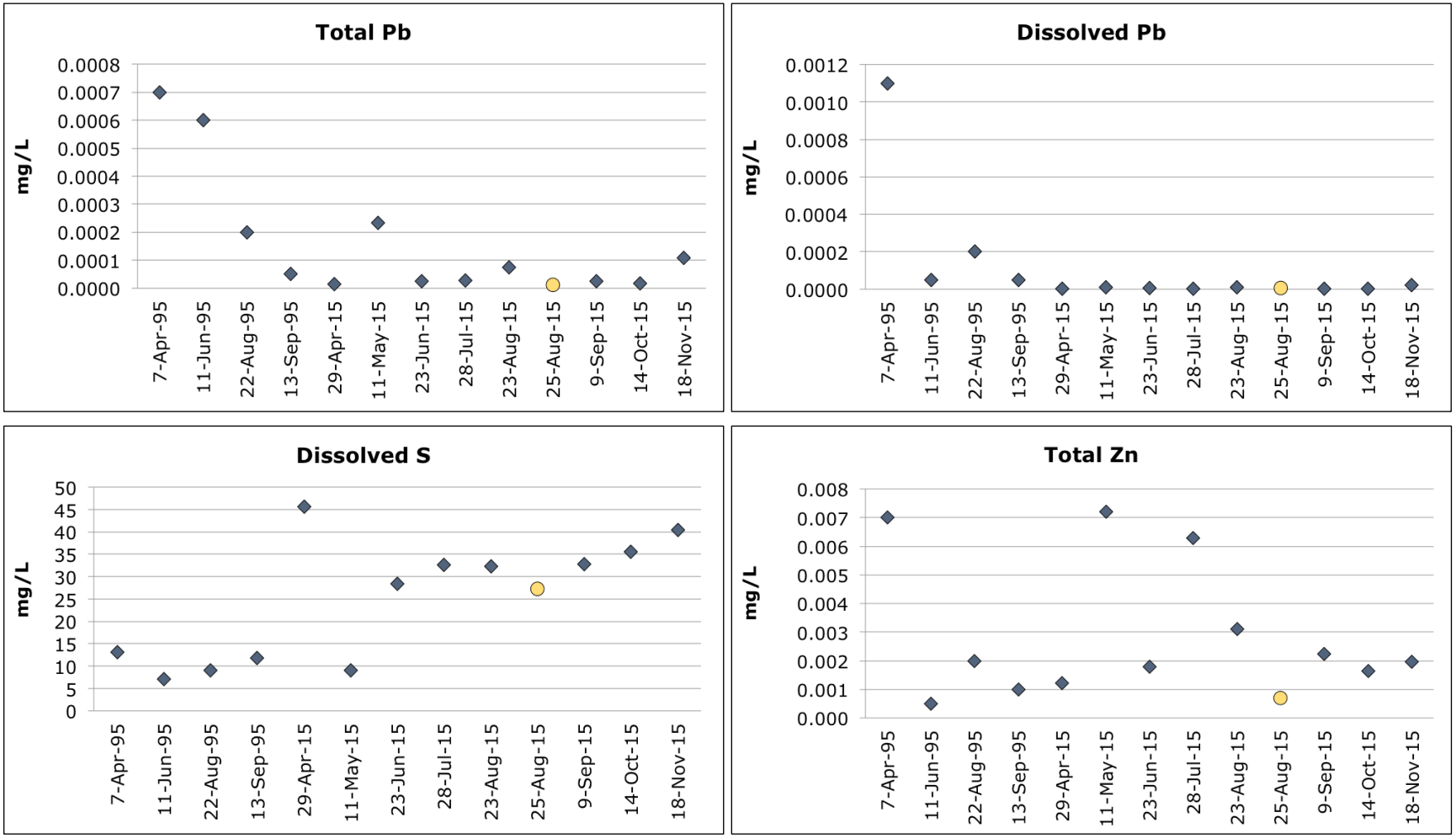

Figure B1 – Comparison of KZ22-DS sample from this study with routine monitoring locations for water quality parameter values from sampling location KZ22.

Historical and ongoing monitoring measurements for KZ22 correspond to 1995 – 2015 values from Alexco Environmental Group (2015), with dark blue diamonds. For comparison, the August 2015 site visit data collected by Contango is shown as a yellow circle.

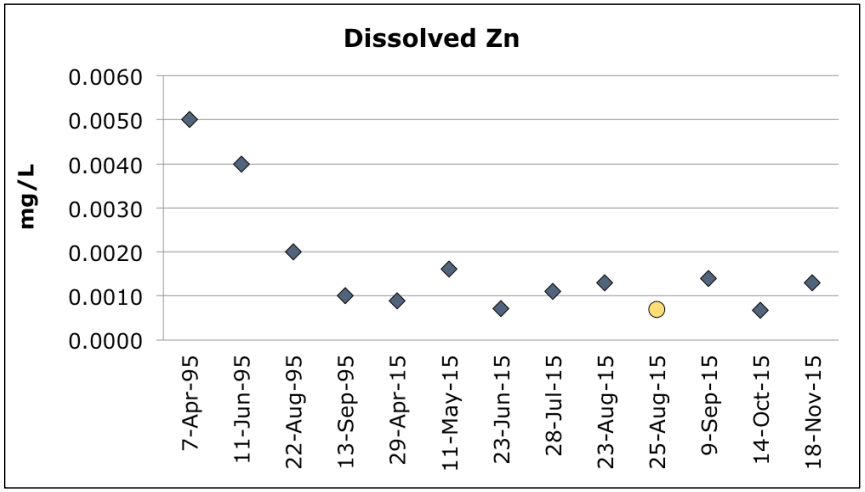

Figure B1 – Comparison of KZ22-DS sample from this study with routine monitoring locations for water quality parameter values from sampling location KZ22.

Historical and ongoing monitoring measurements for KZ22 correspond to 1995 – 2015 values from Alexco Environmental Group (2015), with dark blue diamonds. For comparison, the August 2015 site visit data collected by Contango is shown as a yellow circle.

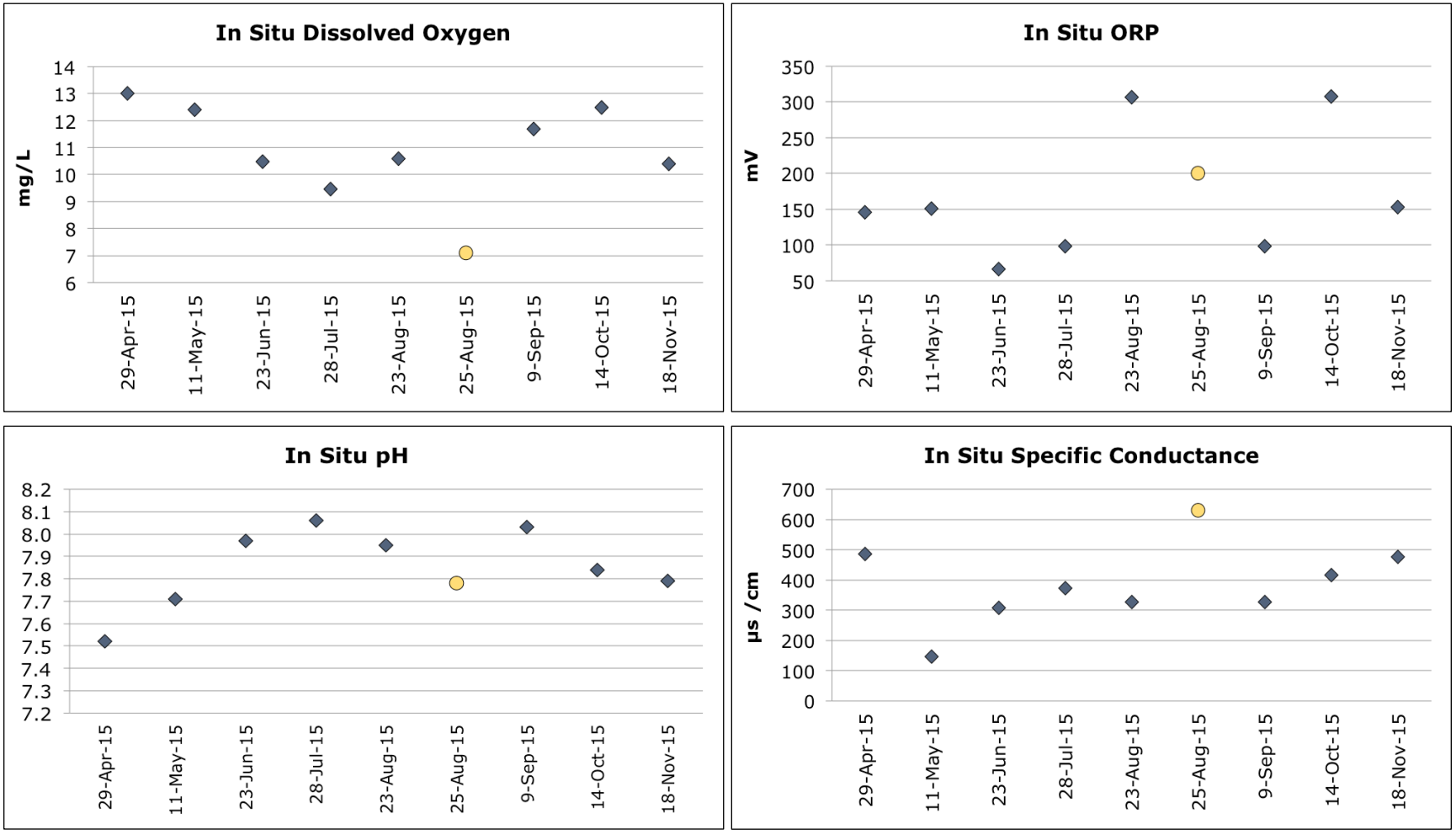

Figure B2 – Comparison of in situ analysis of KZ22-DS with routine monitoring locations for in situ water values from sampling location KZ22.

Contango sampling point is indicated as a yellow circle and 2015 Alexco Environmental Group sampling points are indicated by blue diamonds. The Y-axis does not always start at 0, to show the data with greater detail.

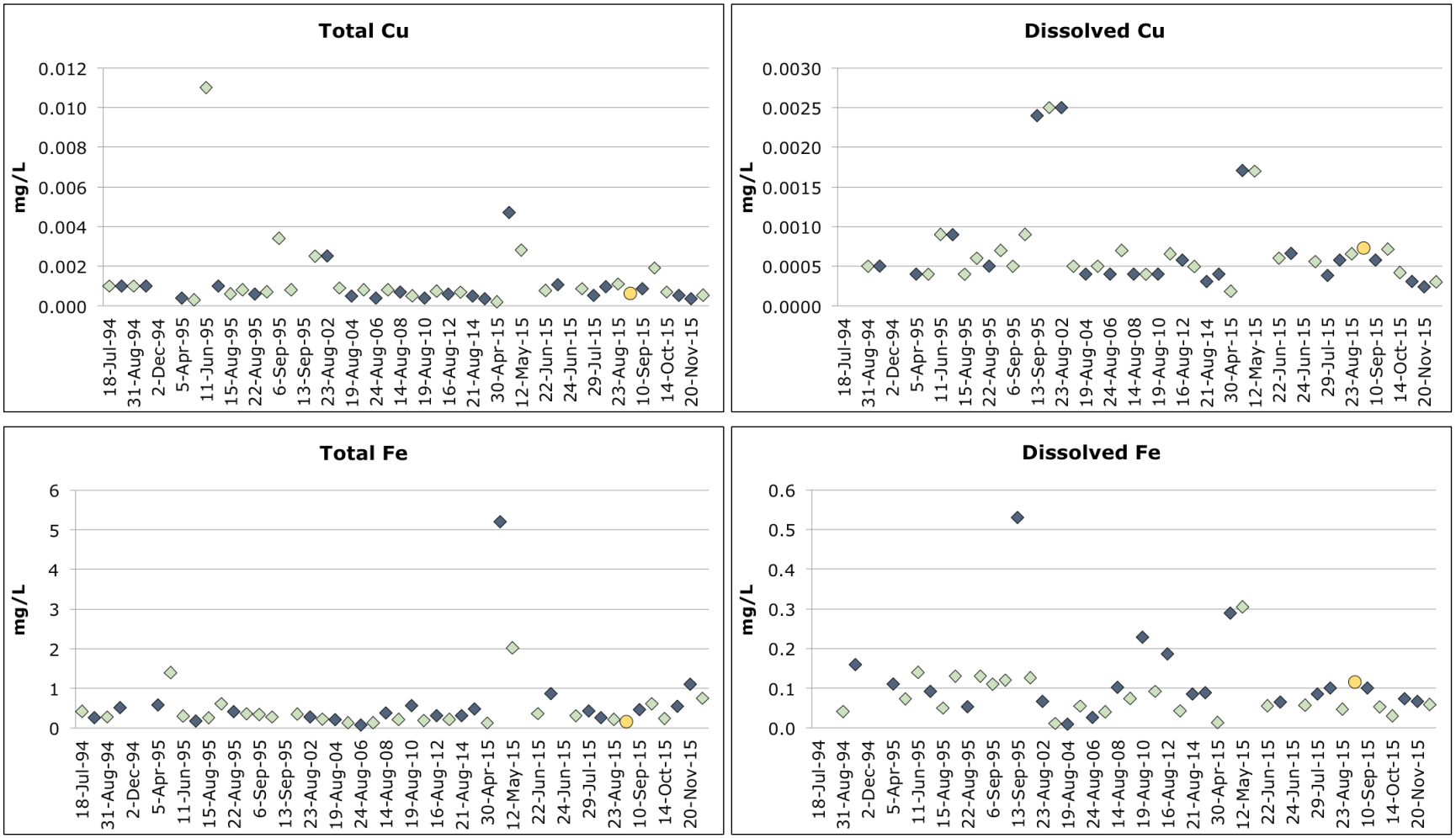

Figure B3 – Comparison of KZ-G-creek sample from this study with routine monitoring locations water quality parameter values from sampling locations KZ-7 and KZ-9.

Historical and ongoing monitoring measurements for KZ7 (green diamonds) and KZ9 (blue diamonds) correspond to 1995 – 2015 values provided by Alexco Environmental Group (2015). For comparison, the August 2015 site visit data collected by Contango is shown as a yellow circle.

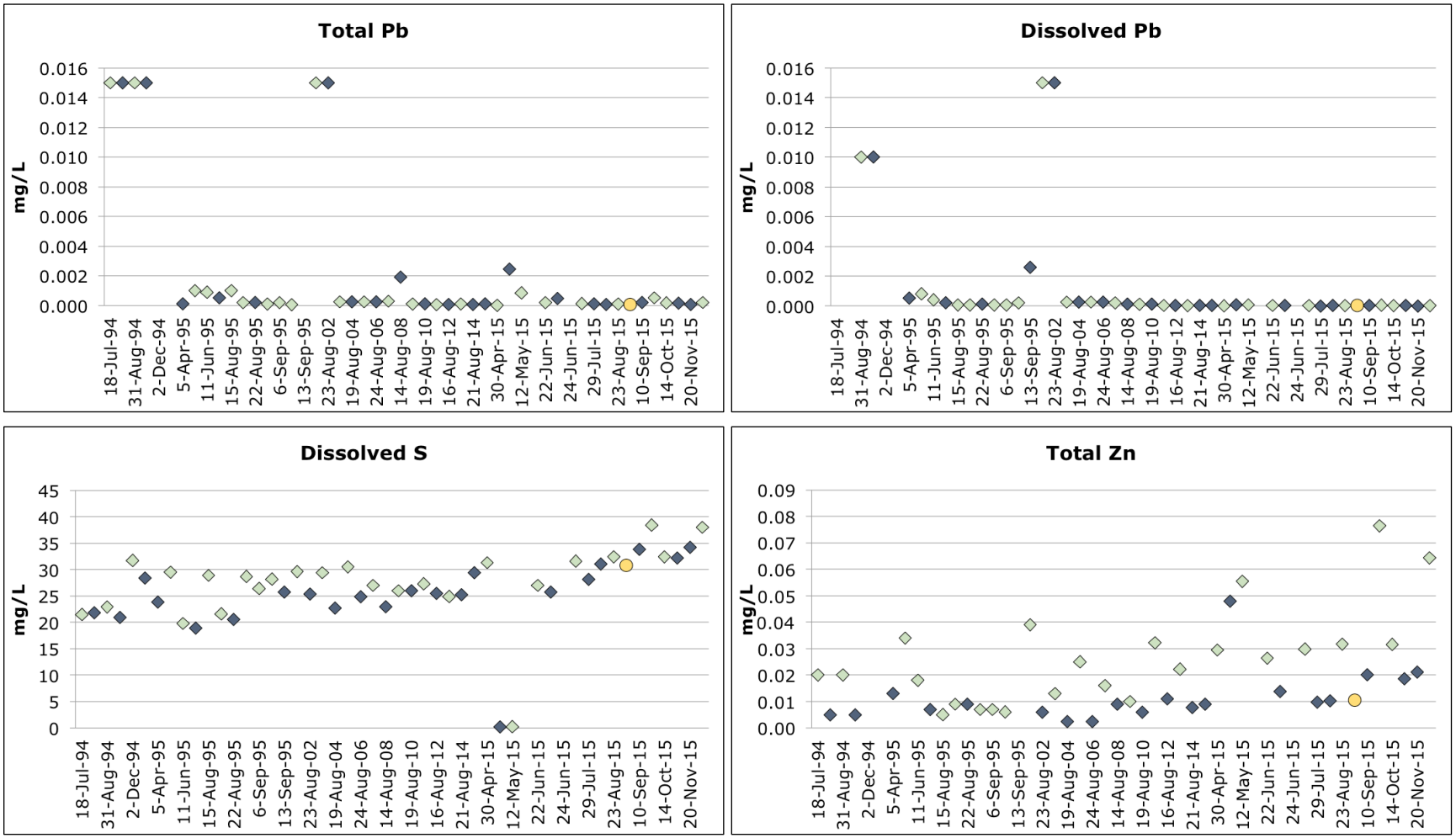

Figure B3 – Comparison of KZ-G-creek sample from this study with routine monitoring locations water quality parameter values from sampling locations KZ-7 and KZ-9.

