2015-2016 VEGETATION BASELINE REPORT

KUDZ ZE KAYAH MINE PROJECT

BMC-16-01-345_002_Vegetation Baseline Report_RevB_161205

December 2016

Prepared for:

BMC MINERALS (NO. 1) LTD.

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Report prepared by:

12/5/2016

Lisa Knight, B.Sc. B.Ed., R.P.Bio.
Senior Environmental Scientist

12/5/2016

Mitchell Heynen, B.Sc., A.Ag
Environmental Scientist / GIS Technician

Report reviewed by:

12/5/2016

Jenifer Hill, B.Sc., M.Sc. R.P.Bio.
Principal, JLH Environmental

12/5/2016

Scott Keesey, B.Sc. EP
Senior Environmental Manager

EXECUTIVE SUMMARY

This report provides information on the existing vegetation communities present in the immediate vicinity of the Kudz Ze Kayah (KZK) Project. It references the appended terrestrial ecosystem descriptions and mapping and includes the results of surveys for rare plants, invasive plants, baseline metal concentrations in vegetation, wetlands, and timber resources. This baseline report will inform future vegetation monitoring initiatives, form a basis to assess effects of the proposed KZK mine development on vegetation resources and values, inform wetland treatment design, and provide the basis for reclamation plans. This report combines historical information from surveys completed during the initial project assessment in the 1990s, and information collected during the re-initiation of Project baseline surveys in 2015 and 2016 to support this Project Proposal.

Terrestrial ecosystem mapping (TEM) has been completed with the 1995, 1:10,000 aerial imagery for the Project Footprint and 1992, 1:40,000 imagery for most of the local study area (LSA). There were 126 vegetation associations identified over 216 polygons delineated for the LSA. Thirty-one vegetation plots were sampled in 2015 and 28 plots were sampled in 2016. The TEM was also refined with 1:15,000, 2016 aerial imagery. The TEM will be used to help assess effects on habitat and reclamation planning.

No rare plants were identified during the targeted survey, and none were observed incidentally during other vegetation survey efforts.

Six invasive plant species were found along the tote road, and one was found within the Project development area. The invasive species identified (a single patch of smooth brome (*Bromus inermis*) within the development area was discovered in early July, and was effectively buried by recent construction of an exploration trail. The highest concentration of invasive species with the most infestations was at the large clearing at the beginning of the tote road (the junction with the Robert Campbell Highway and around the gatehouse).

Soil and vegetation tissue were sampled and analyzed for elemental metal concentrations in 2015 and 2016. Five soil results exceeded Canadian Council of Ministers of the Environment (CCME) industrial soil guidelines at some of the sample sites for arsenic, copper, nickel, selenium, and zinc. Metal concentrations were naturally elevated in some vegetation tissue collected from a variety of plant species. Elevated metal concentrations in plant tissue is typical in mineralized areas.

In 2015, Contango Strategies Ltd. surveyed wetlands to assess the potential for passive and semi-passive water treatment at the site. The site assessment was focused on the natural wetlands and creek areas along the middle and lower reaches of Geona Creek. Eleven sites were sampled to characterize vegetation and bacterial associations. In addition, a wetland classification survey was conducted in the summer of 2016, where eight wetlands that were within or adjacent to the proposed mine site were visited and classified according to the Canadian Wetland Classification System. Wetlands are considered a component of the Yukon Ecosystem Land Classification (ELC) and results of the wetland classification survey are included in the TEM report.

Timber volume and density estimates were made for forested polygons along the tote road. In general, the timber resources are of poor quality from a forestry perspective; the number of stems per hectare was very low.

LIST OF ACRONYMS

AEG	Alexco Environmental Group Inc.
BMC	BMC Minerals (No. 1) Ltd.
CAEAL	Canadian Association for Environmental Analytical Laboratories
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environmental Quality Guideline
CWCS	Canadian Wetland Classification System
Cmol+/Kg	Centi-mol per kg
DBH	Diameter at Breast Height
dS/cm	Deci-Siemens per centimetre
DL	Detection Limit
ELC	Ecological and Landscape Classification
GIS	Geographic Information System
Ha	Hectare
IEE	Initial Environmental Evaluation
ISMP	Invasive Species Management Plan
KFN	Kluane First Nation
KZK	Kudz Ze Kayah
LSA	Local Study Area
Masl	Meters above sea level
N/A	Not applicable
N, P, K, S	Available nitrogen, phosphorus, potassium, and sulphur
PQL	Practical Quantitation Limit
RRDC	Ross River Dena Council
RDL	Reporting Detection Limit
RSA	Regional Study Area
TEM	Terrestrial Ecosystem Map
TR	Tote Road
UTM	Universal Transverse Mercator
YCDC	Yukon Conservation Data Centre
YESAB	Yukon Environmental and Socio-Economic Assessment Board
YISC	Yukon Invasive Species Council
YG	Yukon Government
ZOI	Zone of Influence

GLOSSARY

Alpine (Bioclimate Zone): high elevation ecosystems occurring at > 1,550 masl associated with mountain environments. Typically comprised of dwarf shrubs, herb/cryptograms, and lichen as the dominant vegetation type. In very high elevation areas, bare rock, colluvium or ice/snow may be the dominant condition.