Historical and ongoing monitoring measurements for KZ7 (green diamonds) and KZ9 (blue diamonds) correspond to 1995 – 2015 values provided by Alexco Environmental Group (2015). For comparison, the August 2015 site visit data collected by Contango is shown as a yellow circle.

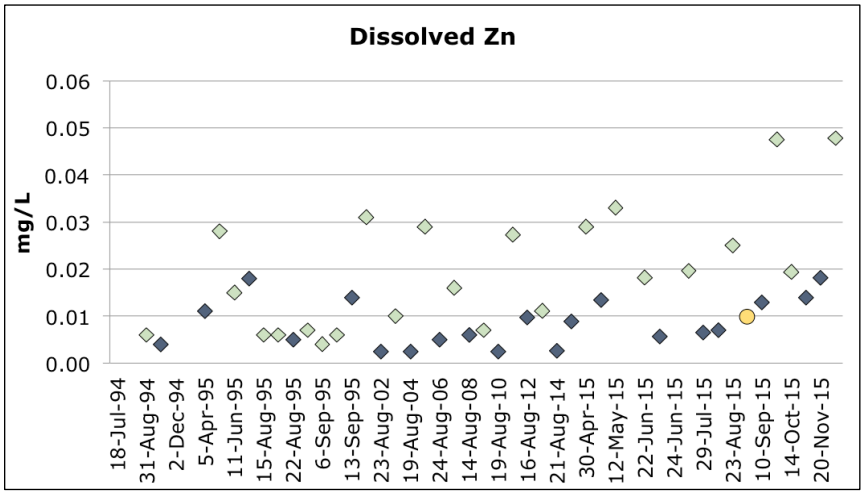

Figure B3 – Comparison of KZ-G-creek sample from this study with routine monitoring locations water quality parameter values from sampling locations KZ-7 and KZ-9.

Historical and ongoing monitoring measurements for KZ7 (green diamonds) and KZ9 (blue diamonds) correspond to 1995 – 2015 values provided by Alexco Environmental Group (2015). For comparison, the August 2015 site visit data collected by Contango is shown as a yellow circle.

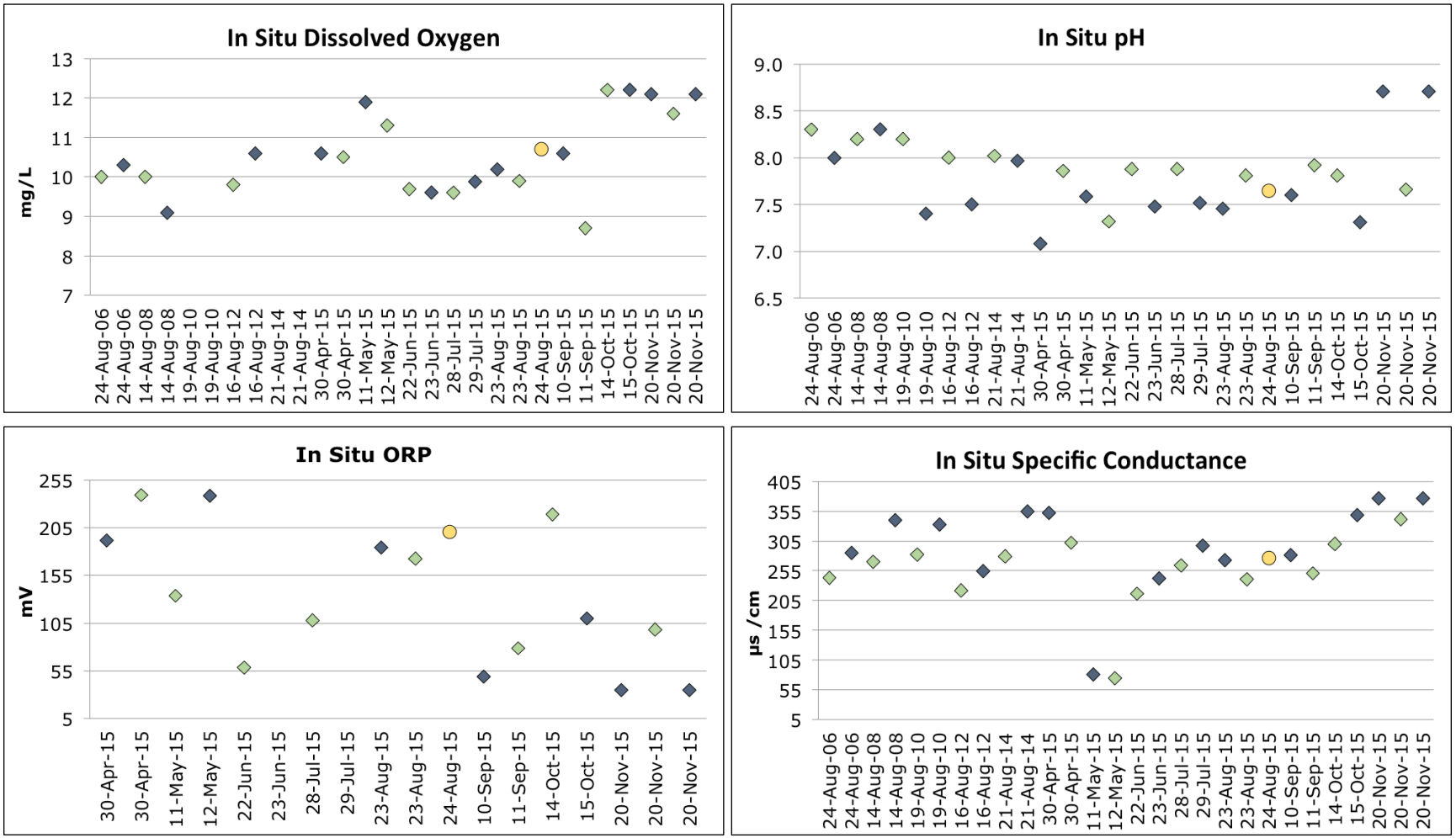

Figure B4 – Comparison of in situ analysis of KZ-G-creek with routine monitoring locations for in situ water values from sampling location KZ7 and KZ9.

Contango sampling point is indicated as a yellow circle, and 2015 Alexco Environmental Group sampling points for KZ7 are indicated by green diamonds, with KZ9 by blue diamonds. The Y-axis does not always start at 0, to show the data with greater detail.

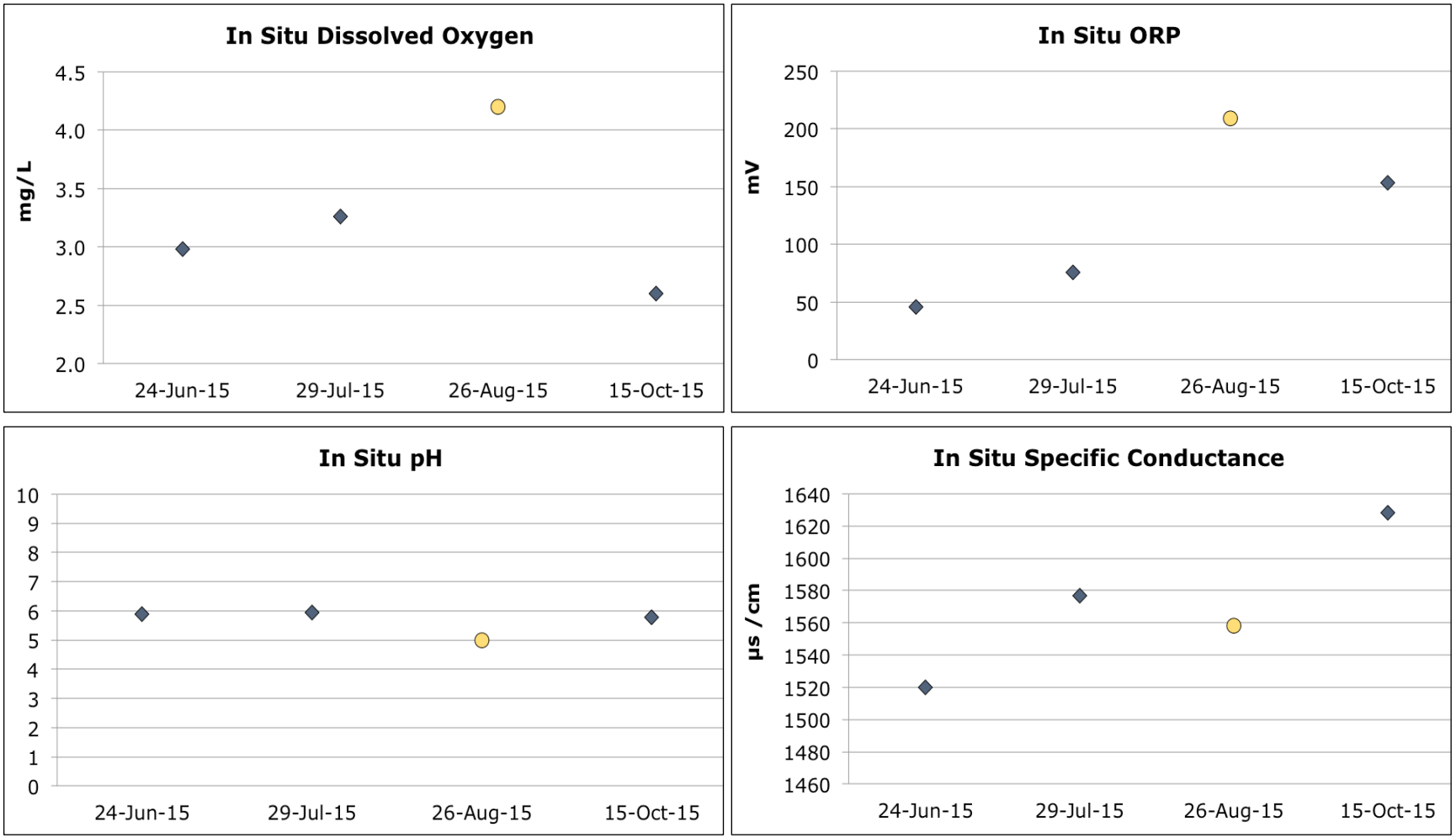

Figure B5 – Comparison of routine monitoring locations for in situ analysis of KZ9-east-seep sampling location. Contango sampling point is indicated as a yellow circle and 2015 Alexco Environmental Group sampling points are indicated by blue diamonds. The Y-axis does not always start at 0, to show the data with greater detail.

Appendix C – Analytical Data

Analytical data from Maxxam Laboratories in Burnaby, BC, Canada is provided in reports in the following pages:

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411323

Attention:Monique Haakensen

Contango Strategies Limited
15-410 Downey Road
Saskatoon, SK
Canada S7N 4N1

Report Date: 2015/09/11
Report #: R2039295
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B575200
Received: 2015/08/29, 12:15

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate and Bicarbonate @25C (Soluble) (1)	5	2015/09/04	2015/09/04	AB SOP-00033 / AB SOP-00005	SM 22 2320 B m
Cation/EC Ratio (1)	5	N/A	2015/09/04	AB WI-00065	Auto Calc
Cation Exchange Capacity (1)	5	2015/09/08	2015/09/08	AB WI-00065	Auto Calc
Chloride (Soluble) (1)	4	2015/09/04	2015/09/04	AB SOP-00033 / AB SOP-00020	SM 22-4500-Cl G m
Chloride and Sulphate by IC (Soluble) (1)	1	2015/09/04	2015/09/08	AB SOP-00033 / AB SOP-00026	SM 22 4110 B m
Conductivity @25C (Soluble) (1)	5	2015/09/04	2015/09/04	AB SOP-00033 / AB SOP-00004	SM 22 2510 B m
Elements by ICP -Soils (1)	5	2015/09/04	2015/09/04	AB SOP-00001 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Soils (1)	5	2015/09/04	2015/09/04	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance (1)	5	N/A	2015/09/04	AB WI-00065	Auto Calc
Sum of Cations, Anions (1)	5	N/A	2015/09/04	AB WI-00065	Auto Calc
Potassium (Available) (1)	5	2015/09/08	2015/09/08	CAL SOP-00153 / AB SOP-00042	EPA 200.7 CFR 2012 m
Metals - SPLP	5	2015/09/01	2015/09/04	BBY7SOP-00002	EPA 6020A R1 m
Nitrate-N (Available) (1)	5	2015/09/08	2015/09/08	CAL SOP-00152 / AB SOP-00023	SM 22 4110 B m
Phosphorus (Available by ICP) (1)	5	2015/09/08	2015/09/08	CAL SOP-00152 / AB SOP-00042	EPA 200.7 CFR 2012 m
pH @25C (1:2 Calcium Chloride Extract) (1)	5	2015/09/03	2015/09/04	AB SOP-00033 / AB SOP-00006	SM 22 4500 H+B m
Sodium Adsorption Ratio (1)	5	N/A	2015/09/04	AB WI-00065	Auto Calc
Ca,Mg,Na,K,SO4 (Soluble) (1)	4	2015/09/04	2015/09/04	AB SOP-00033 / AB SOP-00042	EPA 200.7 CFR 2012 m
Ca,Mg,Na,K,SO4 (Soluble) (1)	1	2015/09/06	2015/09/06	AB SOP-00033 / AB SOP-00042	EPA 200.7 CFR 2012 m
Soluble Paste (1)	5	2015/09/04	2015/09/04	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Ions Calculation (1)	5	N/A	2015/09/04	AB WI-00065	Auto Calc

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

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411323

Attention:Monique Haakensen

Contango Strategies Limited
15-410 Downey Road
Saskatoon, SK
Canada S7N 4N1

Report Date: 2015/09/11
Report #: R2039295
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B575200
Received: 2015/08/29, 12:15

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Organic Carbon LECO Method (1)	5	2015/09/04	2015/09/05	AB SOP-00035 / CAL SOP-00243	LECO 203-821-170 m
Texture by Hydrometer, incl Gravel (Wet) (1)	4	2015/09/04	2015/09/08	AB SOP-00035 / AB SOP-00030	Carter 2nd ed 55.3 m
Theoretical Gypsum Requirement (1, 2)	5	N/A	2015/09/04	AB WI-00065	Auto Calc

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 Calgary Environmental
(2) Units for TGR have changed from tons/acre to tonnes/ha

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 Job #: B575200
Report Date: 2015/09/11

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

SOIL SALINITY 4 (SOIL)

Maxxam ID		NA1386			NA1387		NA1388		
Sampling Date		2015/08/27 11:20			2015/08/27 14:00		2015/08/27 14:30		
COC Number		08411323			08411323		08411323		
	UNITS	KZ-NW	RDL	QC Batch	KZ9-SHALLOW1	RDL	KZ9-SHALLOW2	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	3.0	N/A	8022185	2.5	N/A	2.5	N/A	8022185
Cation Sum	meq/L	4.8	N/A	8022185	3.1	N/A	3.7	N/A	8022185
Cation/EC Ratio	N/A	8.4	0.10	8022183	9.2	0.10	9.7	0.10	8022183
Ion Balance	N/A	1.6	0.010	8022184	1.2	0.010	1.5	0.010	8022184
Calculated Calcium (Ca)	mg/kg	100	2.5	8021651	46	1.5	65	1.7	8021651
Calculated Magnesium (Mg)	mg/kg	14	1.7	8021651	3.9	1.0	4.1	1.1	8021651
Calculated Sodium (Na)	mg/kg	17	4.1	8021651	8.2	2.5	13	2.8	8021651
Calculated Potassium (K)	mg/kg	33	2.1	8021651	4.3	1.3	2.9	1.5	8021651
Calculated Chloride (Cl)	mg/kg	8.3	8.3	8021651	14	5.0	11	5.7	8021651
Calculated Sulphate (SO4)	mg/kg	230	8.3	8021651	46	5.0	42	5.7	8021651
Soluble Parameters									
Soluble Chloride (Cl)	mg/L	5.1	5.0	8030278	14	5.0	9.7	5.0	8028655
Soluble Conductivity	dS/m	0.57	0.020	8028273	0.33	0.020	0.39	0.020	8028273
Soluble (CaCl2) pH	pH	6.17	N/A	8026873	6.92	N/A	6.98	N/A	8026873
Sodium Adsorption Ratio	N/A	0.32	0.10	8021650	0.31	0.10	0.40	0.10	8021650
Soluble Calcium (Ca)	mg/L	62	1.5	8028259	46	1.5	57	1.5	8028341
Soluble Magnesium (Mg)	mg/L	8.7	1.0	8028259	3.9	1.0	3.6	1.0	8028341
Soluble Sulphate (SO4)	mg/L	140	5.0	8030278	46	5.0	37	5.0	8028341
Soluble Sodium (Na)	mg/L	10	2.5	8028259	8.1	2.5	12	2.5	8028341
Soluble Potassium (K)	mg/L	20	1.3	8028259	4.3	1.3	2.6	1.3	8028341
Saturation %	%	170	N/A	8027437	100	N/A	110	N/A	8027437
Theoretical Gypsum Requirement	tonnes/ha	<0.20	0.20	8022186	<0.20	0.20	<0.20	0.20	8022186

RDL = Reportable Detection Limit
N/A = Not Applicable

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Contango Strategies Limited
Client Project #: BMC-15-01
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SOIL SALINITY 4 (SOIL)

Maxxam ID		NA1389		NA1390		
Sampling Date		2015/08/27 15:54		2015/08/26 15:00		
COC Number		08411323		08411323		
	UNITS	POND	RDL	KZ22-DS	RDL	QC Batch
Calculated Parameters						
Anion Sum	meq/L	3.3	N/A	5.2	N/A	8022185
Cation Sum	meq/L	4.5	N/A	7.9	N/A	8022185
Cation/EC Ratio	N/A	8.0	0.10	10	0.10	8022183
Ion Balance	N/A	1.4	0.010	1.5	0.010	8022184
Calculated Calcium (Ca)	mg/kg	240	6.6	550	13	8021651
Calculated Magnesium (Mg)	mg/kg	29	4.4	120	8.9	8021651
Calculated Sodium (Na)	mg/kg	47	11	65	22	8021651
Calculated Potassium (K)	mg/kg	130	5.7	1200	12	8021651
Calculated Chloride (Cl)	mg/kg	93	22	640	45	8021651
Calculated Sulphate (SO4)	mg/kg	410	22	840	45	8021651
Soluble Parameters						
Soluble Chloride (Cl)	mg/L	21	5.0	72	5.0	8028655
Soluble Conductivity	dS/m	0.56	0.020	0.77	0.020	8028273
Soluble (CaCl2) pH	pH	6.48	N/A	6.86	N/A	8026873
Sodium Adsorption Ratio	N/A	0.37	0.10	0.22	0.10	8021650
Soluble Calcium (Ca)	mg/L	54	1.5	62	1.5	8028341
Soluble Magnesium (Mg)	mg/L	6.7	1.0	14	1.0	8028341
Soluble Sulphate (SO4)	mg/L	94	5.0	94	5.0	8028341
Soluble Sodium (Na)	mg/L	11	2.5	7.3	2.5	8028341
Soluble Potassium (K)	mg/L	31	1.3	130	1.3	8028341
Saturation %	%	440	N/A	890	N/A	8027437
Theoretical Gypsum Requirement	tonnes/ha	<0.20	0.20	<0.20	0.20	8022186