Boreal Subalpine (Bioclimate Zone): sparsely forested areas of moderate to high elevation (1,300 – 1,550 masl) situated above the boreal high and below the Alpine zone. The subalpine is a transitional zone from the forested boreal and higher elevation non-forested. Comprised of open canopy conifer forest and tall shrub communities. Subalpine fir is the predominant tree species.

Canadian Wetland Classification System: the Canadian hierarchical wetland classification system, which includes wetland class, form and type.

Detection Limit: the lowest quantity of a constituent that can be distinguished from the absence of that constituent using the analytical technique employed, generally at a 1% confidence limit (i.e. it is the smallest amount of a constituent that can be measured with a 99% certainty of detection).

Diameter at Breast Height: the diameter of a tree measured at 1.3 m from root collar used in calculating timber volume.

Digital Elevation Model: a digital model or 3D representation of a terrain's surface.

Ecological and Landscape Classification: a set of protocol which are used for the identification and delineation of areas based upon their vegetation, climate and soils.

Ecoregion: ecoregions represent smaller areas of ecozones characterized by distinctive physiography and ecological responses to climate as expressed by the development of vegetation, soil, water, and fauna.

Ecozone: Ecozones are large and generalized ecological units characterized by interactive abiotic factors. Five Ecozones are recognized in Yukon: Southern Arctic, Pacific Maritime, Taiga Plain, Boreal, and Taiga Cordillera. Boreal and Taiga are the dominant units. The Project is in the Boreal and Taiga Cordillera Ecozones.

Geographic Information System: a computer system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.

Graminoid: herbaceous plants with a grass-like morphology. Includes the families Poaceae (grasses), Cyperaceae (sedges), and Juncaceae (rushes). Graminoids are often dominant in open habitat comprising grasslands, marshes, and alpine meadows.

Initial Environmental Evaluation: document produced by Cominco in 1996 that summarises baseline studies at the Kudz Ze Kayah property, describes the mine plan, waste material characterization, closure plan, environmental management, potential impacts and associated mitigation measures, and socioeconomic impacts associated with the KZK project as it was defined in 1996.

Kaska First Nation: a transboundary Nation involving Kaska people from the Ross River Dena Council and Liard First Nation in southeastern Yukon, and Daylu Dena Council, Dease River First Nation and Kwadacha Nation in northern British Columbia.

Local Study Area: the area encompassing a 3km buffer surrounding the proposed Project infrastructure and a 1.5 km buffer around the Tote Road.

Regional Study Area: the area encompassed by Game Management Subzone 10-07. This area was used for wildlife surveys and was selected because of the strong interconnectivity between vegetation cover and composition and wildlife.

Reporting Detection Limit: the lowest quantity of a constituent that can be distinguished from the absence of that constituent using the analytical technique employed, generally at a 1% confidence limit (i.e. it is the smallest amount of a constituent that can be measured with a 99% certainty of detection).

Terrestrial Ecosystem Map: a mapping system that stratifies the landscape into units according to ecological and terrain features using a combination of remote imagery interpretation and ground sampling. Spatial depiction shows relationships of ecosystems, presents a baseline inventory of vegetation communities and provides a means of assessing impacts.

Yukon Conservation Data Centre: a government agency that maintains, gathers and distributes information on animals, plants and ecological communities at risk or of conservation concern.

Yukon Environmental and Socio-economic Assessment Board: an independent arms-length body, responsible for implementation of the assessment responsibilities under the *Yukon Environmental and Socio-economic Assessment Act*.

Zone of Influence: the geographic area whose environmental conditions is significantly affected by changes in the study area.

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1 INTRODUCTION

BMC Minerals (No. 1) Ltd. (BMC) retained Alexco Environmental Group Inc. (AEG) to conduct baseline environmental studies at its Kudz Ze Kayah (KZK) Project in order to update and expand the baseline information that exists for this Project area. Previous vegetation surveys for the Project were conducted in the 1990s, which supported the 1996 Initial Environmental Evaluation (IEE) for the Project (Cominco, 1996). Baseline data for metals concentrations in vegetation were also collected in 1997 for the Water Use Licence Application (Norecol, Dames and Moore,1997). These documents and other recent government data for rare plant species were reviewed and integrated into this current baseline report.

AEG conducted a review of the IEE in relation to criteria contained in the Yukon Environmental and Socio-economic Assessment Board's (YESAB) *Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submissions*, and the Yukon Water Board's *Type A and B Quartz Mining Undertakings Information Package for Applicants*. Additionally, existing information was reviewed in relation to other baseline studies for similar projects in Yukon, and Environment Yukon was consulted in regards to existing vegetation and ecosystem data in the Project area.

AEG determined that much of the 1990s vegetation baseline information collected for the Project needed updating and study areas required adjustment to reflect the Project, as its currently proposed. Both temporal and spatial gaps in the existing data were identified. Successional changes to vegetation communities have occurred since the 1996 vegetation map was completed and the environmental assessment process has become more stringent. The previous surveys conducted by Norecol, Dames & Moore, Inc. concentrated on the tote road and proposed mine site, and have been modified to encompass the larger local and regional study areas (Norecol, Dames and Moore, 1996).

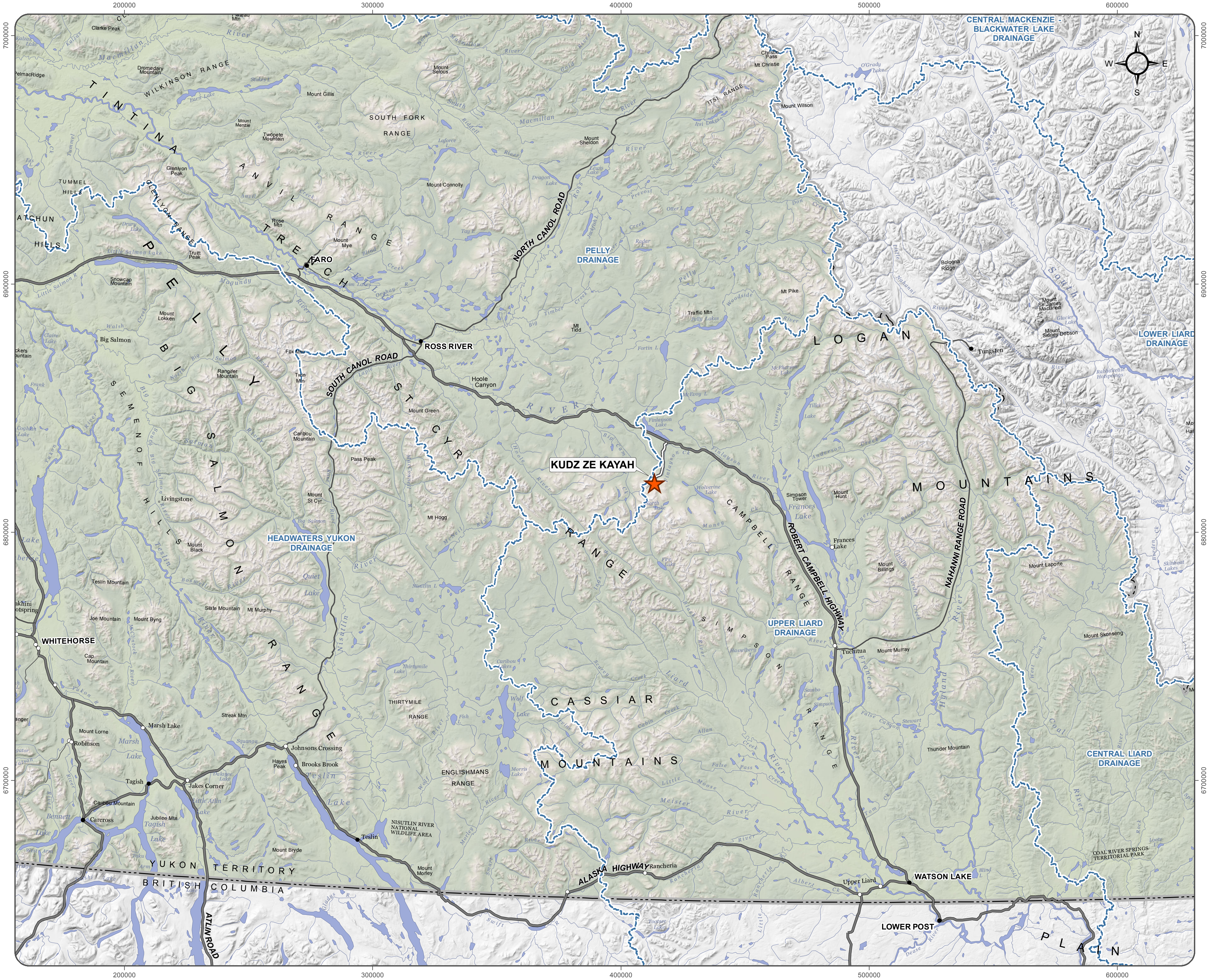
Based on the review of historical information, AEG consequently structured the 2015 and 2016 vegetation baseline programs to include expanded study areas where appropriate and included control areas outside of the Project's zone of influence (ZOI).

The vegetation baseline work of 2015 relied on aerial imagery taken in 1995. Only the Project area had photographic overlap to produce stereographic view. The landscape where the tote road will eventually be upgraded had top view or oblique angled photos taken. The 1995 imagery was in black and white at 1:10,000 scale. New colour, stereographic imagery was captured in June of 2016 that covered the LSA. The 2016 imagery was used to update timber estimates and refine the TEM polygons and vegetation and terrain interpretation.

This report summarizes historical, 2015 and 2016 data and observations for rare plants, invasive plants, baseline concentrations of metals in vegetation and soils, wetlands, as well as volume and density estimates for forest stands. The Terrestrial Ecosystem Map (TEM) report in Appendix A details the process involved in updating and reclassifying the 1997 vegetation map polygons according to the Yukon Ecological Landscape Classification (ELC) system (Environment Yukon, 2016).