RDL = Reportable Detection Limit
N/A = Not Applicable

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Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

ASSESSMENT ICP METALS (SOIL)

Maxxam ID		NA1386	NA1387	NA1388		NA1389		NA1390		
Sampling Date		2015/08/27 11:20	2015/08/27 14:00	2015/08/27 14:30		2015/08/27 15:54		2015/08/26 15:00		
COC Number		08411323	08411323	08411323		08411323		08411323		
	UNITS	KZ-NW	KZ9-SHALLOW1	KZ9-SHALLOW2	RDL	POND	RDL	KZ22-DS	RDL	QC Batch
Elements										
Total Aluminum (Al)	mg/kg	10000	1500	3200	39	2500	40	5800	39	8027472
Total Boron (B)	mg/kg	<7.8	<7.8	<7.8 (1)	7.8	<8.0	8.0	<7.8	7.8	8027472
Total Calcium (Ca)	mg/kg	8900	290000	230000	200	13000	200	14000	200	8027472
Total Iron (Fe)	mg/kg	62000	84000	96000	39	4400	40	32000	39	8027472
Total Lithium (Li)	mg/kg	<39	<39	<39 (1)	39	<40	40	<39	39	8027472
Total Magnesium (Mg)	mg/kg	6000	1700	2300	78	920	80	5400	78	8027472
Total Manganese (Mn)	mg/kg	260	9800	24000	39	180	40	750	39	8027472
Total Phosphorus (P)	mg/kg	1400	<78	170 (1)	78	1200	80	780	78	8027472
Total Potassium (K)	mg/kg	1000	<98	<98 (1)	98	720	100	3100	98	8027472
Total Sodium (Na)	mg/kg	<200	<200	<200 (1)	200	<200	200	<200	200	8027472
Total Strontium (Sr)	mg/kg	<39	410	350	39	44	40	49	39	8027472
Total Sulphur (S)	mg/kg	1800	1200	940	78	4600	80	1800	78	8027472
Total Antimony (Sb)	mg/kg	<2.0	<2.0	<2.0	2.0	<2.0	2.0	<2.0	2.0	8027377
Total Arsenic (As)	mg/kg	140	49	52	4.0	<4.0	4.0	8.5	4.0	8027377
Total Barium (Ba)	mg/kg	360	310	840	4.0	87	4.0	36	4.0	8027377
Total Beryllium (Be)	mg/kg	<1.6	<1.6	2.0	1.6	<1.6	1.6	<1.6	1.6	8027377
Total Cadmium (Cd)	mg/kg	2.9	0.47	0.89	0.20	0.34	0.20	1.1	0.20	8027377
Total Chromium (Cr)	mg/kg	27	<4.0	5.2	4.0	<4.0	4.0	4.5	4.0	8027377
Total Cobalt (Co)	mg/kg	13	10	36	2.0	2.8	2.0	2.3	2.0	8027377
Total Copper (Cu)	mg/kg	25	<4.0	<4.0	4.0	43	4.0	12	4.0	8027377
Total Lead (Pb)	mg/kg	18	<2.0	<2.0	2.0	4.4	2.0	2.4	2.0	8027377
Total Mercury (Hg)	mg/kg	<0.20	<0.20	<0.20	0.20	<0.20	0.20	<0.20	0.20	8027377
Total Molybdenum (Mo)	mg/kg	<1.6	<1.6	<1.6	1.6	<1.6	1.6	<1.6	1.6	8027377
Total Nickel (Ni)	mg/kg	29	26	76	4.0	5.6	4.0	11	4.0	8027377
Total Selenium (Se)	mg/kg	2.4	<2.0	<2.0	2.0	<2.0	2.0	<2.0	2.0	8027377
Total Silver (Ag)	mg/kg	<0.80	<0.80	<0.80	0.80	<0.80	0.80	<0.80	0.80	8027377
Total Thallium (Tl)	mg/kg	<0.40	<0.40	<0.40	0.40	<0.40	0.40	<0.40	0.40	8027377
Total Tin (Sn)	mg/kg	<4.0	<4.0	<4.0	4.0	<4.0	4.0	<4.0	4.0	8027377
Total Uranium (U)	mg/kg	1.1	0.84	<0.80	0.80	2.6	0.80	<0.80	0.80	8027377
Total Vanadium (V)	mg/kg	32	<4.0	4.6	4.0	<4.0	4.0	4.8	4.0	8027377
Total Zinc (Zn)	mg/kg	450	140	240	40	41	40	<40	40	8027377

RDL = Reportable Detection Limit
(1) Matrix Spike recovery non calculable due to matrix interference. Original sample diluted to remove interference.

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NPK (AVAILABLE)

Maxxam ID		NA1386	NA1387	NA1388	NA1389	NA1390		
Sampling Date		2015/08/27 11:20	2015/08/27 14:00	2015/08/27 14:30	2015/08/27 15:54	2015/08/26 15:00		
COC Number		08411323	08411323	08411323	08411323	08411323		
	UNITS	**KZ-NW**	**KZ9-SHALLOW1**	**KZ9-SHALLOW2**	**POND**	**KZ22-DS**	**RDL**	**QC Batch**
Nutrients								
Available (NH4F) Nitrogen (N)	mg/kg	<10 (1)	<10 (1)	<10 (1)	<10 (1)	<10 (1)	10	8030450
Available (NH4F) Phosphorus (P)	mg/kg	14	<5.0	<5.0	130	11	5.0	8030438
Available (NH4OAc) Potassium (K)	mg/kg	140	42	87	270	1700	10	8030354

RDL = Reportable Detection Limit
(1) Detection limits raised due to sample matrix.

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RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		NA1386	NA1387	NA1388	NA1389	NA1390		
Sampling Date		2015/08/27 11:20	2015/08/27 14:00	2015/08/27 14:30	2015/08/27 15:54	2015/08/26 15:00		
COC Number		08411323	08411323	08411323	08411323	08411323		
	UNITS	KZ-NW	KZ9-SHALLOW1	KZ9-SHALLOW2	POND	KZ22-DS	RDL	QC Batch
Elements								
Cation exchange capacity	cmol+/Kg	37	35	49	47	74	10	8030955
Metals								
SPLP Aluminum (Al)	mg/L	0.068	<0.020	<0.020	0.087	0.027	0.020	8027291
SPLP Antimony (Sb)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Arsenic (As)	mg/L	0.0377	<0.0010	<0.0010	<0.0010	0.0013	0.0010	8027291
SPLP Barium (Ba)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8027291
SPLP Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Boron (B)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	8027291
SPLP Cadmium (Cd)	mg/L	0.000167	<0.000020	<0.000020	0.000022	0.000364	0.000020	8027291
SPLP Calcium (Ca)	mg/L	11.5	46.0	50.1	7.6	15.2	1.0	8027291
SPLP Chromium (Cr)	mg/L	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Cobalt (Co)	mg/L	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Copper (Cu)	mg/L	0.0035	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8027291
SPLP Iron (Fe)	mg/L	6.64	0.684	0.412	0.077	1.49	0.050	8027291
SPLP Lead (Pb)	mg/L	0.0498	0.0016	<0.0010	0.0018	<0.0010	0.0010	8027291
SPLP Magnesium (Mg)	mg/L	1.3	2.7	3.0	<1.0	2.8	1.0	8027291
SPLP Manganese (Mn)	mg/L	0.0453	0.267	0.0542	<0.0050	0.0185	0.0050	8027291
SPLP Mercury (Hg)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	8027291
SPLP Molybdenum (Mo)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8027291
SPLP Nickel (Ni)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8027291
SPLP Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Sodium (Na)	mg/L	18.9	6.0	3.8	13.8	5.9	1.0	8027291
SPLP Silver (Ag)	mg/L	0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	8027291
SPLP Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	8027291
SPLP Titanium (Ti)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8027291
SPLP Uranium (U)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	8027291
SPLP Vanadium (V)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8027291
SPLP Zinc (Zn)	mg/L	0.388	<0.010	<0.010	<0.010	<0.010	0.010	8027291
Physical Properties								
% sand by hydrometer	%	25	45	48	34		2.0	8027654
% silt by hydrometer	%	58	31	28	47		2.0	8027654
Clay Content	%	16	8.0	12	14		2.0	8027654
Gravel	%	<2.0	17	11	4.8		2.0	8027654
Soluble Parameters								
Soluble Bicarbonate (HCO3)	mg/L	<10	73	86	46	72	10	8027924
RDL = Reportable Detection Limit								

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RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		NA1386	NA1387	NA1388	NA1389	NA1390		
Sampling Date		2015/08/27 11:20	2015/08/27 14:00	2015/08/27 14:30	2015/08/27 15:54	2015/08/26 15:00		
COC Number		08411323	08411323	08411323	08411323	08411323		
	UNITS	**KZ-NW**	**KZ9-SHALLOW1**	**KZ9-SHALLOW2**	**POND**	**KZ22-DS**	**RDL**	**QC Batch**
Soluble Carbonate (CO3)	mg/L	<10	<10	<10	<10	<10	10	8027924
Soluble Hydroxide (OH)	mg/L	<10	<10	<10	<10	<10	10	8027924
RDL = Reportable Detection Limit								

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MISCELLANEOUS (SOIL)

Maxxam ID		NA1386	NA1387	NA1388		NA1389	NA1390		
Sampling Date		2015/08/27 11:20	2015/08/27 14:00	2015/08/27 14:30		2015/08/27 15:54	2015/08/26 15:00		
COC Number		08411323	08411323	08411323		08411323	08411323		
	UNITS	**KZ-NW**	**KZ9-SHALLOW1**	**KZ9-SHALLOW2**	**RDL**	**POND**	**KZ22-DS**	**RDL**	**QC Batch**
Misc. Inorganics									
Total Organic Carbon (C)	%	8.1 (1)	1.2 (2)	1.8	0.20	18 (1)	32 (1)	0.40	8027707

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

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Maxxam Job #: B575200
Report Date: 2015/09/11

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1386
Sample ID: KZ-NW
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation/EC Ratio	CALC	8022183	N/A	2015/09/04	Automated Statchk
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride and Sulphate by IC (Soluble)	IC/EC	8030278	2015/09/04	2015/09/08	Dawn Alarie
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Ion Balance	CALC	8022184	N/A	2015/09/04	Lili Zhou
Sum of Cations, Anions	CALC	8022185	N/A	2015/09/04	Lili Zhou
Potassium (Available)	ICPA	8030354	2015/09/08	2015/09/08	Harry (Peng) Liang
Metals - SPLP	ICP/CRCM	8027291	2015/09/01	2015/09/04	Greg Sparrow
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
pH @25C (1:2 Calcium Chloride Extract)	PH	8026873	2015/09/03	2015/09/04	Eliza Javier Herrera
Sodium Adsorption Ratio	CALC	8021650	N/A	2015/09/04	Automated Statchk
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028259	2015/09/06	2015/09/06	Mary-Anne Pineda
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu
Soluble Ions Calculation	CALC	8021651	N/A	2015/09/04	Lili Zhou
Total Organic Carbon LECO Method	COMB	8027707	2015/09/04	2015/09/05	Krupa Barot
Texture by Hydrometer, incl Gravel (Wet)	HY	8027654	2015/09/04	2015/09/08	Bipin Lamichhane
Theoretical Gypsum Requirement	CALC	8022186	N/A	2015/09/04	Automated Statchk

Maxxam ID: NA1386 Dup
Sample ID: KZ-NW
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Texture by Hydrometer, incl Gravel (Wet)	HY	8027654	2015/09/04	2015/09/08	Bipin Lamichhane

Maxxam ID: NA1387
Sample ID: KZ9-SHALLOW1
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation/EC Ratio	CALC	8022183	N/A	2015/09/04	Automated Statchk
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride (Soluble)	KONE	8028655	2015/09/04	2015/09/04	Kamal Patel
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Ion Balance	CALC	8022184	N/A	2015/09/04	Automated Statchk
Sum of Cations, Anions	CALC	8022185	N/A	2015/09/04	Automated Statchk
Potassium (Available)	ICPA	8030354	2015/09/08	2015/09/08	Harry (Peng) Liang
Metals - SPLP	ICP/CRCM	8027291	2015/09/01	2015/09/04	Greg Sparrow

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Maxxam Job #: B575200
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Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1387
Sample ID: KZ9-SHALLOW1
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
pH @25C (1:2 Calcium Chloride Extract)	PH	8026873	2015/09/03	2015/09/04	Eliza Javier Herrera
Sodium Adsorption Ratio	CALC	8021650	N/A	2015/09/04	Automated Statchk
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028341	2015/09/04	2015/09/04	Jianying Huang
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu
Soluble Ions Calculation	CALC	8021651	N/A	2015/09/04	Automated Statchk
Total Organic Carbon LECO Method	COMB	8027707	2015/09/04	2015/09/05	Krupa Barot
Texture by Hydrometer, incl Gravel (Wet)	HY	8027654	2015/09/04	2015/09/08	Bipin Lamichhane
Theoretical Gypsum Requirement	CALC	8022186	N/A	2015/09/04	Automated Statchk

Maxxam ID: NA1387 Dup
Sample ID: KZ9-SHALLOW1
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals - SPLP	ICP/CRCM	8027291	2015/09/03	2015/09/04	Greg Sparrow

Maxxam ID: NA1388
Sample ID: KZ9-SHALLOW2
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation/EC Ratio	CALC	8022183	N/A	2015/09/04	Automated Statchk
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride (Soluble)	KONE	8028655	2015/09/04	2015/09/04	Kamal Patel
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Ion Balance	CALC	8022184	N/A	2015/09/04	Automated Statchk
Sum of Cations, Anions	CALC	8022185	N/A	2015/09/04	Automated Statchk
Potassium (Available)	ICPA	8030354	2015/09/08	2015/09/08	Harry (Peng) Liang
Metals - SPLP	ICP/CRCM	8027291	2015/09/01	2015/09/04	Greg Sparrow
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
pH @25C (1:2 Calcium Chloride Extract)	PH	8026873	2015/09/03	2015/09/04	Eliza Javier Herrera
Sodium Adsorption Ratio	CALC	8021650	N/A	2015/09/04	Automated Statchk
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028341	2015/09/04	2015/09/04	Jianying Huang
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu
Soluble Ions Calculation	CALC	8021651	N/A	2015/09/04	Automated Statchk
Total Organic Carbon LECO Method	COMB	8027707	2015/09/04	2015/09/05	Krupa Barot
Texture by Hydrometer, incl Gravel (Wet)	HY	8027654	2015/09/04	2015/09/08	Bipin Lamichhane
Theoretical Gypsum Requirement	CALC	8022186	N/A	2015/09/04	Automated Statchk

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Maxxam Job #: B575200
Report Date: 2015/09/11

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1388 Dup
Sample ID: KZ9-SHALLOW2
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride (Soluble)	KONE	8028655	2015/09/04	2015/09/04	Kamal Patel
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028341	2015/09/04	2015/09/04	Jianying Huang
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu

Maxxam ID: NA1389
Sample ID: POND
Matrix: Soil

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation/EC Ratio	CALC	8022183	N/A	2015/09/04	Lili Zhou
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride (Soluble)	KONE	8028655	2015/09/04	2015/09/04	Kamal Patel
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Ion Balance	CALC	8022184	N/A	2015/09/04	Lili Zhou
Sum of Cations, Anions	CALC	8022185	N/A	2015/09/04	Lili Zhou
Potassium (Available)	ICPA	8030354	2015/09/08	2015/09/08	Harry (Peng) Liang
Metals - SPLP	ICP/CRCM	8027291	2015/09/01	2015/09/04	Greg Sparrow
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
pH @25C (1:2 Calcium Chloride Extract)	PH	8026873	2015/09/03	2015/09/04	Eliza Javier Herrera
Sodium Adsorption Ratio	CALC	8021650	N/A	2015/09/04	Lili Zhou
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028341	2015/09/04	2015/09/04	Jianying Huang
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu
Soluble Ions Calculation	CALC	8021651	N/A	2015/09/04	Lili Zhou
Total Organic Carbon LECO Method	COMB	8027707	2015/09/04	2015/09/05	Krupa Barot
Texture by Hydrometer, incl Gravel (Wet)	HY	8027654	2015/09/04	2015/09/08	Bipin Lamichhane
Theoretical Gypsum Requirement	CALC	8022186	N/A	2015/09/04	Lili Zhou

Maxxam ID: NA1390
Sample ID: KZ22-DS
Matrix: Soil

Collected: 2015/08/26
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate and Bicarbonate @25C (Soluble)	AT/ALK	8027924	2015/09/04	2015/09/04	Tracy (Jing) Ling
Cation/EC Ratio	CALC	8022183	N/A	2015/09/04	Automated Statchk

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Maxxam Job #: B575200
Report Date: 2015/09/11

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1390
Sample ID: KZ22-DS
Matrix: Soil