2 PROJECT LOCATION

The Project is located approximately 260 km northwest of Watson Lake, 110 km southeast of Ross River and 24 km southwest of the Robert Campbell Highway near Finlayson Lake, Yukon (Figure 2-1). Information describing the Project setting is included in Section 3.



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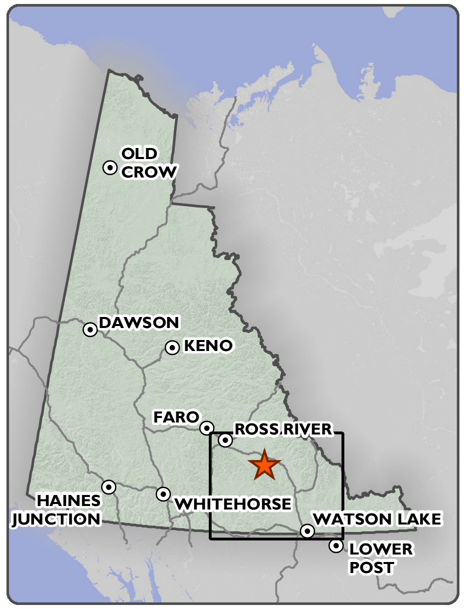
KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 2 -1
LOCATION OF KUDZ ZE KAYAH PROJECT

NOVEMBER 2016



★ KUDZ ZE KAYAH PROJECT

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.
Drainage areas obtained from National Hydrology Network 2011

Datum: NAD 83; Projection UTM Zone 9N

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Kilometres

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3 ENVIRONMENTAL SETTING

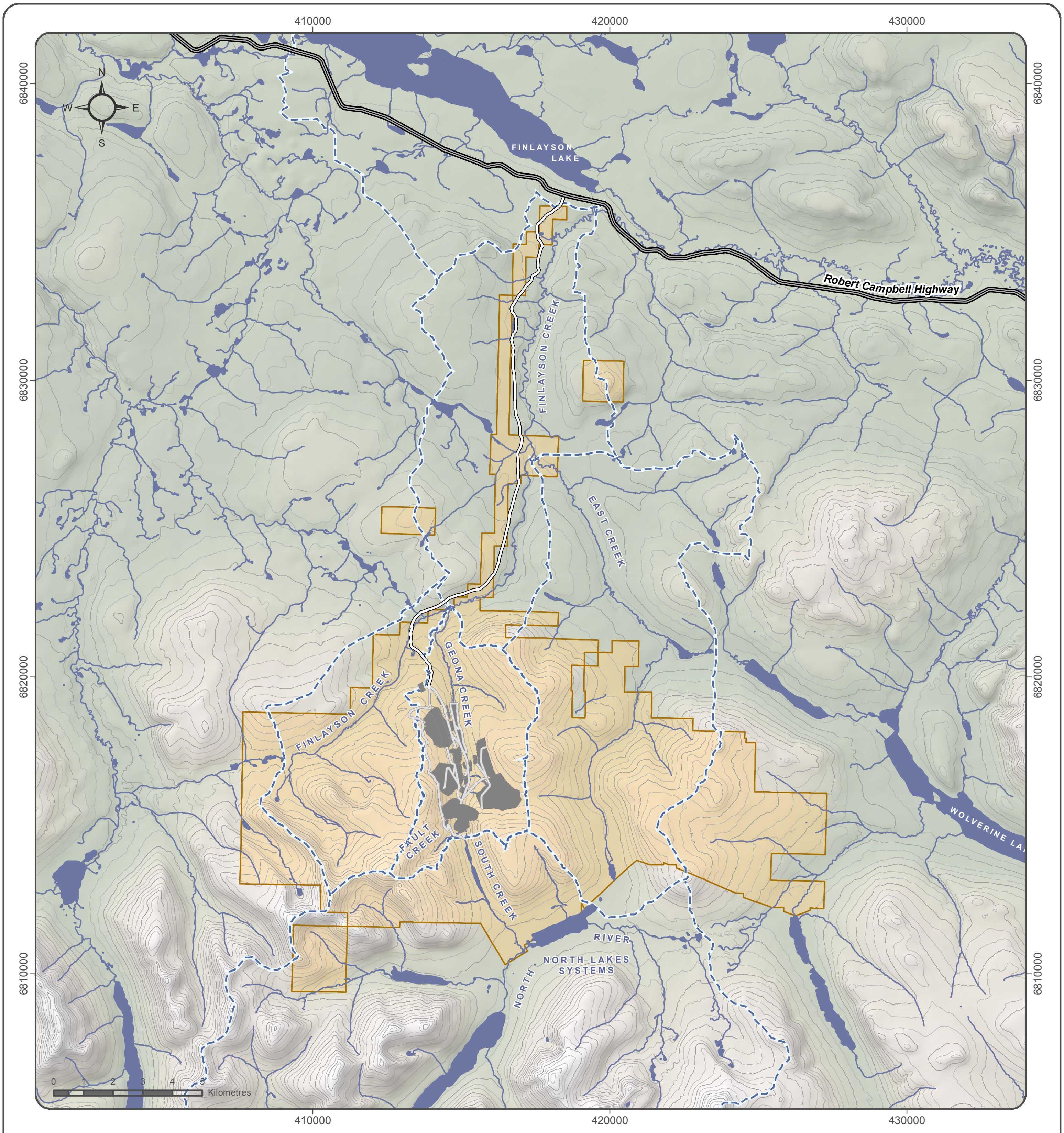
The Project is situated in the northern foothills of the Pelly Mountains on the east side of the divide between the Pelly River and Liard River drainage basins (Figure 3-1). The proposed mine site and tote road are located within the Yukon Plateau-North Ecoregion, part of the Canadian Boreal Cordillera Ecozone. The upper Geona Valley, where the Project is situated, is in a transitional zone bordering on three different ecoregions: the Yukon Plateau-North, the Liard Basin to the east, and the higher elevation Pelly Mountains Ecoregion to the south (Yukon Ecoregions Working Group, 2004) (Figure 3-2).

The topography of the Project area consists of mainly rounded glaciated mountains with wetlands and creeks occupying valley bottoms. Elevations in the vicinity of the proposed mine site range from approximately 1,300 metres above sea level (masl) in the valleys to about 1,900 masl on the peak located above Fault Creek, to the southwest of the proposed mine footprint. The Project is within the discontinuous permafrost zone, with an active layer of up to 2 metres, beneath which ice is present (Geo-Engineering, 2000).

The Project lies primarily in the boreal subalpine bioclimate zone and marginally extents into the alpine zone. The alpine tundra is characterized by dwarf shrubs, graminoids, herb and lichen cover. Prevalent species at high elevations include: low growing scrub birch (*Betula glandulosa*), prostrate willow species (*S. reticulata, arctica* and *polaris*), heather (*Cassiope tetragona*), short stalk sedge (*Carex podocarpa*), Lupine (*Lupinus arcticus*) plus a variety of alpine plants. Tall shrubs are the dominant vegetation cover at sub-alpine elevations composed mainly of a matrix of scrub birch and willows interspersed by meadows that host a high diversity of forbs and graminoids. The appearance of subalpine fir (*Abies lasiocarpa*) increases as elevation decreases below 1,550 m. Forested areas on the lower slopes of Geona Valley consist of sub-alpine fir and of white spruce (*Picea glauca*) with a well-developed shrub layer of scrub birch, willows and Labrador tea. The common ground cover is feathermoss with lichen and grasses in drier areas. A mixed forest of white and black spruce (*Picea mariana*) is the main vegetation type below 1,300 m and occurs extensively on either side of the tote road. Wetlands found within the study area are often fens associated with riparian systems or bogs that occur in isolated kettle depressions or low angle slopes with near surface permafrost.

Information supplied by Yukon Government Wildland Fire Management department shows that large fires have not occurred in the Project area since the 1940s, which are the earliest dates that records are available. The closest notable fire burned in the 1990s and was located approximately 25 km to the southeast, just south of Wolverine Lake (Figure 3-3).

Evidence of fire disturbance was observed in some of the forested ecosystem plots surveyed. Signs of earlier fires (> 100 years old) included charcoal in soil pits, distinctive age classes between sub-alpine fir (90 years old) and surviving veteran white spruce (> 150 years old), burn scars on snags, and coarse woody debris in isolated sites (likely caused by spot fires).