Collected: 2015/08/26
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8030955	2015/09/08	2015/09/08	Lili Zhou
Chloride (Soluble)	KONE	8028655	2015/09/04	2015/09/04	Kamal Patel
Conductivity @25C (Soluble)	COND	8028273	2015/09/04	2015/09/04	Ilonka Kovac
Elements by ICP -Soils	ICPA	8027472	2015/09/04	2015/09/04	Jianying Huang
Elements by ICPMS - Soils	ICPM	8027377	2015/09/04	2015/09/04	Hassan El-Chammaa
Ion Balance	CALC	8022184	N/A	2015/09/04	Automated Statchk
Sum of Cations, Anions	CALC	8022185	N/A	2015/09/04	Automated Statchk
Potassium (Available)	ICPA	8030354	2015/09/08	2015/09/08	Harry (Peng) Liang
Metals - SPLP	ICP/CRCM	8027291	2015/09/01	2015/09/04	Greg Sparrow
Nitrate-N (Available)	IC/UV	8030450	2015/09/08	2015/09/08	Dawn Alarie
Phosphorus (Available by ICP)	ICPA	8030438	2015/09/08	2015/09/08	Harry (Peng) Liang
pH @25C (1:2 Calcium Chloride Extract)	PH	8026873	2015/09/03	2015/09/04	Eliza Javier Herrera
Sodium Adsorption Ratio	CALC	8021650	N/A	2015/09/04	Automated Statchk
Ca,Mg,Na,K,SO4 (Soluble)	ICPA	8028341	2015/09/04	2015/09/04	Jianying Huang
Soluble Paste	BAL	8027437	2015/09/04	2015/09/04	Yan Xu
Soluble Ions Calculation	CALC	8021651	N/A	2015/09/04	Automated Statchk
Total Organic Carbon LECO Method	COMB	8027707	2015/09/04	2015/09/05	Krupa Barot
Theoretical Gypsum Requirement	CALC	8022186	N/A	2015/09/04	Automated Statchk

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Site Location: KUDZ ZE KAYAH

GENERAL COMMENTS

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

Package 1	7.0°C
Package 2	8.3°C

ASSESSMENT ICP METALS (SOIL) Comments

Sample NA1386-02 Elements by ICP -Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1386-02 Elements by ICPMS - Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1387-02 Elements by ICP -Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1387-02 Elements by ICPMS - Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1388-02 Elements by ICPMS - Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1389-02 Elements by ICP -Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1389-02 Elements by ICPMS - Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1390-02 Elements by ICP -Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1390-02 Elements by ICPMS - Soils: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

NPK (AVAILABLE) Comments

Sample NA1386-02 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1386-02 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1387-02 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1387-02 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1388-02 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1388-02 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1389-02 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1389-02 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1390-02 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample NA1390-02 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

Contango Strategies Limited
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
8026873	Soluble (CaCl2) pH	2015/09/04			99	97 - 103			0.39	N/A	100	98 - 102
8027291	SPLP Aluminum (Al)	2015/09/04					<0.020	mg/L	NC	35		
8027291	SPLP Antimony (Sb)	2015/09/04					<0.0010	mg/L	NC	35		
8027291	SPLP Arsenic (As)	2015/09/04	96	75 - 125	93	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Barium (Ba)	2015/09/04					<0.10	mg/L	NC	35		
8027291	SPLP Beryllium (Be)	2015/09/04	85	75 - 125	83	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Boron (B)	2015/09/04					<0.50	mg/L	NC	35		
8027291	SPLP Cadmium (Cd)	2015/09/04	99	75 - 125	99	75 - 125	<0.000020	mg/L	NC	35		
8027291	SPLP Calcium (Ca)	2015/09/04					<1.0	mg/L	0.61	35		
8027291	SPLP Chromium (Cr)	2015/09/04	102	75 - 125	100	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Cobalt (Co)	2015/09/04	103	75 - 125	103	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Copper (Cu)	2015/09/04	99	75 - 125	102	75 - 125	<0.0020	mg/L	NC	35		
8027291	SPLP Iron (Fe)	2015/09/04					<0.050	mg/L	2.7	35		
8027291	SPLP Lead (Pb)	2015/09/04	107	75 - 125	108	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Magnesium (Mg)	2015/09/04					<1.0	mg/L	NC	35		
8027291	SPLP Manganese (Mn)	2015/09/04					<0.0050	mg/L	2.1	35		
8027291	SPLP Mercury (Hg)	2015/09/04					<0.00010	mg/L	NC	35		
8027291	SPLP Molybdenum (Mo)	2015/09/04					<0.0050	mg/L	NC	35		
8027291	SPLP Nickel (Ni)	2015/09/04	96	75 - 125	98	75 - 125	<0.010	mg/L	NC	35		
8027291	SPLP Selenium (Se)	2015/09/04	88	75 - 125	86	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Silver (Ag)	2015/09/04					<0.00010	mg/L	NC	35		
8027291	SPLP Sodium (Na)	2015/09/04					<1.0	mg/L	2.9	35		
8027291	SPLP Thallium (Tl)	2015/09/04					<0.00010	mg/L	NC	35		
8027291	SPLP Titanium (Ti)	2015/09/04					<0.10	mg/L	NC	35		
8027291	SPLP Uranium (U)	2015/09/04	105	75 - 125	101	75 - 125	<0.0010	mg/L	NC	35		
8027291	SPLP Vanadium (V)	2015/09/04	105	75 - 125	119	75 - 125	<0.010	mg/L	NC	35		
8027291	SPLP Zinc (Zn)	2015/09/04	88	75 - 125	115	75 - 125	<0.010	mg/L	NC	35		
8027377	Total Antimony (Sb)	2015/09/04	87	75 - 125	88	75 - 125	<0.50	mg/kg	NC	35		
8027377	Total Arsenic (As)	2015/09/04	NC	75 - 125	93	75 - 125	<1.0	mg/kg	8.0	35	106	50 - 150
8027377	Total Barium (Ba)	2015/09/04	NC	75 - 125	93	75 - 125	<1.0	mg/kg	22	35	100	69 - 131
8027377	Total Beryllium (Be)	2015/09/04	89	75 - 125	90	75 - 125	<0.40	mg/kg	NC	35		

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QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
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
8027377	Total Cadmium (Cd)	2015/09/04	90	75 - 125	91	75 - 125	<0.050	mg/kg	NC	35		
8027377	Total Chromium (Cr)	2015/09/04	83	75 - 125	90	75 - 125	<1.0	mg/kg	NC	35	91	41 - 159
8027377	Total Cobalt (Co)	2015/09/04	NC	75 - 125	89	75 - 125	<0.50	mg/kg	18	35	94	75 - 125
8027377	Total Copper (Cu)	2015/09/04	90	75 - 125	87	75 - 125	<1.0	mg/kg	NC	35	92	73 - 127
8027377	Total Lead (Pb)	2015/09/04	84	75 - 125	90	75 - 125	<0.50	mg/kg	NC	35	92	54 - 146
8027377	Total Mercury (Hg)	2015/09/04	92	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35		
8027377	Total Molybdenum (Mo)	2015/09/04	93	75 - 125	90	75 - 125	<0.40	mg/kg	NC	35		
8027377	Total Nickel (Ni)	2015/09/04	NC	75 - 125	90	75 - 125	<1.0	mg/kg	22	35	99	61 - 139
8027377	Total Selenium (Se)	2015/09/04	91	75 - 125	91	75 - 125	<0.50	mg/kg	NC	35		
8027377	Total Silver (Ag)	2015/09/04	91	75 - 125	90	75 - 125	<0.20	mg/kg	NC	35		
8027377	Total Thallium (Tl)	2015/09/04	88	75 - 125	90	75 - 125	<0.10	mg/kg	NC	35		
8027377	Total Tin (Sn)	2015/09/04	94	75 - 125	87	75 - 125	<1.0	mg/kg	NC	35		
8027377	Total Uranium (U)	2015/09/04	84	75 - 125	91	75 - 125	<0.20	mg/kg	NC	35		
8027377	Total Vanadium (V)	2015/09/04	82	75 - 125	93	75 - 125	<1.0	mg/kg	NC	35	105	50 - 150
8027377	Total Zinc (Zn)	2015/09/04	NC	75 - 125	89	75 - 125	<10	mg/kg	16	35	99	72 - 128
8027437	Saturation %	2015/09/04							3.5	12	102	75 - 125
8027472	Total Aluminum (Al)	2015/09/04	NC	75 - 125	92	75 - 125	<10	mg/kg	11	35	93	51 - 149
8027472	Total Boron (B)	2015/09/04	NC	75 - 125	94	75 - 125	<2.0	mg/kg	NC	35		
8027472	Total Calcium (Ca)	2015/09/04	NC	75 - 125	102	75 - 125	<50	mg/kg	8.3	35	109	77 - 123
8027472	Total Iron (Fe)	2015/09/04	NC	75 - 125	91	75 - 125	<10	mg/kg	1.9	35	108	61 - 139
8027472	Total Lithium (Li)	2015/09/04	NC	75 - 125	95	75 - 125	<10	mg/kg	NC	35	102	75 - 125
8027472	Total Magnesium (Mg)	2015/09/04	NC	75 - 125	95	75 - 125	<20	mg/kg	4.2	35	105	69 - 131
8027472	Total Manganese (Mn)	2015/09/04	NC	75 - 125	98	75 - 125	<10	mg/kg	17	35	109	71 - 129
8027472	Total Phosphorus (P)	2015/09/04	NC	75 - 125	94	75 - 125	<20	mg/kg	NC	35	102	89 - 117
8027472	Total Potassium (K)	2015/09/04	NC	75 - 125	90	75 - 125	<25	mg/kg	NC	35	92	60 - 140
8027472	Total Sodium (Na)	2015/09/04	NC	75 - 125	92	75 - 125	<50	mg/kg	NC	35	84	60 - 140
8027472	Total Strontium (Sr)	2015/09/04	NC	75 - 125	95	75 - 125	<10	mg/kg	5.3	35	101	75 - 125
8027472	Total Sulphur (S)	2015/09/04					<20	mg/kg	6.0	35		
8027654	% sand by hydrometer	2015/09/08							5.4	35	96	N/A
8027654	% silt by hydrometer	2015/09/08							0.52	35	101	N/A
8027654	Clay Content	2015/09/08							5.4	35	103	N/A

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QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
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
8027654	Gravel	2015/09/08							NC	35		
8027707	Total Organic Carbon (C)	2015/09/05			91	75 - 125	<0.020	%	8.7	35	86	75 - 125
8027924	Soluble Bicarbonate (HCO3)	2015/09/04					<10	mg/L	4.3	35		
8027924	Soluble Carbonate (CO3)	2015/09/04					<10	mg/L	NC	35		
8027924	Soluble Hydroxide (OH)	2015/09/04					<10	mg/L	NC	35		
8028259	Soluble Calcium (Ca)	2015/09/04	110	75 - 125	111	80 - 120	<1.5	mg/L	0.77	35	114	75 - 125
8028259	Soluble Magnesium (Mg)	2015/09/04	105	75 - 125	106	80 - 120	<1.0	mg/L	0.060	35	109	75 - 125
8028259	Soluble Potassium (K)	2015/09/04	101	75 - 125	102	80 - 120	<1.3	mg/L	3.5	35	92	75 - 125
8028259	Soluble Sodium (Na)	2015/09/04	99	75 - 125	100	80 - 120	<2.5	mg/L	0.54	35	105	75 - 125
8028273	Soluble Conductivity	2015/09/04			100	90 - 110	<0.020	dS/m	6.3	35	96	75 - 125
8028341	Soluble Calcium (Ca)	2015/09/04	104	75 - 125	104	80 - 120	<1.5	mg/L	11	35	99	75 - 125
8028341	Soluble Magnesium (Mg)	2015/09/04	98	75 - 125	99	80 - 120	<1.0	mg/L	NC	35	93	75 - 125
8028341	Soluble Potassium (K)	2015/09/04	99	75 - 125	100	80 - 120	<1.3	mg/L	NC	35	99	75 - 125
8028341	Soluble Sodium (Na)	2015/09/04	98	75 - 125	99	80 - 120	<2.5	mg/L	NC	35	92	75 - 125
8028341	Soluble Sulphate (SO4)	2015/09/04					<5.0	mg/L	4.2	35	93	75 - 125
8028655	Soluble Chloride (Cl)	2015/09/04	107	75 - 125	104	75 - 125	9.0, RDL=5.0	mg/L	NC	35	89	75 - 125
8030278	Soluble Chloride (Cl)	2015/09/08	NC	75 - 125	107	75 - 125	<5.0	mg/L	0.36	35	115	75 - 125
8030278	Soluble Sulphate (SO4)	2015/09/08	NC	75 - 125	108	75 - 125	<5.0	mg/L	6.9	35	118	75 - 125
8030354	Available (NH4OAc) Potassium (K)	2015/09/08			98	80 - 120	<2.0	mg/kg	4.2	35		
8030438	Available (NH4F) Phosphorus (P)	2015/09/08			107	80 - 120	<1.0	mg/kg	NC	35		
8030450	Available (NH4F) Nitrogen (N)	2015/09/08	100	75 - 125	101	80 - 120	<2.0	mg/kg	NC	35		

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Maxxam Job #: B575200
Report Date: 2015/09/11

QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
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
8030955	Cation exchange capacity	2015/09/08							NC	35		

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).

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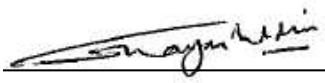
Maxxam Job #: B575200
Report Date: 2015/09/11

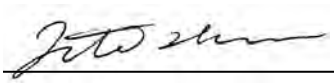
Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

VALIDATION SIGNATURE PAGE

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



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist



Lili Zhou, Senior analyst, Inorganic department.

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Maxxam
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

08411323

BY FCD-00077/05

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

COC #:

Page _____ of _____

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	BMC MINERALS LTD.	Company Name:	Contango Strategies Limited	Quotation #:	B50743	x Regular TAT 5 days (Most analyses)
Contact Name:	Accounts Payable	Contact Name:	Monique Haakensen	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	530-1130 WEST PENDER ST	Address:	15-410 Downey Road	Project #:	BMC-15-01	Rush TAT (Surcharges will be applied)
	Vancouver, BC PC: V6E 4A4		Saskatoon, Sask PC: S7N 4N1	Site Location:	Kudz Ze Kayah	Same Day / 2 Days / 1 Day / 3 Days
Phone:		Phone:	(306) 978-3111 vpittet@contangostrategies.com	Site #:		
Email:	kdbergh@gmail.com	Email:	mhaakensen@contangostrategies.com	Sampled By:	Monique Haakensen & Jordyn Bergsveinsen	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
BC CSR Soil / BC CSR Water / CCME (Specify) / Other (Specify) / Drinking Water / BC Water Quality	Return Cooler / Ship Sample Bottles (Please Specify) / USE SCENARIO # 12485	

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	CEC	Available NPK	Total Organic Carbon	SPLP metals	Salinity 4 (pH, EC, %sat, Ca, Mg, Na, K, Cl, S	SAR	Alkalinity	Texture (% Sand, % Silt, % Clay)	Assessment ICP metals package (includes sulphur)	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	KZ-NW	NA1386	15-08-27	11:20		x	x	x	x	x	x	x	x	x	2		
2	KZ9-shallow1	NA1387	15-08-27	14:00		x	x	x	x	x	x	x	x	x	2		
3	KZ9-shallow2	NA1388	15-08-27	14:30		x	x	x	x	x	x	x	x	x	2		
4	Pond	NA1389	15-08-27	15:54		x	x	x	x	x	x	x	x	x	2		
5	KZ22-DS	NA1390	15-08-26	15:00		x	x	x	x	x	x	x	x	x	2		submitted moss, please treat as soil
6		NA1391															

LABORATORY USE ONLY

CUSTODY SEAL: Present / Intact

COOLER TEMPERATURES: 6.7, 9.8, 8.2

COOLING MEDIA PRESENT: Y / N

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Monique Haakensen	2015/08/29	9:45	JWATHNUE Roy	2015/08/29	12:15	B575200

B575200

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411322

Attention:Monique Haakensen

Contango Strategies Limited
15-410 Downey Road
Saskatoon, SK
Canada S7N 4N1

Report Date: 2015/09/18
Report #: R2043876
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B575206
Received: 2015/08/29, 12:15

Sample Matrix: VEGETATION
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements in Tissue by CRC ICPMS - Dry Wt	8	2015/09/16	2015/09/17	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	1	2015/09/16	2015/09/18	BBY7SOP-00002	EPA 6020A R1 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

==========

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		NA1423	NA1424	NA1425	NA1426	NA1427	NA1428		
Sampling Date		2015/08/27 11:05	2015/08/27 10:30	2015/08/27 13:05	2015/08/27 12:30	2015/08/27 14:00	2015/08/27 14:30		
COC Number		08411322	08411322	08411322	08411322	08411322	08411322		
	UNITS	KZ-NW	KZ-SW	KZ-NE	KZ-SE	KZ9-SHALLOW1	KZ9-SHALLOW2	RDL	QC Batch
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	19.0 (1)	3.3	3.3	31.2	6.5	8.5	1.0	8039934
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8039934
Total Arsenic (As)	mg/kg	0.318	0.066	<0.050	0.124	0.266	0.116	0.050	8039934
Total Barium (Ba)	mg/kg	69.2	32.1	43.7	42.0	21.7	22.3	0.10	8039934
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8039934
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8039934
Total Boron (B)	mg/kg	6.4	3.6	3.8	6.1	18.3	18.3	2.0	8039934
Total Cadmium (Cd)	mg/kg	0.032	<0.010	0.063	0.105	0.014	0.023	0.010	8039934
Total Calcium (Ca)	mg/kg	8390	5270	6430	5290	9800	8960	10	8039934
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	0.37	0.60	0.24	0.20	8039934
Total Cobalt (Co)	mg/kg	0.035	0.047	0.022	0.050	0.046	0.087	0.020	8039934
Total Copper (Cu)	mg/kg	2.73	1.74	2.64	5.34	4.88	6.41	0.050	8039934
Total Iron (Fe)	mg/kg	212	76	85	713	497	371	10	8039934
Total Lead (Pb)	mg/kg	0.053	0.044	0.030	0.158	0.055	0.136	0.010	8039934
Total Magnesium (Mg)	mg/kg	3180	2110	2040	1290	1360	576	10	8039934
Total Manganese (Mn)	mg/kg	93.9	526	470	171	1560	224	0.10	8039934
Total Mercury (Hg)	mg/kg	0.019	0.010	<0.010	0.022	<0.010	<0.010	0.010	8039934
Total Molybdenum (Mo)	mg/kg	3.03	1.17	1.50	0.664	1.98	1.84	0.050	8039934
Total Nickel (Ni)	mg/kg	0.158	0.115	0.188	0.283	1.25	0.896	0.050	8039934
Total Phosphorus (P)	mg/kg	1840	1500	1690	2940	905	363	10	8039934
Total Potassium (K)	mg/kg	9220	7640	6990	15100	13100	12200	10	8039934
Total Selenium (Se)	mg/kg	0.184	0.081	0.254	0.364	0.050	0.076	0.050	8039934
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8039934
Total Sodium (Na)	mg/kg	<10	<10	<10	11	17	23	10	8039934
Total Strontium (Sr)	mg/kg	18.2	12.6	19.3	17.6	38.0	36.9	0.10	8039934
Total Thallium (Tl)	mg/kg	0.0599	0.0090	0.0121	0.0051	<0.0020	<0.0020	0.0020	8039934
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8039934
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	2.1	<1.0	<1.0	1.0	8039934
Total Uranium (U)	mg/kg	0.0030	0.0150	0.0024	0.0078	0.0083	0.0216	0.0020	8039934
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8039934
Total Zinc (Zn)	mg/kg	20.3	22.2	25.1	33.5	78.2	31.3	0.20	8039934

RDL = Reportable Detection Limit

(1) Duplicate RPD for (Aluminum) above control limit - Non-homogenous sample - Increased variability of results.