★ Kudz Ze Kayah Project Location

▭ Selected Regional Catchments

■ Location of Proposed Mine Infrastructure

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

═ Robert Campbell Highway

═ Tote Road/Proposed Access Road

— Proposed Mine Road

KUDZ ZE KAYAH PROJECT

FIGURE 3-1

OVERVIEW OF PROJECT AREA AND LOCAL CATCHMENTS

DECEMBER 2016

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
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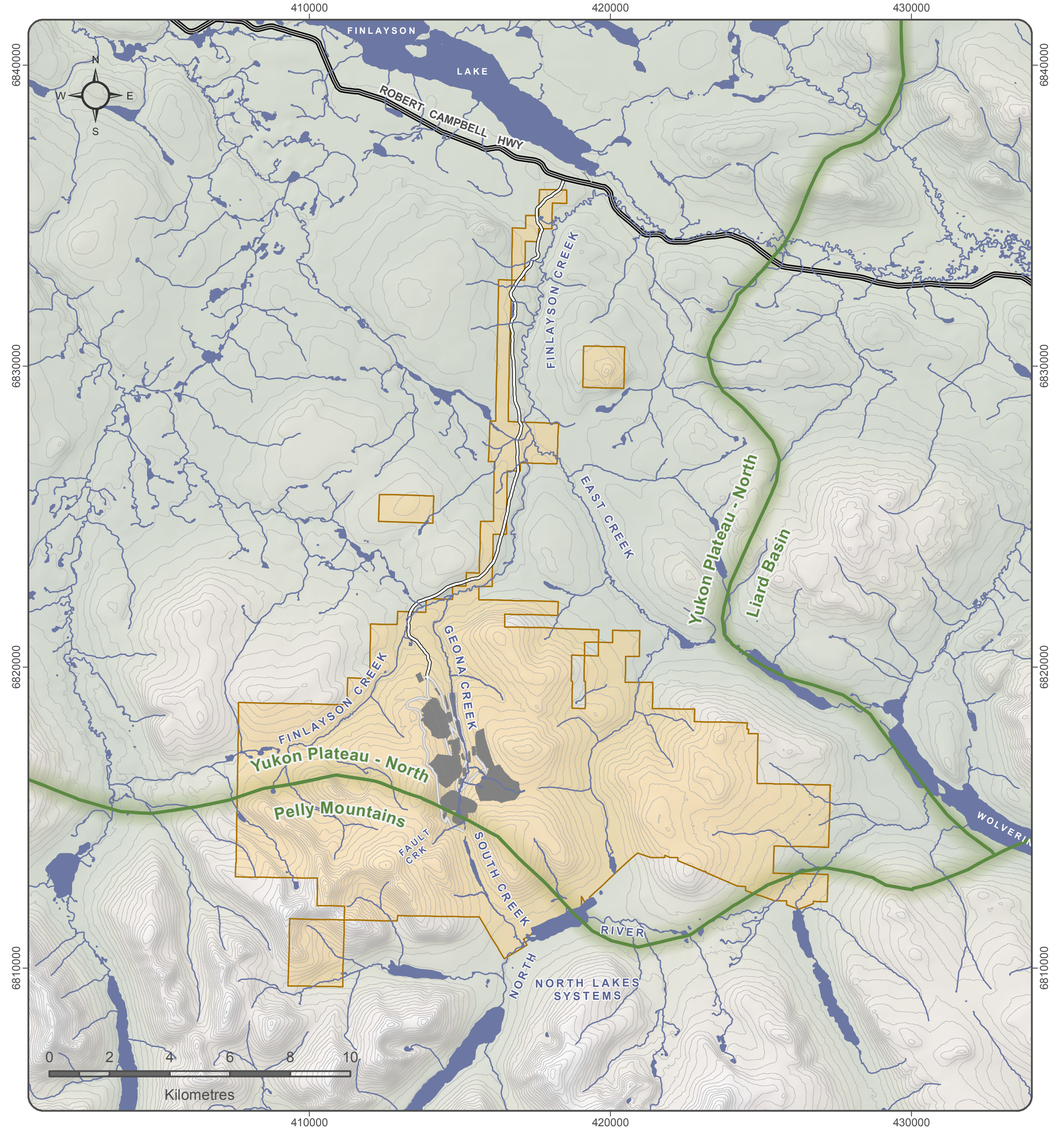

- 🟩 Ecoregion Boundary
- ■ Location of Proposed Mine Infrastructure
- ▨ BMC Minerals (No.1) Ltd. Mineral Claim Areas
- ═ Tote Road/Proposed Access Road
- ═ Proposed Mine Road
- — Contour (40 m interval)
- — Watercourse
- ■ Waterbody

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FIGURE 3-2
ECOREGION BOUNDARIES NEAR THE KUDZ ZE KAYAH PROJECT AREA

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AEG

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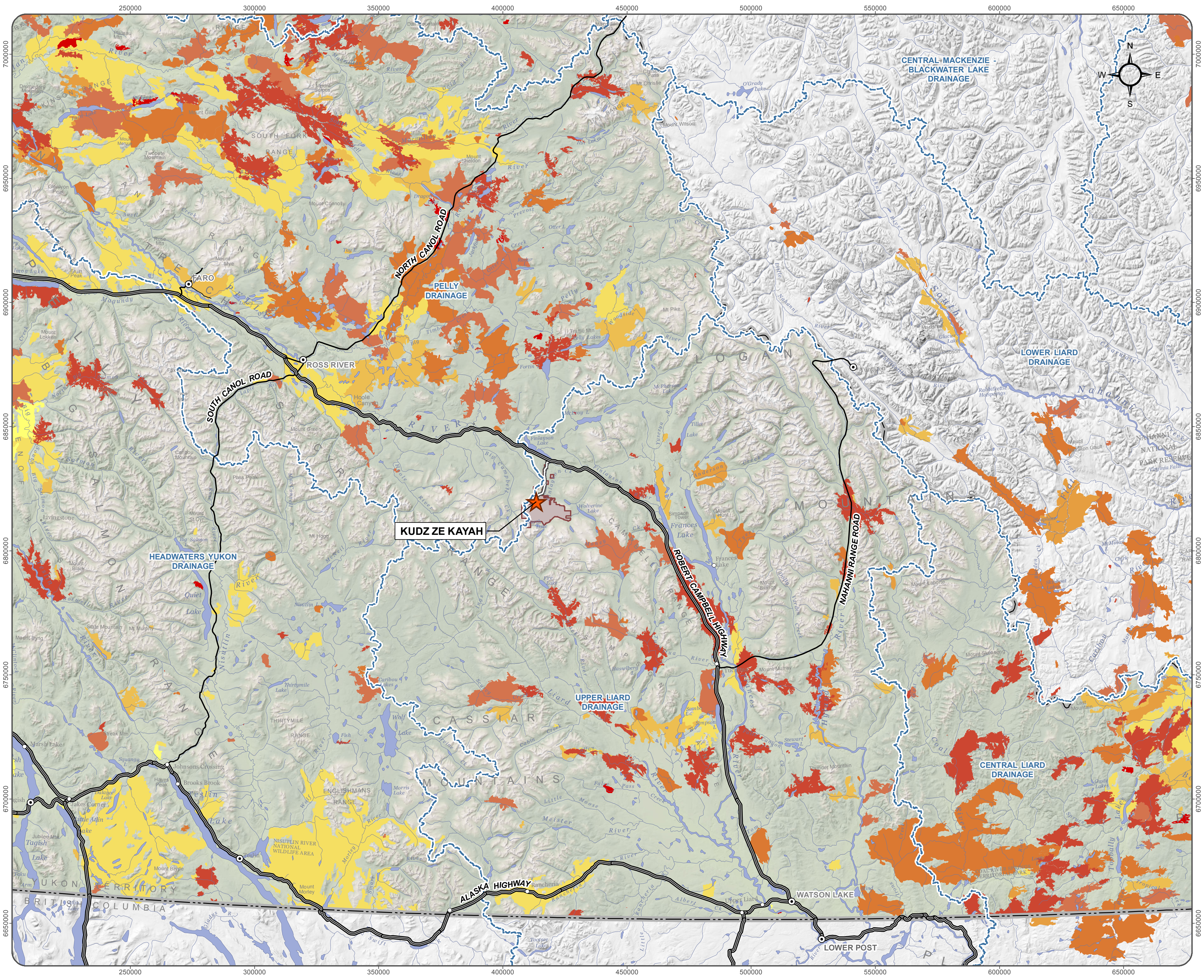