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		NA1429	NA1430	NA1431		
Sampling Date		2015/08/27 14:52	2015/08/27 15:54	2015/08/26 15:00		
COC Number		08411322	08411322	08411322		
	UNITS	KZ9-DEEP	POND	KZ22-DS	RDL	QC Batch
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	7.4	2.2	28.3	1.0	8039934
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	8039934
Total Arsenic (As)	mg/kg	0.063	<0.050	0.238	0.050	8039934
Total Barium (Ba)	mg/kg	36.8	16.2	22.8	0.10	8039934
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	0.10	8039934
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	0.10	8039934
Total Boron (B)	mg/kg	26.6	2.1	5.8	2.0	8039934
Total Cadmium (Cd)	mg/kg	0.101	<0.010	0.030	0.010	8039934
Total Calcium (Ca)	mg/kg	14100	3650	5910	10	8039934
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.29	0.20	8039934
Total Cobalt (Co)	mg/kg	0.075	<0.020	0.078	0.020	8039934
Total Copper (Cu)	mg/kg	4.24	2.31	3.16	0.050	8039934
Total Iron (Fe)	mg/kg	245	54	313	10	8039934
Total Lead (Pb)	mg/kg	0.058	0.063	0.101	0.010	8039934
Total Magnesium (Mg)	mg/kg	1430	1930	1570	10	8039934
Total Manganese (Mn)	mg/kg	380	148	139	0.10	8039934
Total Mercury (Hg)	mg/kg	0.011	<0.010	<0.010	0.010	8039934
Total Molybdenum (Mo)	mg/kg	1.78	0.790	0.438	0.050	8039934
Total Nickel (Ni)	mg/kg	0.723	0.065	0.434	0.050	8039934
Total Phosphorus (P)	mg/kg	251	1630	1200	10	8039934
Total Potassium (K)	mg/kg	4320	6380	13500	10	8039934
Total Selenium (Se)	mg/kg	0.112	<0.050	0.189	0.050	8039934
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	0.020	8039934
Total Sodium (Na)	mg/kg	34	14	<10	10	8039934
Total Strontium (Sr)	mg/kg	58.6	10.8	17.4	0.10	8039934
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0020	8039934
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	0.10	8039934
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.1	1.0	8039934
Total Uranium (U)	mg/kg	0.0647	<0.0020	0.0272	0.0020	8039934
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	0.20	8039934
Total Zinc (Zn)	mg/kg	48.0	9.82	14.5	0.20	8039934

RDL = Reportable Detection Limit

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1423 **Collected:** 2015/08/27
Sample ID: KZ-NW **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/18	Adnan Dzebic

Maxxam ID: NA1423 Dup **Collected:** 2015/08/27
Sample ID: KZ-NW **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/18	Adnan Dzebic

Maxxam ID: NA1424 **Collected:** 2015/08/27
Sample ID: KZ-SW **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1425 **Collected:** 2015/08/27
Sample ID: KZ-NE **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1426 **Collected:** 2015/08/27
Sample ID: KZ-SE **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1427 **Collected:** 2015/08/27
Sample ID: KZ9-SHALLOW1 **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1428 **Collected:** 2015/08/27
Sample ID: KZ9-SHALLOW2 **Shipped:**
Matrix: VEGETATION **Received:** 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA1429
Sample ID: KZ9-DEEP
Matrix: VEGETATION

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1430
Sample ID: POND
Matrix: VEGETATION

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

Maxxam ID: NA1431
Sample ID: KZ22-DS
Matrix: VEGETATION

Collected: 2015/08/26
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8039934	2015/09/16	2015/09/17	Adnan Dzebic

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
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	11.7°C

Results relate only to the items tested.

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Maxxam Job #: B575206
Report Date: 2015/09/18

QUALITY ASSURANCE REPORT

Contango Strategies Limited
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
8039934	Total Aluminum (Al)	2015/09/18					<1.0	mg/kg	42 (1)	35	41	17 - 93
8039934	Total Antimony (Sb)	2015/09/18	81	75 - 125	101	75 - 125	<0.0050	mg/kg	NC	35		
8039934	Total Arsenic (As)	2015/09/18	88	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35	122	42 - 199
8039934	Total Barium (Ba)	2015/09/18	NC	75 - 125	107	75 - 125	<0.10	mg/kg	12	35		
8039934	Total Beryllium (Be)	2015/09/18	94	75 - 125	100	75 - 125	<0.10	mg/kg	NC	35		
8039934	Total Bismuth (Bi)	2015/09/18					<0.10	mg/kg	NC	35		
8039934	Total Boron (B)	2015/09/18					<2.0	mg/kg	NC	35	97	75 - 125
8039934	Total Cadmium (Cd)	2015/09/18	91	75 - 125	98	75 - 125	<0.010	mg/kg	NC	35	90	75 - 125
8039934	Total Calcium (Ca)	2015/09/18					<10	mg/kg	14	35	91	75 - 125
8039934	Total Chromium (Cr)	2015/09/18	91	75 - 125	100	75 - 125	<0.20	mg/kg	NC	35		
8039934	Total Cobalt (Co)	2015/09/18	91	75 - 125	99	75 - 125	<0.020	mg/kg	NC	35	85	75 - 125
8039934	Total Copper (Cu)	2015/09/18	NC	75 - 125	98	75 - 125	<0.050	mg/kg	11	35	91	75 - 125
8039934	Total Iron (Fe)	2015/09/18					<10	mg/kg	18	35		
8039934	Total Lead (Pb)	2015/09/18	87	75 - 125	97	75 - 125	<0.010	mg/kg	NC	35		
8039934	Total Magnesium (Mg)	2015/09/18					<10	mg/kg	8.2	35		
8039934	Total Manganese (Mn)	2015/09/18	NC	75 - 125	99	75 - 125	<0.10	mg/kg	6.1	35	93	75 - 125
8039934	Total Mercury (Hg)	2015/09/18	82	75 - 125	103	75 - 125	0.011, RDL=0.010	mg/kg	NC	35	100	75 - 125
8039934	Total Molybdenum (Mo)	2015/09/18	NC	75 - 125	97	75 - 125	<0.050	mg/kg	6.6	35		
8039934	Total Nickel (Ni)	2015/09/18	91	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	84	75 - 125
8039934	Total Phosphorus (P)	2015/09/18					<10	mg/kg	5.6	35	99	75 - 125
8039934	Total Potassium (K)	2015/09/18					<10	mg/kg	6.9	35	94	75 - 125
8039934	Total Selenium (Se)	2015/09/18	91	75 - 125	94	75 - 125	<0.050	mg/kg	NC	35	101	75 - 125
8039934	Total Silver (Ag)	2015/09/18	76	75 - 125	88	75 - 125	<0.020	mg/kg	NC	35		
8039934	Total Sodium (Na)	2015/09/18					<10	mg/kg	NC	35	92	75 - 125
8039934	Total Strontium (Sr)	2015/09/18	NC	75 - 125	100	75 - 125	<0.10	mg/kg	8.4	35	99	75 - 125
8039934	Total Thallium (Tl)	2015/09/18	NC	75 - 125	105	75 - 125	<0.0020	mg/kg	7.3	35		
8039934	Total Tin (Sn)	2015/09/18	82	75 - 125	101	75 - 125	<0.10	mg/kg	NC	35		
8039934	Total Titanium (Ti)	2015/09/18	79	75 - 125	97	75 - 125	<1.0	mg/kg	NC	35		
8039934	Total Uranium (U)	2015/09/18	91	75 - 125	99	75 - 125	<0.0020	mg/kg	NC	35		
8039934	Total Vanadium (V)	2015/09/18	93	75 - 125	99	75 - 125	<0.20	mg/kg	NC	35		

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Maxxam Job #: B575206
Report Date: 2015/09/18

QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
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
8039934	Total Zinc (Zn)	2015/09/18	NC	75 - 125	102	75 - 125	<0.20	mg/kg	5.5	35	88	75 - 125

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) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B575206
Report Date: 2015/09/18

Contango Strategies Limited
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).

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 CUSTODY RECC

08411322

BBY FCD-00077/05

Page ____ of ____

COC #:

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	BMC MINERALS LTD.	Company Name:	Contango Strategies Limited	Quotation #:	B50743	[x] Regular TAT 5 days (Most analyses)
Contact Name:	Accounts Payable	Contact Name:	Monique Haakensen	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	530-1130 WEST PENDER ST	Address:	15-410 Downey Road	Project #:	BMC-15-01	Rush TAT (Surcharges will be applied)
	Vancouver, BC PC: V6E 4A4		Saskatoon, Sask PC: S7N 4N1	Site Location:	Kudz Ze Kayah	[ ] Same Day [ ] 2 Days
Phone:		Phone:	(306) 978-3111 vpittet@contangostrategies.com	Site #:		[ ] 1 Day [ ] 3 Days
Email:	kdbergh@gmail.com	Email:	mhaakensen@contangostrategies.com	Sampled By:	Monique Haakensen & Jordyn Bergsveinsen	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	USE SCENARIO # 12485	

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

LABORATORY USE ONLY: CUSTODY SEAL Present / Intact; COOLER TEMPERATURES 11.2, 1.2; COOLING MEDIA PRESENT: Y / N

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Metals in Vegetation	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	KZ-NW	NA1423	15-08-27	11:05		x	1		
2	KZ-SW	NA1424	15-08-27	10:30		x	1		
3	KZ-NE	NA1425	15-08-27	13:05		x	1		
4	KZ-SE	NA1426	15-08-27	12:30		x	1		
5	KZ9-shallow1	NA1427	15-08-27	14:00		x	1		
6	KZ9-shallow2	NA1428	15-08-27	14:30		x	1		
7	KZ9-deep	NA1429	15-08-27	14:52		x	1		
8	Pond	NA1430	15-08-27	15:54		x	1		
9	KZ22-DS	NA1431	15-08-26	15:00		x	1		
10									

B575206

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Monique Haakensen	2015/08/28	9:45	JUVAHNUE ROY	2015/08/29	12:15	B575206

LOG-YES

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411324

Attention:Monique Haakensen

Contango Strategies Limited
15-410 Downey Road
Saskatoon, SK
Canada S7N 4N1

Report Date: 2015/09/09
Report #: R2038172
Version: 3 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B575116
Received: 2015/08/29, 12:15

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	10	2015/08/29	2015/08/29	BBY6SOP-00026	SM 22 2320 B m
Biochemical Oxygen Demand	10	2015/08/29	2015/08/29	BBY6SOP-00045	SM 22 5210 B m
Chloride by Automated Colourimetry	9	N/A	2015/08/31	BBY6SOP-00011	SM 22 4500-Cl- G m
Chloride by Automated Colourimetry	1	N/A	2015/09/01	BBY6SOP-00011	SM 22 4500-Cl- G m
COD by Colorimeter	10	2015/09/01	2015/09/02	BBY6SOP-00024	SM 22 5220 D m
Conductance - water	10	N/A	2015/08/29	BBY6SOP-00026	SM 22 2510 B m
Hardness Total (calculated as CaCO3)	10	N/A	2015/09/03	BBY7SOP-00002	EPA 6020a R1 m
Hardness (calculated as CaCO3)	10	N/A	2015/09/02	BBY7SOP-00002	EPA 6020a R1 m
Mercury (Dissolved-LowLevel) by CVAF	10	N/A	2015/09/03	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Mercury (Total-LowLevel) by CVAF	10	2015/09/03	2015/09/03	BBY7SOP-00015	BCMOE BCLM Oct2013 m
Ion Balance	10	N/A	2015/09/02	BBY WI-00033	SM 22 1030E
Sum of cations, anions	10	N/A	2015/09/02	Calc	
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	10	N/A	2015/09/02	BBY7SOP-00002	EPA 6020A R1 m
Elements by ICPMS Low Level (dissolved)	10	N/A	2015/09/02	BBY7SOP-00002	EPA 6020A R1 m
Elements by ICPMS Digested LL (total)	6	2015/09/02	2015/09/03	BBY7SOP-00002	EPA 6020A R1 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	10	N/A	2015/09/03	BBY7SOP-00002	EPA 6020A R1 m
Elements by ICPMS Low Level (total)	4	N/A	2015/09/02	BBY7SOP-00002	EPA 6020A R1 m
Nitrogen (Total)	9	2015/09/02	2015/09/02	BBY6SOP-00016	SM 22 4500-N C m
Nitrogen (Total)	1	2015/09/04	2015/09/04	BBY6SOP-00016	SM 22 4500-N C m
Ammonia-N (Preserved)	10	N/A	2015/09/02	BBY6SOP-00009	SM 22 4500-NH3- G m
Nitrate+Nitrite (N) (low level)	10	N/A	2015/08/29	BBY6SOP-00010	SM 22 4500-NO3- I m
Nitrite (N) (low level)	10	N/A	2015/08/29	BBY6SOP-00010	SM 22 4500-NO3- I m
Nitrogen - Nitrate (as N)	10	N/A	2015/09/01	BBY6SOP-00010	SM 22 4500-NO3- I m
Filter and HNO3 Preserve for Metals	10	N/A	2015/09/03	BBY7 WI-00004	BCMOE Reqs 08/14
pH Water (2)	10	N/A	2015/08/29	BBY6SOP-00026	SM 22 4500-H+ B m
Sulphate by Automated Colourimetry	10	N/A	2015/08/31	BBY6SOP-00017	SM 22 4500-SO42- E m
Total Dissolved Solids - Low Level	10	N/A	2015/09/03	BBY6SOP-00033	SM 22 2540 C m
TKN (Calc. TN, N/N) total	10	N/A	2015/09/03	BBY WI-00033	Calculation
Carbon (Total Organic) (1, 3)	10	N/A	2015/09/02	CAL SOP-00077	MMCW 119 1996 m
Total Suspended Solids-Low Level	10	2015/09/01	2015/09/02	BBY6SOP-00034	SM 22 2540 D

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Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08411324

Attention:Monique Haakensen

Contango Strategies Limited
15-410 Downey Road
Saskatoon, SK
Canada S7N 4N1

Report Date: 2015/09/09
Report #: R2038172
Version: 3 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B575116

Received: 2015/08/29, 12:15

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 Calgary Environmental
(2) The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.
(3) TOC present in the sample should be considered as non-purgeable TOC.

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 Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		NA0813		NA0814		NA0815	NA0816		
Sampling Date		2015/08/27 11:05		2015/08/27 10:30		2015/08/27 13:05	2015/08/27 12:30		
COC Number		08411324		08411324		08411324	08411324		
	UNITS	KZ-NW	QC Batch	KZ-SW	QC Batch	KZ-NE	KZ-SE	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	2.1	8020783	2.8	8020783	2.5	2.6	N/A	8020783
Cation Sum	meq/L	2.3	8020783	2.9	8020783	2.9	2.9	N/A	8020783
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	ONSITE	FIELD	FIELD	N/A	ONSITE
Ion Balance	N/A	1.1	8020782	1.0	8020782	1.1	1.1	0.010	8020782
Nitrate (N)	mg/L	0.0038	8020906	0.0080	8020906	0.0051	0.0055	0.0020	8020906
Demand Parameters									
Biochemical Oxygen Demand	mg/L	<6.0	8020769	<6.0	8020769	<6.0	<6.0	6.0	8020769
Chemical Oxygen Demand	mg/L	18	8023365	20	8023365	27	<10	10	8023365
Misc. Inorganics									
Alkalinity (Total as CaCO3)	mg/L	104	8021116	135	8021116	121	124	0.50	8021116
Total Organic Carbon (C)	mg/L	5.7	8025058	5.6	8025058	7.9	3.3	0.50	8025058
Alkalinity (PP as CaCO3)	mg/L	<0.50	8021116	<0.50	8021116	<0.50	<0.50	0.50	8021116
Bicarbonate (HCO3)	mg/L	127	8021116	165	8021116	148	151	0.50	8021116
Carbonate (CO3)	mg/L	<0.50	8021116	<0.50	8021116	<0.50	<0.50	0.50	8021116
Hydroxide (OH)	mg/L	<0.50	8021116	<0.50	8021116	<0.50	<0.50	0.50	8021116
Anions									
Dissolved Sulphate (SO4)	mg/L	0.71	8023298	5.04	8023298	4.53	8.13	0.50	8023298
Dissolved Chloride (Cl)	mg/L	<0.50	8023293	<0.50	8023293	<0.50	<0.50	0.50	8023293
Nutrients									
Total Ammonia (N)	mg/L	0.050	8025809	0.043	8025807	0.045	0.036	0.0050	8025809
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.295	8020910	0.313	8020910	0.426	0.323	0.020	8020910
Nitrate plus Nitrite (N)	mg/L	0.0038	8021166	0.0102	8021166	0.0051	0.0055	0.0020	8021166
Nitrite (N)	mg/L	<0.0020	8021167	0.0022	8021167	<0.0020	<0.0020	0.0020	8021167
Total Nitrogen (N)	mg/L	0.299	8025779	0.323	8025778	0.431	0.328	0.020	8025778
Physical Properties									
Conductivity	uS/cm	209	8021117	268	8021117	252	266	1.0	8021117
pH	pH	7.58	8021118	7.58	8021118	7.35	7.09	N/A	8021118
Physical Properties									
Total Suspended Solids	mg/L	3.8	8023325	3.6	8023325	8.0	12.3	1.0	8023325
Total Dissolved Solids	mg/L	118	8021834	162	8021834	160	162	1.0	8021834

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		NA0817		NA0818			NA0819		
Sampling Date		2015/08/27 14:00		2015/08/27 14:30			2015/08/27 14:52		
COC Number		08411324		08411324			08411324		
	UNITS	KZ9-SHALLOW1	QC Batch	KZ9-SHALLOW2	RDL	QC Batch	KZ9-DEEP	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	15	8020783	17	N/A	8020783	14	N/A	8020783
Cation Sum	meq/L	15	8020783	16	N/A	8020783	14	N/A	8020783
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	N/A	ONSITE	FIELD	N/A	ONSITE
Ion Balance	N/A	1.0	8020782	0.97	0.010	8020782	1.0	0.010	8020782
Nitrate (N)	mg/L	0.0042	8020906	1.17	0.0020	8020906	0.0742	0.0020	8020906
Demand Parameters									
Biochemical Oxygen Demand	mg/L	<6.0	8020769	<6.0	6.0	8020769	<6.0	6.0	8020769
Chemical Oxygen Demand	mg/L	<10	8023365	<10	10	8023365	<10	10	8023365
Misc. Inorganics									
Alkalinity (Total as CaCO3)	mg/L	712	8021116	822	0.50	8021116	687	0.50	8021116
Total Organic Carbon (C)	mg/L	0.96	8025058	1.3	0.50	8025323	3.0	0.50	8025323
Alkalinity (PP as CaCO3)	mg/L	<0.50	8021116	<0.50	0.50	8021116	<0.50	0.50	8021116
Bicarbonate (HCO3)	mg/L	868	8021116	1000	0.50	8021116	838	0.50	8021116
Carbonate (CO3)	mg/L	<0.50	8021116	<0.50	0.50	8021116	<0.50	0.50	8021116
Hydroxide (OH)	mg/L	<0.50	8021116	<0.50	0.50	8021116	<0.50	0.50	8021116
Anions									
Dissolved Sulphate (SO4)	mg/L	20.7	8023291	19.8	0.50	8023298	16.9	0.50	8023298
Dissolved Chloride (Cl)	mg/L	1.3	8024847	1.1	0.50	8023293	1.1	0.50	8023293
Nutrients									
Total Ammonia (N)	mg/L	0.0087	8025809	0.036	0.0050	8025810	0.044	0.0050	8025809
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.047	8020910	<0.020	0.020	8020910	0.153	0.020	8020910
Nitrate plus Nitrite (N)	mg/L	0.0042	8021164	1.17 (1)	0.0020	8021166	0.0742	0.0020	8021166
Nitrite (N)	mg/L	<0.0020	8021165	<0.0020	0.0020	8021167	<0.0020	0.0020	8021167
Total Nitrogen (N)	mg/L	0.051	8025778	0.229	0.020	8027283	0.227	0.020	8025778
Physical Properties									
Conductivity	uS/cm	1240	8021117	1430	1.0	8021117	1230	1.0	8021117
pH	pH	7.70	8021118	7.32	N/A	8021118	7.00	N/A	8021118
Physical Properties									
Total Suspended Solids	mg/L	12.5 (2)	8023340	33.5 (2)	3.0	8023340	<1.0	1.0	8023340
Total Dissolved Solids	mg/L	786	8021834	882	1.0	8021834	742	1.0	8021834

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Nitrate plus Nitrite greater than total Nitrogen. Reanalysis yields similar results.
(2) RDL raised due to sample matrix interference.

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

Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		NA0820			NA0821		NA0822		
Sampling Date		2015/08/27 15:54			2015/08/27 15:00		2015/08/27 11:30		
COC Number		08411324			08411324		08411324		
	UNITS	POND	RDL	QC Batch	KZ22-DS	RDL	KZ-G-CREEK	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	1.2	N/A	8020783	4.0	N/A	2.8	N/A	8020783
Cation Sum	meq/L	1.6	N/A	8020783	4.0	N/A	3.0	N/A	8020783
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE	FIELD	N/A	FIELD	N/A	ONSITE
Ion Balance	N/A	1.1	0.010	8020782	1.0	0.010	1.1	0.010	8020782
Nitrate (N)	mg/L	0.0216	0.0020	8020906	0.0129	0.0020	0.0397	0.0020	8020906
Demand Parameters									
Biochemical Oxygen Demand	mg/L	7.1	6.0	8020769	<6.0	6.0	<6.0	6.0	8020769
Chemical Oxygen Demand	mg/L	46	10	8023365	<10	10	<10	10	8023365
Misc. Inorganics									
Alkalinity (Total as CaCO3)	mg/L	60.7	0.50	8021116	169	0.50	108	0.50	8021116
Total Organic Carbon (C)	mg/L	12	0.50	8025323	2.4	0.50	1.9	0.50	8025323
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	8021116	<0.50	0.50	<0.50	0.50	8021116
Bicarbonate (HCO3)	mg/L	74.0	0.50	8021116	207	0.50	132	0.50	8021116
Carbonate (CO3)	mg/L	<0.50	0.50	8021116	<0.50	0.50	<0.50	0.50	8021116
Hydroxide (OH)	mg/L	<0.50	0.50	8021116	<0.50	0.50	<0.50	0.50	8021116
Anions									
Dissolved Sulphate (SO4)	mg/L	<0.50	0.50	8023298	27.2	0.50	30.8	0.50	8023298
Dissolved Chloride (Cl)	mg/L	0.63	0.50	8023293	<0.50	0.50	<0.50	0.50	8023293
Nutrients									
Total Ammonia (N)	mg/L	0.046	0.0050	8025807	0.042	0.0050	0.028	0.0050	8025809
Total Total Kjeldahl Nitrogen (Calc)	mg/L	1.09	0.020	8020910	0.115	0.020	0.060	0.020	8020910
Nitrate plus Nitrite (N)	mg/L	0.0216	0.0020	8021164	0.0129	0.0020	0.0397	0.0020	8021166
Nitrite (N)	mg/L	<0.0020	0.0020	8021165	<0.0020	0.0020	<0.0020	0.0020	8021167
Total Nitrogen (N)	mg/L	1.11	0.020	8025778	0.128	0.020	0.099	0.020	8025779
Physical Properties									
Conductivity	uS/cm	124	1.0	8021117	377	1.0	279	1.0	8021117
pH	pH	7.40	N/A	8021118	7.78	N/A	7.95	N/A	8021118
Physical Properties									
Total Suspended Solids	mg/L	16.8 (1)	3.0	8023340	<1.0	1.0	2.6 (2)	2.0	8023340
Total Dissolved Solids	mg/L	88.0	1.0	8021834	224	1.0	166	1.0	8021834

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) RDL raised due to sample matrix interference.
(2) RDL raised due to insufficient volume caused by a laboratory error.

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL DISSOLVED METALS WITH CV HG (WATER)

Maxxam ID		NA0813	NA0814	NA0815	NA0816	NA0817		
Sampling Date		2015/08/27 11:05	2015/08/27 10:30	2015/08/27 13:05	2015/08/27 12:30	2015/08/27 14:00		
COC Number		08411324	08411324	08411324	08411324	08411324		
	UNITS	KZ-NW	KZ-SW	KZ-NE	KZ-SE	KZ9-SHALLOW1	RDL	QC Batch
Misc. Inorganics								
Dissolved Hardness (CaCO3)	mg/L	114	142	137	136	737	0.50	8020672
Elements								
Dissolved Mercury (Hg)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8026802
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	mg/L	0.00601	0.00407	0.00953	0.00943	0.00428	0.00050	8023768
Dissolved Antimony (Sb)	mg/L	0.000060	0.000054	0.000041	<0.000020	<0.000020	0.000020	8023768
Dissolved Arsenic (As)	mg/L	0.000380	0.00102	0.000649	0.000319	0.000393	0.000020	8023768
Dissolved Barium (Ba)	mg/L	0.157	0.144	0.0682	0.0828	0.0897	0.000020	8023768
Dissolved Beryllium (Be)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	0.000010	8023768
Dissolved Bismuth (Bi)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8023768
Dissolved Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8023768
Dissolved Cadmium (Cd)	mg/L	0.0000400	0.0000140	0.0000440	0.0000150	0.0000100	0.0000050	8023768
Dissolved Chromium (Cr)	mg/L	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	0.00010	8023768
Dissolved Cobalt (Co)	mg/L	0.000184	0.000359	0.000940 (1)	0.000483	0.00165	0.0000050	8023768
Dissolved Copper (Cu)	mg/L	0.000690	0.000647	0.000915	0.000185	0.000061	0.000050	8023768
Dissolved Iron (Fe)	mg/L	0.106	0.429	1.52	0.420	0.0526	0.0010	8023768
Dissolved Lead (Pb)	mg/L	0.0000230	0.0000280	0.0000580	0.000124 (1)	0.0000130	0.0000050	8023768
Dissolved Lithium (Li)	mg/L	<0.00050	<0.00050	<0.00050	0.00665	0.0711	0.00050	8023768
Dissolved Manganese (Mn)	mg/L	0.0133 (1)	0.430	0.850 (1)	0.582	1.60	0.000050	8023768
Dissolved Molybdenum (Mo)	mg/L	0.000337	0.000540	0.000269	0.000054	0.000311	0.000050	8023768
Dissolved Nickel (Ni)	mg/L	0.00110	0.000977	0.00160	0.000855	0.00439	0.000020	8023768
Dissolved Phosphorus (P)	mg/L	0.0031	0.0046	0.0099	0.0051	<0.0020	0.0020	8023768
Dissolved Selenium (Se)	mg/L	0.000050	0.000079	0.000190	0.000083	<0.000040	0.000040	8023768
Dissolved Silicon (Si)	mg/L	4.66	4.63	5.90	7.45	15.8	0.050	8023768
Dissolved Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8023768
Dissolved Strontium (Sr)	mg/L	0.0904	0.128	0.160	0.156	0.930	0.000050	8023768
Dissolved Thallium (Tl)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8023768
Dissolved Tin (Sn)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8023768
Dissolved Titanium (Ti)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	8023768
Dissolved Uranium (U)	mg/L	0.000243	0.000279	0.000294	0.0000730	0.00192	0.0000020	8023768
Dissolved Vanadium (V)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8023768
Dissolved Zinc (Zn)	mg/L	0.00563	0.00175	0.00786	0.00915	0.00488	0.00010	8023768
Dissolved Zirconium (Zr)	mg/L	<0.00010	0.00011	0.00030	<0.00010	<0.00010	0.00010	8023768
Dissolved Calcium (Ca)	mg/L	36.7	46.6	44.5	45.8	243	0.050	8020904

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL DISSOLVED METALS WITH CV HG (WATER)

Maxxam ID		NA0813	NA0814	NA0815	NA0816	NA0817		
Sampling Date		2015/08/27 11:05	2015/08/27 10:30	2015/08/27 13:05	2015/08/27 12:30	2015/08/27 14:00		
COC Number		08411324	08411324	08411324	08411324	08411324		
	UNITS	**KZ-NW**	**KZ-SW**	**KZ-NE**	**KZ-SE**	**KZ9-SHALLOW1**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	5.49	6.16	6.20	5.28	31.5	0.050	8020904
Dissolved Potassium (K)	mg/L	0.064	0.163	0.204	1.07	4.77	0.050	8020904
Dissolved Sodium (Na)	mg/L	0.980	1.05	1.16	1.54	8.30	0.050	8020904
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	<3.0	3.6	7.4	3.0	8020904
RDL = Reportable Detection Limit								

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Maxxam Job #: B575116
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Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL DISSOLVED METALS WITH CV HG (WATER)

Maxxam ID		NA0818	NA0819	NA0820	NA0821	NA0822		
Sampling Date		2015/08/27 14:30	2015/08/27 14:52	2015/08/27 15:54	2015/08/27 15:00	2015/08/27 11:30		
COC Number		08411324	08411324	08411324	08411324	08411324		
	UNITS	**KZ9-SHALLOW2**	**KZ9-DEEP**	**POND**	**KZ22-DS**	**KZ-G-CREEK**	**RDL**	**QC Batch**
Misc. Inorganics								
Dissolved Hardness (CaCO3)	mg/L	796	696	77.4	198	146	0.50	8020672
Elements								
Dissolved Mercury (Hg)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8026802
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	mg/L	0.00938	0.00734	0.0140	0.00233	0.00477	0.00050	8023768
Dissolved Antimony (Sb)	mg/L	<0.000020	<0.000020	<0.000020	0.000051	0.000047	0.000020	8023768
Dissolved Arsenic (As)	mg/L	0.000492	0.000112	0.000154	0.000279	0.000204	0.000020	8023768
Dissolved Barium (Ba)	mg/L	0.111	0.0840	0.0266	0.0634	0.0661	0.000020	8023768
Dissolved Beryllium (Be)	mg/L	0.000056	0.000033	<0.000010	<0.000010	<0.000010	0.000010	8023768
Dissolved Bismuth (Bi)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8023768
Dissolved Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8023768
Dissolved Cadmium (Cd)	mg/L	0.0000240	0.0000120	<0.0000050	0.0000170	0.0000590	0.0000050	8023768
Dissolved Chromium (Cr)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	8023768
Dissolved Cobalt (Co)	mg/L	0.000848	0.0000730	0.0000970	0.0000480	0.0000290	0.0000050	8023768
Dissolved Copper (Cu)	mg/L	0.000181	0.000529	0.000196	0.000674	0.000728	0.000050	8023768
Dissolved Iron (Fe)	mg/L	0.387	0.0239	0.0802	0.0474	0.115	0.0010	8023768
Dissolved Lead (Pb)	mg/L	0.0000540	0.0000160	0.0000200	<0.0000050	0.0000310	0.0000050	8023768
Dissolved Lithium (Li)	mg/L	0.0738	0.0620	0.00098	0.00354	0.00128	0.00050	8023768
Dissolved Manganese (Mn)	mg/L	0.725	0.0530	0.0136	0.0107	0.0210	0.000050	8023768
Dissolved Molybdenum (Mo)	mg/L	0.000174	0.000077	0.000078	0.000847	0.000562	0.000050	8023768
Dissolved Nickel (Ni)	mg/L	0.00347	0.00180	0.000399	0.000850	0.000253	0.000020	8023768
Dissolved Phosphorus (P)	mg/L	0.0022	0.0020	0.0114	<0.0020	<0.0020	0.0020	8023768
Dissolved Selenium (Se)	mg/L	0.000041	0.000157	0.000105	0.000530	0.000687	0.000040	8023768
Dissolved Silicon (Si)	mg/L	16.9	14.6	0.293 (1)	4.01	2.93	0.050	8023768
Dissolved Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8023768
Dissolved Strontium (Sr)	mg/L	1.04	0.883	0.0829	0.188	0.153	0.000050	8023768
Dissolved Thallium (Tl)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8023768
Dissolved Tin (Sn)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8023768
Dissolved Titanium (Ti)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	8023768
Dissolved Uranium (U)	mg/L	0.00155	0.00136	0.0000680	0.00176	0.000790	0.0000020	8023768
Dissolved Vanadium (V)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8023768
Dissolved Zinc (Zn)	mg/L	0.0105	0.00451	0.00157	0.00070	0.00982	0.00010	8023768
Dissolved Zirconium (Zr)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	8023768
Dissolved Calcium (Ca)	mg/L	269	233	25.7	57.2	49.2	0.050	8020904

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL DISSOLVED METALS WITH CV HG (WATER)

Maxxam ID		NA0818	NA0819	NA0820	NA0821	NA0822		
Sampling Date		2015/08/27 14:30	2015/08/27 14:52	2015/08/27 15:54	2015/08/27 15:00	2015/08/27 11:30		
COC Number		08411324	08411324	08411324	08411324	08411324		
	UNITS	**KZ9-SHALLOW2**	**KZ9-DEEP**	**POND**	**KZ22-DS**	**KZ-G-CREEK**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	30.4	27.4	3.23	13.3	5.64	0.050	8020904
Dissolved Potassium (K)	mg/L	4.59	3.92	0.400	1.19	1.29	0.050	8020904
Dissolved Sodium (Na)	mg/L	7.70	7.34	0.651	1.34	0.848	0.050	8020904
Dissolved Sulphur (S)	mg/L	7.0	6.0	<3.0	9.4	11.6	3.0	8020904
RDL = Reportable Detection Limit								