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VEGETATION BASELINE REPORT

FIGURE 3-3

FIRE HISTORY IN PROXIMITY OF KUDZ ZE KAYAH PROJECT AREA

NOVEMBER 2016

★ Kudz Ze Kayah Project Site

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

FOREST FIRE HISTORY (By Decade)

- 🟨 1940
- 🟨 1950
- 🟨 1960
- 🟧 1970
- 🟧 1980
- 🟧 1990
- 🟥 2000
- 🟥 2010

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.
Fire history data received from wildland fire managment 2016

Datum: NAD 83; Projection UTM Zone 9N

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4 SCOPE OF BASELINE VEGETATION BASELINE SURVEY

The Project development planning began in 1995 by the property owner at that time, Cominco Ltd. A suite of baseline environmental monitoring programs and surveys were completed to support the Project assessment and licensing applications and included vegetation surveys. The 1996 surveys were scoped primarily to support the development of an ecosystem map for the study area, and in 1997, a vegetation survey was completed that investigated metal concentrations in vegetation. No rare or invasive plant surveys were undertaken during this earlier set of programs.

The 2015 baseline vegetation surveys were designed with consideration of the requirements set out by YESAB, and with consideration of the existing understanding of vegetation in the Project area and proposed locations of Project infrastructure. This resulted in new study designs and surveys for refinement of terrestrial ecosystem mapping, rare and invasive plants, wetlands, metal concentrations in soils and vegetation, and volume and density estimates for forest stands.

During 2016 the above programs were expanded to ensure baseline information was complete. New aerial imagery and an updated design for the placement of mine infrastructure required further rare plant and wetland surveys. More timber and ecological ground plots were established and measured to increase accuracy of timber volume estimates and TEM. At each new plot, soil and vegetation samples were taken to assess metal concentrations. The invasive plant sites located in 2015 were revisited in 2016 to monitor status of infestations.

The vegetation and soils survey program also established permanent ecosystem test and control plots to confirm interpretive efforts from aerial imagery, to characterize vegetative communities within the Project Footprint area, and to set a baseline to allow monitoring of Project-related effects over time to measurable indicators. Ecosystem plot data were used to update the TEM. The map and associated ecosystem information (Appendix A) are key floristic effects monitoring tools.

Each of the following main sections in this report provides a description, an overview of previous studies, current status and understanding, and then details recent survey methodologies and results.

4.1 SCHEDULE OF SURVEY PROGRAMS

Table 4-1 summarizes the baseline vegetation study areas, methods, and timing conducted in 2015 and 2016.