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Maxxam ID		NA0816	NA0817	NA0821	NA0822		
Sampling Date		2015/08/27 12:30	2015/08/27 14:00	2015/08/27 15:00	2015/08/27 11:30		
COC Number		08411324	08411324	08411324	08411324		
	UNITS	KZ-SE	KZ9-SHALLOW1	KZ22-DS	KZ-G-CREEK	RDL	QC Batch
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	137	743	200	146	0.50	8020482
Elements							
Total Mercury (Hg)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8026380
Total Metals by ICPMS							
Total Aluminum (Al)	mg/L	0.0145	0.0163	0.00253	0.00727	0.00050	8025453
Total Antimony (Sb)	mg/L	<0.000020	<0.000020	0.000066	0.000065	0.000020	8025453
Total Arsenic (As)	mg/L	0.000593	0.00118	0.000287	0.000232	0.000020	8025453
Total Barium (Ba)	mg/L	0.0933	0.105	0.0692	0.0701	0.000020	8025453
Total Beryllium (Be)	mg/L	<0.000010	0.000046	<0.000010	<0.000010	0.000010	8025453
Total Bismuth (Bi)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8025453
Total Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	0.010	8025453
Total Cadmium (Cd)	mg/L	0.0000330	0.0000150	0.0000330	0.0000730	0.0000050	8025453
Total Chromium (Cr)	mg/L	0.00016	<0.00010	<0.00010	<0.00010	0.00010	8025453
Total Cobalt (Co)	mg/L	0.000533	0.00177	0.0000680	0.0000300	0.0000050	8025453
Total Copper (Cu)	mg/L	0.000247	0.000214	0.000994	0.000634	0.000050	8025453
Total Iron (Fe)	mg/L	5.70	2.24	0.126	0.164	0.0010	8025453
Total Lead (Pb)	mg/L	0.0000740	0.0000620	0.0000120	0.0000840	0.0000050	8025453
Total Lithium (Li)	mg/L	0.00779	0.0845	0.00385	0.00141	0.00050	8025453
Total Manganese (Mn)	mg/L	0.591	1.55	0.0157	0.0233	0.000050	8025453
Total Molybdenum (Mo)	mg/L	0.000060	0.000359	0.000857	0.000515	0.000050	8025453
Total Nickel (Ni)	mg/L	0.00100	0.00444	0.000987	0.000287	0.000020	8025453
Total Phosphorus (P)	mg/L	0.0374	0.0035	<0.0020	<0.0020	0.0020	8025453
Total Selenium (Se)	mg/L	0.000107	<0.000040	0.000547	0.000711	0.000040	8025453
Total Silicon (Si)	mg/L	7.54	15.6	3.81	2.64	0.050	8025453
Total Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	8025453
Total Strontium (Sr)	mg/L	0.159	0.953	0.186	0.152	0.000050	8025453
Total Thallium (Tl)	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000020	8025453
Total Tin (Sn)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8025453
Total Titanium (Ti)	mg/L	0.00059	<0.00050	<0.00050	<0.00050	0.00050	8025453
Total Uranium (U)	mg/L	0.000102	0.00226	0.00204	0.000896	0.0000020	8025453
Total Vanadium (V)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	8025453
Total Zinc (Zn)	mg/L	0.0129	0.00641	0.00069	0.0106	0.00010	8025453
Total Zirconium (Zr)	mg/L	0.00013	0.00012	<0.00010	<0.00010	0.00010	8025453
Total Calcium (Ca)	mg/L	45.9	244	56.9	49.4	0.050	8020905
Total Magnesium (Mg)	mg/L	5.38	32.6	14.1	5.51	0.050	8020905
RDL = Reportable Detection Limit							

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Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Maxxam ID		NA0816	NA0817	NA0821	NA0822		
Sampling Date		2015/08/27 12:30	2015/08/27 14:00	2015/08/27 15:00	2015/08/27 11:30		
COC Number		08411324	08411324	08411324	08411324		
	UNITS	**KZ-SE**	**KZ9-SHALLOW1**	**KZ22-DS**	**KZ-G-CREEK**	**RDL**	**QC Batch**
Total Potassium (K)	mg/L	1.25	4.92	1.38	1.45	0.050	8020905
Total Sodium (Na)	mg/L	1.61	8.74	1.40	0.917	0.050	8020905
Total Sulphur (S)	mg/L	3.6	7.7	9.6	11.2	3.0	8020905
RDL = Reportable Detection Limit							

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LL TOTAL METALS (DIGESTED) WITH CV HG

Maxxam ID		NA0813	NA0814	NA0815		NA0818		
Sampling Date		2015/08/27 11:05	2015/08/27 10:30	2015/08/27 13:05		2015/08/27 14:30		
COC Number		08411324	08411324	08411324		08411324		
	UNITS	KZ-NW	KZ-SW	KZ-NE	QC Batch	KZ9-SHALLOW2	RDL	QC Batch
Calculated Parameters								
Total Hardness (CaCO3)	mg/L	105	139	135	8020482	863	0.50	8020482
Elements								
Total Mercury (Hg)	mg/L	<0.0000020	<0.0000020	<0.0000020	8026380	<0.0000020	0.0000020	8026837
Total Metals by ICPMS								
Total Aluminum (Al)	mg/L	0.0085	0.0089	0.0163	8025320	0.0222	0.0030	8025320
Total Antimony (Sb)	mg/L	0.000067	0.000059	0.000063	8025320	<0.000050	0.000050	8025320
Total Arsenic (As)	mg/L	0.000396	0.00157	0.000752	8025320	0.00106	0.000020	8025320
Total Barium (Ba)	mg/L	0.154	0.148	0.0746	8025320	0.125	0.00010	8025320
Total Beryllium (Be)	mg/L	<0.000010	<0.000010	<0.000010	8025320	0.000092	0.000010	8025320
Total Bismuth (Bi)	mg/L	<0.000020	<0.000020	<0.000020	8025320	<0.000020	0.000020	8025320
Total Boron (B)	mg/L	<0.050	<0.050	<0.050	8025320	<0.050	0.050	8025320
Total Cadmium (Cd)	mg/L	0.0000420	0.0000220	0.0000730	8025320	0.0000300	0.0000050	8025320
Total Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	8025320	<0.00050	0.00050	8025320
Total Cobalt (Co)	mg/L	0.000171	0.000427	0.000709	8025320	0.00101	0.000010	8025320
Total Copper (Cu)	mg/L	0.00105 (1)	0.00105	0.00143	8025320	0.00038	0.00020	8025320
Total Iron (Fe)	mg/L	0.140	1.75	2.46	8025320	1.65	0.0050	8025320
Total Lead (Pb)	mg/L	<0.000050	0.000050	0.000141	8025320	<0.000050	0.000050	8025320
Total Lithium (Li)	mg/L	<0.00050	<0.00050	<0.00050	8025320	0.0839	0.00050	8025320
Total Manganese (Mn)	mg/L	0.0105	0.459	0.528	8025320	0.796	0.00010	8025320
Total Molybdenum (Mo)	mg/L	0.000366	0.000609	0.000319	8025320	0.000198	0.000050	8025320
Total Nickel (Ni)	mg/L	0.00125	0.00113	0.00175	8025320	0.00411	0.00010	8025320
Total Phosphorus (P)	mg/L	<0.010	0.018	0.023	8025320	<0.010	0.010	8025320
Total Selenium (Se)	mg/L	0.000063	0.000091	0.000175	8025320	<0.000040	0.000040	8025320
Total Silicon (Si)	mg/L	4.25	4.55	5.58	8025320	16.9	0.10	8025320
Total Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	8025320	<0.0000050	0.0000050	8025320
Total Strontium (Sr)	mg/L	0.0823	0.122	0.147	8025320	1.02	0.000050	8025320
Total Thallium (Tl)	mg/L	0.0000020	<0.0000020	0.0000020	8025320	<0.0000020	0.0000020	8025320
Total Tin (Sn)	mg/L	<0.00020	<0.00020	<0.00020	8025320	<0.00020	0.00020	8025320
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	8025320	<0.0050	0.0050	8025320
Total Uranium (U)	mg/L	0.000257	0.000318	0.000336	8025320	0.00182	0.0000050	8025320
Total Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	8025320	<0.00050	0.00050	8025320
Total Zinc (Zn)	mg/L	0.0058	0.0038	0.0118	8025320	0.0161	0.0010	8025320
Total Zirconium (Zr)	mg/L	<0.00010	0.00016	0.00029	8025320	0.00013	0.00010	8025320
Total Calcium (Ca)	mg/L	33.9	45.8	44.3	8020905	290	0.25	8020905

RDL = Reportable Detection Limit
(1) Duplicate RPD above control limit - (10% of analytes failure allowed)

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LL TOTAL METALS (DIGESTED) WITH CV HG

Maxxam ID		NA0813	NA0814	NA0815		NA0818		
Sampling Date		2015/08/27 11:05	2015/08/27 10:30	2015/08/27 13:05		2015/08/27 14:30		
COC Number		08411324	08411324	08411324		08411324		
	UNITS	**KZ-NW**	**KZ-SW**	**KZ-NE**	**QC Batch**	**KZ9-SHALLOW2**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	4.92	6.11	5.80	8020905	33.7	0.25	8020905
Total Potassium (K)	mg/L	<0.25	<0.25	<0.25	8020905	5.11	0.25	8020905
Total Sodium (Na)	mg/L	0.95	1.12	1.22	8020905	8.82	0.25	8020905
Total Sulphur (S)	mg/L	<15	<15	<15	8020905	<15	15	8020905
RDL = Reportable Detection Limit								

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Maxxam Job #: B575116
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Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LL TOTAL METALS (DIGESTED) WITH CV HG

Maxxam ID		NA0819	NA0820		
Sampling Date		2015/08/27 14:52	2015/08/27 15:54		
COC Number		08411324	08411324		
	UNITS	KZ9-DEEP	POND	RDL	QC Batch
Calculated Parameters					
Total Hardness (CaCO3)	mg/L	676	66.0	0.50	8020482
Elements					
Total Mercury (Hg)	mg/L	<0.0000020	<0.0000020	0.0000020	8026380
Total Metals by ICPMS					
Total Aluminum (Al)	mg/L	0.0096	0.0656	0.0030	8025320
Total Antimony (Sb)	mg/L	<0.000050	<0.000050	0.000050	8025320
Total Arsenic (As)	mg/L	0.000163	0.000171	0.000020	8025320
Total Barium (Ba)	mg/L	0.0842	0.0389	0.00010	8025320
Total Beryllium (Be)	mg/L	0.000032	<0.000010	0.000010	8025320
Total Bismuth (Bi)	mg/L	<0.000020	<0.000020	0.000020	8025320
Total Boron (B)	mg/L	<0.050	<0.050	0.050	8025320
Total Cadmium (Cd)	mg/L	0.0000140	0.0000080	0.0000050	8025320
Total Chromium (Cr)	mg/L	<0.00050	<0.00050	0.00050	8025320
Total Cobalt (Co)	mg/L	0.000076	0.000405	0.000010	8025320
Total Copper (Cu)	mg/L	0.00070	0.00066	0.00020	8025320
Total Iron (Fe)	mg/L	0.0423	1.10	0.0050	8025320
Total Lead (Pb)	mg/L	<0.000050	0.000121	0.000050	8025320
Total Lithium (Li)	mg/L	0.0649	<0.00050	0.00050	8025320
Total Manganese (Mn)	mg/L	0.0549	0.185	0.00010	8025320
Total Molybdenum (Mo)	mg/L	0.000076	0.000122	0.000050	8025320
Total Nickel (Ni)	mg/L	0.00193	0.00053	0.00010	8025320
Total Phosphorus (P)	mg/L	<0.010	0.088	0.010	8025320
Total Selenium (Se)	mg/L	0.000158	0.000140	0.000040	8025320
Total Silicon (Si)	mg/L	14.5	0.11	0.10	8025320
Total Silver (Ag)	mg/L	<0.0000050	0.0000050	0.0000050	8025320
Total Strontium (Sr)	mg/L	0.797	0.0746	0.000050	8025320
Total Thallium (Tl)	mg/L	<0.0000020	0.0000020	0.0000020	8025320
Total Tin (Sn)	mg/L	<0.00020	<0.00020	0.00020	8025320
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	8025320
Total Uranium (U)	mg/L	0.00148	0.0000990	0.0000050	8025320
Total Vanadium (V)	mg/L	<0.00050	<0.00050	0.00050	8025320
Total Zinc (Zn)	mg/L	0.0050	0.0040	0.0010	8025320
Total Zirconium (Zr)	mg/L	<0.00010	<0.00010	0.00010	8025320
Total Calcium (Ca)	mg/L	226	22.0	0.25	8020905
Total Magnesium (Mg)	mg/L	27.4	2.67	0.25	8020905
RDL = Reportable Detection Limit					

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Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

LL TOTAL METALS (DIGESTED) WITH CV HG

Maxxam ID		NA0819	NA0820		
Sampling Date		2015/08/27 14:52	2015/08/27 15:54		
COC Number		08411324	08411324		
	UNITS	KZ9-DEEP	POND	RDL	QC Batch
Total Potassium (K)	mg/L	4.02	0.69	0.25	8020905
Total Sodium (Na)	mg/L	7.28	0.64	0.25	8020905
Total Sulphur (S)	mg/L	<15	<15	15	8020905
RDL = Reportable Detection Limit					

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0813
Sample ID: KZ-NW
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Rob Reinert
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Nitrogen (Total)	TRAA/COL	8025779	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025058	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023325	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0813 Dup
Sample ID: KZ-NW
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Nitrogen (Total)	TRAA/COL	8025779	2015/09/02	2015/09/02	Diana Cruz
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska

Maxxam ID: NA0814
Sample ID: KZ-SW
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0814
Sample ID: KZ-SW
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025807	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025058	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023325	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0815
Sample ID: KZ-NE
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Rob Reinert
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Rob Reinert
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0815
Sample ID: KZ-NE
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025058	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023325	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0816
Sample ID: KZ-SE
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Elements by ICPMS Low Level (total)	ICP/CRCM	8025453	N/A	2015/09/02	Greg Sparrow
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025058	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023325	2015/09/01	2015/09/02	Liilia Iankovska

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0817
Sample ID: KZ9-SHALLOW1
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8024847	N/A	2015/09/01	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Elements by ICPMS Low Level (total)	ICP/CRCM	8025453	N/A	2015/09/02	Greg Sparrow
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021164	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021165	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023291	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025058	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0817 Dup
Sample ID: KZ9-SHALLOW1
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean

Maxxam ID: NA0818
Sample ID: KZ9-SHALLOW2
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0818
Sample ID: KZ9-SHALLOW2
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026837	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Rob Reinert
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Nitrogen (Total)	TRAA/COL	8027283	2015/09/04	2015/09/04	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025810	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Rob Reinert
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Rob Reinert
Carbon (Total Organic)	TECH	8025323	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0819
Sample ID: KZ9-DEEP
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0819
Sample ID: KZ9-DEEP
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025323	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0820
Sample ID: POND
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Rob Reinert
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Elements by ICPMS Digested LL (total)	ICP/CRCM	8025320	2015/09/02	2015/09/03	Greg Sparrow
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Nitrogen (Total)	TRAA/COL	8025778	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025807	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021164	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021165	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025323	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0820 Dup
Sample ID: POND
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021164	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021165	N/A	2015/08/29	Isaac Wang

Maxxam ID: NA0821
Sample ID: KZ22-DS
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Elements by ICPMS Low Level (total)	ICP/CRCM	8025453	N/A	2015/09/02	Greg Sparrow
Nitrogen (Total)	TRAA/COL	8025779	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025323	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0822
Sample ID: KZ-G-CREEK
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity - Water	AT/ALK	8021116	2015/08/29	2015/08/29	Maria Maclean
Biochemical Oxygen Demand	DO/ELE	8020769	2015/08/29	2015/08/29	Alex Leung
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
COD by Colorimeter	M/COL	8023365	2015/09/01	2015/09/02	Alex Leung

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

TEST SUMMARY

Maxxam ID: NA0822
Sample ID: KZ-G-CREEK
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductance - water	AT/ALK	8021117	N/A	2015/08/29	Maria Maclean
Hardness Total (calculated as CaCO3)	CALC	8020482	N/A	2015/09/03	Automated Statchk
Hardness (calculated as CaCO3)	CALC	8020672	N/A	2015/09/02	Automated Statchk
Mercury (Dissolved-LowLevel) by CVAF	CV/AF	8026802	N/A	2015/09/03	Edwin Lamigo
Mercury (Total-LowLevel) by CVAF	CV/AF	8026380	2015/09/03	2015/09/03	Edwin Lamigo
Ion Balance	CALC	8020782	N/A	2015/09/02	Automated Statchk
Sum of cations, anions	CALC	8020783	N/A	2015/09/02	Automated Statchk
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	ICP/CRCM	8020904	N/A	2015/09/02	Automated Statchk
Elements by ICPMS Low Level (dissolved)	ICP/CRCM	8023768	N/A	2015/09/02	Adnan Dzebic
Na, K, Ca, Mg, S by CRC ICPMS (total)	ICP/CRCM	8020905	N/A	2015/09/03	Automated Statchk
Elements by ICPMS Low Level (total)	ICP/CRCM	8025453	N/A	2015/09/02	Greg Sparrow
Nitrogen (Total)	TRAA/COL	8025779	2015/09/02	2015/09/02	Diana Cruz
Ammonia-N (Preserved)	KONE/COL	8025809	N/A	2015/09/02	Sherryl Flores
Nitrate+Nitrite (N) (low level)	TRAA/COL	8021166	N/A	2015/08/29	Isaac Wang
Nitrite (N) (low level)	TRAA/COL	8021167	N/A	2015/08/29	Isaac Wang
Nitrogen - Nitrate (as N)	CALC	8020906	N/A	2015/09/01	Automated Statchk
Filter and HNO3 Preserve for Metals	ICP	ONSITE	N/A	2015/08/29	Marilou H. Truant
pH Water	AT/ALK	8021118	N/A	2015/08/29	Maria Maclean
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi
Total Dissolved Solids - Low Level	BAL/BAL	8021834	N/A	2015/09/03	Liilia Iankovska
TKN (Calc. TN, N/N) total	CALC	8020910	N/A	2015/09/03	Automated Statchk
Carbon (Total Organic)	TECH	8025323	N/A	2015/09/02	Maruf Ul Karim
Total Suspended Solids-Low Level	BAL/BAL	8023340	2015/09/01	2015/09/02	Liilia Iankovska

Maxxam ID: NA0822 Dup
Sample ID: KZ-G-CREEK
Matrix: Water

Collected: 2015/08/27
Shipped:
Received: 2015/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE/COL	8023293	N/A	2015/08/31	Balwinder Bassi
Sulphate by Automated Colourimetry	KONE/COL	8023298	N/A	2015/08/31	Balwinder Bassi

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
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	7.0°C
Package 2	8.3°C

Sample NA0813-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Sample NA0814-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Sample NA0815-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Sample NA0818-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Sample NA0819-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Sample NA0820-01 : Sample analyzed for digested low level metals due to sediment in sample. This results in an increased reportable detection limit for Al B Ba Bi Cr Co Cu Fe Mn Ni P Pb Sb Si Ti U V and Zn.

Results relate only to the items tested.

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Maxxam Job #: B575116
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QUALITY ASSURANCE REPORT

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8020769	Biochemical Oxygen Demand	2015/08/29			93	85 - 115	<6.0	mg/L	5.6	20
8021116	Alkalinity (PP as CaCO3)	2015/08/29					<0.50	mg/L	NC	20
8021116	Alkalinity (Total as CaCO3)	2015/08/29	NC	80 - 120	91	80 - 120	<0.50	mg/L	1.4	20
8021116	Bicarbonate (HCO3)	2015/08/29					<0.50	mg/L	1.4	20
8021116	Carbonate (CO3)	2015/08/29					<0.50	mg/L	NC	20
8021116	Hydroxide (OH)	2015/08/29					<0.50	mg/L	NC	20
8021117	Conductivity	2015/08/29			100	80 - 120	<1.0	uS/cm	0.57	20
8021118	pH	2015/08/29			102	97 - 103			0.39	N/A
8021164	Nitrate plus Nitrite (N)	2015/08/29	96	80 - 120	106	80 - 120	<0.0020	mg/L	14	25
8021165	Nitrite (N)	2015/08/29	98	80 - 120	102	80 - 120	<0.0020	mg/L	NC	25
8021166	Nitrate plus Nitrite (N)	2015/08/29			105	80 - 120	<0.0020	mg/L		
8021167	Nitrite (N)	2015/08/29			102	80 - 120	<0.0020	mg/L		
8021834	Total Dissolved Solids	2015/09/03	101	80 - 120	96	80 - 120	<1.0	mg/L	1.7	20
8023291	Dissolved Sulphate (SO4)	2015/08/31	104	80 - 120	93	80 - 120	<0.50	mg/L	14	20
8023293	Dissolved Chloride (Cl)	2015/08/31	109	80 - 120	102	80 - 120	<0.50	mg/L	NC	20
8023298	Dissolved Sulphate (SO4)	2015/08/31	NC	80 - 120	88	80 - 120	<0.50	mg/L	0.76	20
8023325	Total Suspended Solids	2015/09/02			96	80 - 120	<1.0	mg/L		
8023340	Total Suspended Solids	2015/09/01			99	80 - 120	<1.0	mg/L		
8023365	Chemical Oxygen Demand	2015/09/02	102	80 - 120	100	80 - 120	<10	mg/L	NC	20
8023768	Dissolved Aluminum (Al)	2015/09/02	NC	80 - 120	100	80 - 120	<0.00050	mg/L	4.9	20
8023768	Dissolved Antimony (Sb)	2015/09/02	100	80 - 120	92	80 - 120	<0.000020	mg/L	1.9	20
8023768	Dissolved Arsenic (As)	2015/09/02	93	80 - 120	92	80 - 120	<0.000020	mg/L	NC	20
8023768	Dissolved Barium (Ba)	2015/09/02	NC	80 - 120	89	80 - 120	<0.000020	mg/L	0.69	20
8023768	Dissolved Beryllium (Be)	2015/09/02	90	80 - 120	92	80 - 120	<0.000010	mg/L	NC	20
8023768	Dissolved Bismuth (Bi)	2015/09/02	95	80 - 120	100	80 - 120	<0.0000050	mg/L	NC	20
8023768	Dissolved Boron (B)	2015/09/02					<0.010	mg/L	NC	20
8023768	Dissolved Cadmium (Cd)	2015/09/02	95	80 - 120	95	80 - 120	<0.0000050	mg/L	NC	20
8023768	Dissolved Chromium (Cr)	2015/09/02	96	80 - 120	94	80 - 120	<0.00010	mg/L	NC	20
8023768	Dissolved Cobalt (Co)	2015/09/02	91	80 - 120	92	80 - 120	<0.0000050	mg/L	NC	20
8023768	Dissolved Copper (Cu)	2015/09/02	89	80 - 120	91	80 - 120	<0.000050	mg/L	1.3	20
8023768	Dissolved Iron (Fe)	2015/09/02	101	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8023768	Dissolved Lead (Pb)	2015/09/02	91	80 - 120	93	80 - 120	<0.0000050	mg/L	NC	20
8023768	Dissolved Lithium (Li)	2015/09/02	89	80 - 120	91	80 - 120	<0.00050	mg/L	NC	20
8023768	Dissolved Manganese (Mn)	2015/09/02	NC	80 - 120	94	80 - 120	<0.000050	mg/L	2.0	20
8023768	Dissolved Molybdenum (Mo)	2015/09/02	NC	80 - 120	91	80 - 120	<0.000050	mg/L	1.3	20
8023768	Dissolved Nickel (Ni)	2015/09/02	91	80 - 120	92	80 - 120	<0.000020	mg/L	NC	20
8023768	Dissolved Phosphorus (P)	2015/09/02					<0.0020	mg/L		
8023768	Dissolved Selenium (Se)	2015/09/02	95	80 - 120	95	80 - 120	<0.000040	mg/L	5.0	20
8023768	Dissolved Silicon (Si)	2015/09/02					<0.050	mg/L	2.8	20
8023768	Dissolved Silver (Ag)	2015/09/02	93	80 - 120	94	80 - 120	<0.0000050	mg/L	NC	20
8023768	Dissolved Strontium (Sr)	2015/09/02	NC	80 - 120	93	80 - 120	<0.000050	mg/L	1.4	20
8023768	Dissolved Thallium (Tl)	2015/09/02	93	80 - 120	94	80 - 120	<0.0000020	mg/L	8.7	20
8023768	Dissolved Tin (Sn)	2015/09/02	94	80 - 120	95	80 - 120	<0.00020	mg/L	NC	20
8023768	Dissolved Titanium (Ti)	2015/09/02	97	80 - 120	92	80 - 120	<0.00050	mg/L	NC	20
8023768	Dissolved Uranium (U)	2015/09/02	95	80 - 120	95	80 - 120	<0.0000020	mg/L	NC	20
8023768	Dissolved Vanadium (V)	2015/09/02	95	80 - 120	94	80 - 120	<0.00020	mg/L	NC	20
8023768	Dissolved Zinc (Zn)	2015/09/02	NC	80 - 120	97	80 - 120	<0.00010	mg/L	0.56	20
8023768	Dissolved Zirconium (Zr)	2015/09/02					<0.00010	mg/L	NC	20
8024847	Dissolved Chloride (Cl)	2015/09/01			102	80 - 120	0.60, RDL=0.50	mg/L	1.9	20
8025058	Total Organic Carbon (C)	2015/09/02	NC	80 - 120	110	80 - 120	<0.50	mg/L	1.6	20
8025320	Total Aluminum (Al)	2015/09/03	100	80 - 120	100	80 - 120	<0.0030	mg/L	NC	20
8025320	Total Antimony (Sb)	2015/09/03	102	80 - 120	105	80 - 120	<0.000050	mg/L	NC	20
8025320	Total Arsenic (As)	2015/09/03	94	80 - 120	94	80 - 120	<0.000020	mg/L	2.8	20
8025320	Total Barium (Ba)	2015/09/03	NC	80 - 120	105	80 - 120	<0.00010	mg/L	4.3	20
8025320	Total Beryllium (Be)	2015/09/03	101	80 - 120	98	80 - 120	<0.000010	mg/L	NC	20
8025320	Total Bismuth (Bi)	2015/09/03	100	80 - 120	96	80 - 120	<0.000020	mg/L	NC	20
8025320	Total Boron (B)	2015/09/03					<0.050	mg/L	NC	20
8025320	Total Cadmium (Cd)	2015/09/03	95	80 - 120	96	80 - 120	<0.0000050	mg/L	2.4	20
8025320	Total Chromium (Cr)	2015/09/03	102	80 - 120	106	80 - 120	<0.00050	mg/L	NC	20
8025320	Total Cobalt (Co)	2015/09/03	105	80 - 120	106	80 - 120	<0.000010	mg/L	1.2	20
8025320	Total Copper (Cu)	2015/09/03	103	80 - 120	108	80 - 120	0.00039, RDL=0.00020	mg/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8025320	Total Iron (Fe)	2015/09/03	NC	80 - 120	113	80 - 120	<0.0050	mg/L	4.2	20
8025320	Total Lead (Pb)	2015/09/03	104	80 - 120	100	80 - 120	<0.000050	mg/L	NC	20
8025320	Total Lithium (Li)	2015/09/03	106	80 - 120	102	80 - 120	<0.00050	mg/L	NC	20
8025320	Total Manganese (Mn)	2015/09/03	NC	80 - 120	104	80 - 120	<0.00010	mg/L	0.067	20
8025320	Total Molybdenum (Mo)	2015/09/03	98	80 - 120	98	80 - 120	<0.000050	mg/L	10	20
8025320	Total Nickel (Ni)	2015/09/03	103	80 - 120	105	80 - 120	<0.00010	mg/L	10	20
8025320	Total Phosphorus (P)	2015/09/03					<0.010	mg/L	NC	20
8025320	Total Selenium (Se)	2015/09/03	89	80 - 120	87	80 - 120	<0.000040	mg/L	NC	20
8025320	Total Silicon (Si)	2015/09/03					<0.10	mg/L	0.43	20
8025320	Total Silver (Ag)	2015/09/03	105	80 - 120	100	80 - 120	<0.0000050	mg/L	NC	20
8025320	Total Strontium (Sr)	2015/09/03	NC	80 - 120	97	80 - 120	<0.000050	mg/L	0.53	20
8025320	Total Thallium (Tl)	2015/09/03	100	80 - 120	95	80 - 120	<0.0000020	mg/L	NC	20
8025320	Total Tin (Sn)	2015/09/03	99	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20
8025320	Total Titanium (Ti)	2015/09/03	107	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20
8025320	Total Uranium (U)	2015/09/03	107	80 - 120	100	80 - 120	<0.0000050	mg/L	1.9	20
8025320	Total Vanadium (V)	2015/09/03	102	80 - 120	103	80 - 120	<0.00050	mg/L	NC	20
8025320	Total Zinc (Zn)	2015/09/03	NC	80 - 120	99	80 - 120	0.0011, RDL=0.0010	mg/L	9.1	20
8025320	Total Zirconium (Zr)	2015/09/03					<0.00010	mg/L	NC	20
8025323	Total Organic Carbon (C)	2015/09/02	111	80 - 120	94	80 - 120	<0.50	mg/L	NC	20
8025453	Total Aluminum (Al)	2015/09/02	101	80 - 120	108	80 - 120	<0.00050	mg/L	NC	20
8025453	Total Antimony (Sb)	2015/09/02	100	80 - 120	110	80 - 120	<0.000020	mg/L	NC	20
8025453	Total Arsenic (As)	2015/09/02	95	80 - 120	103	80 - 120	<0.000020	mg/L	NC	20
8025453	Total Barium (Ba)	2015/09/02	103	80 - 120	109	80 - 120	<0.000020	mg/L	NC	20
8025453	Total Beryllium (Be)	2015/09/02	98	80 - 120	106	80 - 120	<0.000010	mg/L	NC	20
8025453	Total Bismuth (Bi)	2015/09/02	99	80 - 120	105	80 - 120	<0.0000050	mg/L	NC	20
8025453	Total Boron (B)	2015/09/02					<0.010	mg/L	NC	20
8025453	Total Cadmium (Cd)	2015/09/02	97	80 - 120	104	80 - 120	<0.0000050	mg/L	NC	20
8025453	Total Chromium (Cr)	2015/09/02	101	80 - 120	107	80 - 120	<0.00010	mg/L	NC	20
8025453	Total Cobalt (Co)	2015/09/02	104	80 - 120	108	80 - 120	<0.0000050	mg/L	NC	20
8025453	Total Copper (Cu)	2015/09/02	104	80 - 120	108	80 - 120	<0.000050	mg/L	NC	20

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Maxxam Job #: B575116
Report Date: 2015/09/09

QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8025453	Total Iron (Fe)	2015/09/02	110	80 - 120	117	80 - 120	<0.0010	mg/L	NC	20
8025453	Total Lead (Pb)	2015/09/02	102	80 - 120	108	80 - 120	<0.0000050	mg/L	NC	20
8025453	Total Lithium (Li)	2015/09/02	102	80 - 120	108	80 - 120	<0.00050	mg/L	NC	20
8025453	Total Manganese (Mn)	2015/09/02	100	80 - 120	106	80 - 120	<0.000050	mg/L	NC	20
8025453	Total Molybdenum (Mo)	2015/09/02	95	80 - 120	100	80 - 120	<0.000050	mg/L	NC	20
8025453	Total Nickel (Ni)	2015/09/02	102	80 - 120	107	80 - 120	<0.000020	mg/L	NC	20
8025453	Total Phosphorus (P)	2015/09/02					<0.0020	mg/L		
8025453	Total Selenium (Se)	2015/09/02	90	80 - 120	99	80 - 120	<0.000040	mg/L	NC	20
8025453	Total Silicon (Si)	2015/09/02					<0.050	mg/L	NC	20
8025453	Total Silver (Ag)	2015/09/02	102	80 - 120	96	80 - 120	<0.0000050	mg/L	NC	20
8025453	Total Strontium (Sr)	2015/09/02	96	80 - 120	97	80 - 120	<0.000050	mg/L	NC	20
8025453	Total Thallium (Tl)	2015/09/02	100	80 - 120	102	80 - 120	<0.0000020	mg/L	NC	20
8025453	Total Tin (Sn)	2015/09/02	98	80 - 120	108	80 - 120	<0.00020	mg/L	NC	20
8025453	Total Titanium (Ti)	2015/09/02	99	80 - 120	103	80 - 120	<0.00050	mg/L	NC	20
8025453	Total Uranium (U)	2015/09/02	102	80 - 120	108	80 - 120	<0.0000020	mg/L	NC	20
8025453	Total Vanadium (V)	2015/09/02	101	80 - 120	105	80 - 120	<0.00020	mg/L	NC	20
8025453	Total Zinc (Zn)	2015/09/02	101	80 - 120	106	80 - 120	<0.00010	mg/L	4.5	20
8025453	Total Zirconium (Zr)	2015/09/02					<0.00010	mg/L	NC	20
8025778	Total Nitrogen (N)	2015/09/02	NC	80 - 120	86	80 - 120	<0.020	mg/L	4.7	20
8025779	Total Nitrogen (N)	2015/09/02	NC	80 - 120	98	80 - 120	<0.020	mg/L	1.4	20
8025807	Total Ammonia (N)	2015/09/02	103	80 - 120	102	80 - 120	<0.0050	mg/L	NC	20
8025809	Total Ammonia (N)	2015/09/02	102	80 - 120	105	80 - 120	<0.0050	mg/L	NC	20
8025810	Total Ammonia (N)	2015/09/02	101	80 - 120	110	80 - 120	<0.0050	mg/L	NC	20
8026380	Total Mercury (Hg)	2015/09/03	86	80 - 120	97	80 - 120	<0.0000020	mg/L	NC	20
8026802	Dissolved Mercury (Hg)	2015/09/03	98	80 - 120	95	80 - 120	<0.0000020	mg/L	NC	20
8026837	Total Mercury (Hg)	2015/09/03	89	80 - 120	93	80 - 120	<0.0000020	mg/L	NC	20

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Maxxam Job #: B575116
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QUALITY ASSURANCE REPORT(CONT'D)

Contango Strategies Limited
Client Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8027283	Total Nitrogen (N)	2015/09/04	NC	80 - 120	90	80 - 120	<0.020	mg/L	0.91	20

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.

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).

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Maxxam Job #: B575116
Report Date: 2015/09/09

Contango Strategies Limited
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

Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist

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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A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

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

COC #: 08411324

BBY FCD-00077/05

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Invoice Information		Report Information (if differs from invoice)		Project Information (where appli		e (TAT) Required
Company Name:	BMC MINERALS LTD.	Company Name:	Contango Strategies Limited	Quotation #:	B50743	[X] Regular TAT 5 days (Most analyses)
Contact Name:	Accounts Payable	Contact Name:	Monique Haakensen	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	530-1130 WEST PENDER ST	Address:	15-410 Downey Road	Project #:	BMC-15-01	Rush TAT (Surcharges will be applied)
	Vancouver, BC PC: V6E 4A4		Saskatoon, Sask PC: S7N 4N1	Site Location:	Kudz Ze Kayah	[ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3 Days
Phone:		Phone:	(306) 978-3111 vpittet@contangostrategies.com	Site #:		
Email:	kdbergh@gmail.com	Email:	mhaakensen@contangostrategies.com	Sampled By:	Monique Haakensen & Jordyn Bergsveinsen	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	USE SCENARIO # 12485	

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	COD	TOC	Ammonia	Total Nitrogen, TKN	TSS	BOD	Routine (Ca, Mg, Na, K, Cl, SO4, NO3, NO2, Hardness, Alkalinity, pH, EC, TDS)	Regulated Total Metals water package (ICP-MS, including total phosphorus, sulphur, mercury)	Regulated Dissolved metals water package (ICP-MS, including phosphorus, sulphur, mercury)					# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	KZ-NW	NA0813	15-08-27	11:05		x	x	x	x	x	x	x	x	x					9		
2	KZ-SW	NA0814	15-08-27	10:30		x	x	x	x	x	x	x	x	x					9		
3	KZ-NE	NA0815	15-08-27	13:05		x	x	x	x	x	x	x	x	x					9		
4	KZ-SE	NA0816	15-08-27	12:30		x	x	x	x	x	x	x	x	x					9		
5	KZ9-shallow1	NA0817	15-08-27	14:00		x	x	x	x	x	x	x	x	x					9		
6	KZ9-shallow2	NA0818	15-08-27	14:30		x	x	x	x	x	x	x	x	x					9		
7	KZ9-deep	NA0819	15-08-27	14:52		x	x	x	x	x	x	x	x	x					9		
8	Pond	NA0820	15-08-27	15:54		x	x	x	x	x	x	x	x	x					9		
9	KZ22-DS	NA0821	15-08-26	15:00		x	x	x	x	x	x	x	x	x					9		
10	KZ-G-Creek	NA0822	15-08-27	11:30		x	x	x	x	x	x	x	x	x					9		

LABORATORY USE ONLY

CUSTODY SEAL Y / N | COOLER TEMPERATURES

Present | Intact | 6.1 | 8.1 | 9.8 | 8.8

COOLING MEDIA PRESENT: Y / N

B575116

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Monique Haakensen	2015/08/28	9:45	JWAHNNE ROY	2015/08/29	12:15	B575116

Appendix D – Microbial Analyses Data

An excel report has been provided by USB that includes the microbial analyses data.

The excel report includes:
- A list of all samples that had microbial analyses performed
- A list of all bacteria that were identified in each sample
- The bacterial diversity of each sample
- A list of sulphide-producing bacteria that were in each sample, along with characteristics
- Most-probable number growth-based results for each sample, including the number of nitrate reducers, selenium reducers, sulphate reducers, and total heterotrphs.