Table 4-1: Vegetation survey schedule for Kudz Ze Kayah Project

Survey Type	Survey Area	Survey Method	Month/Year
Rare Plant	Infrastructure disturbance footprint and wetland areas near tote road and Geona Valley	Ground transects, ecosystem plots and selected site surveys. Concentrated searches during wetland classification survey for	June and July 2015

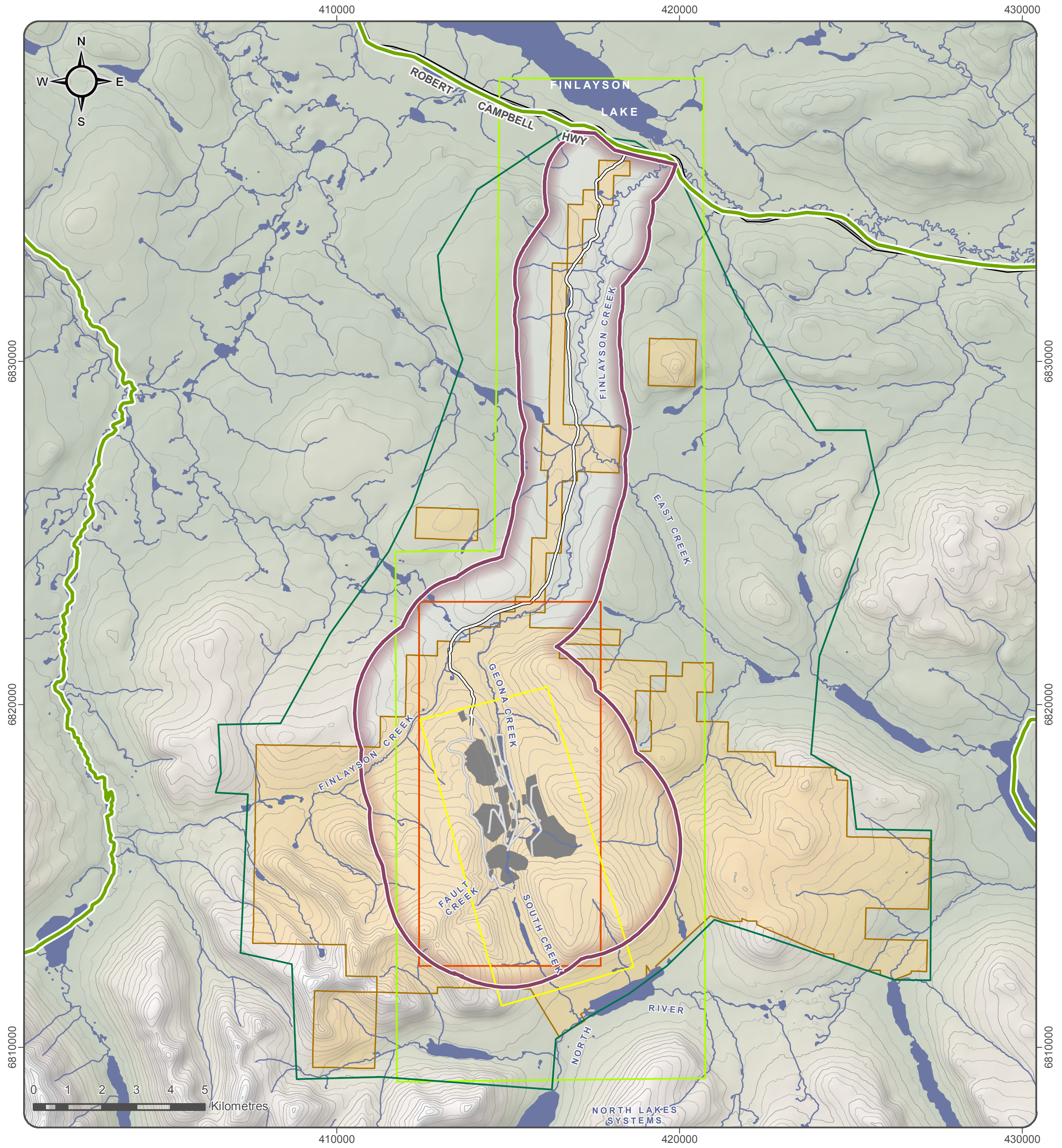
Survey Type	Survey Area	Survey Method	Month/Year
		terrestrial and aquatic rare plants.	July and August 2016
Invasive Plant	Previously disturbed areas along the tote road and in proposed mine site area	Ground searches of disturbed areas. Revisit 2015 locations to monitor changes and remove most aggressive species.	Early August 2015 Late July 2016
Metals in Vegetation and Soils	Sampling conducted in ecosystem and control plots throughout the Project area capturing a variety of ecosystems and aspects	Soil samples; vegetation samples from variety of species with wildlife or human uses. Expanded the survey area and added more plant species for analysis.	Late July - Early August 2015 and 2016
Forest Stand Volume and Density	Ground-truthing for estimates derived from aerial imagery conducted at suitable sites along tote road and proposed mine site area	Timber plots for volume estimates. Added more timber plots and used updated aerial imagery to increase accuracy.	Late June and July 2015; Late July and August 2016
Wetland characterization for passive water treatment	11 sites – natural wetland and creek areas	In situ water, soil, vegetation, and microbiological sampling	25-28 August 2015
Ecosystem classification and mapping (Appendix A)			
Wetland Classification	9 wetlands directly within the mine development footprint were classified; 7 of the 9 wetlands are located along in the Geona Valley bottom	Classification is based on the Canadian Wetland Classification System (CWCS).	2-4 August, 2016
Ecosystem Plots	LSA and some controls established just outside of the LSA boundary	Ecosystem measurements and interpretations based on Field Manual of Describing Terrestrial Ecosystems.	July/August, 2015 to 2016

4.2 SURVEY AREAS

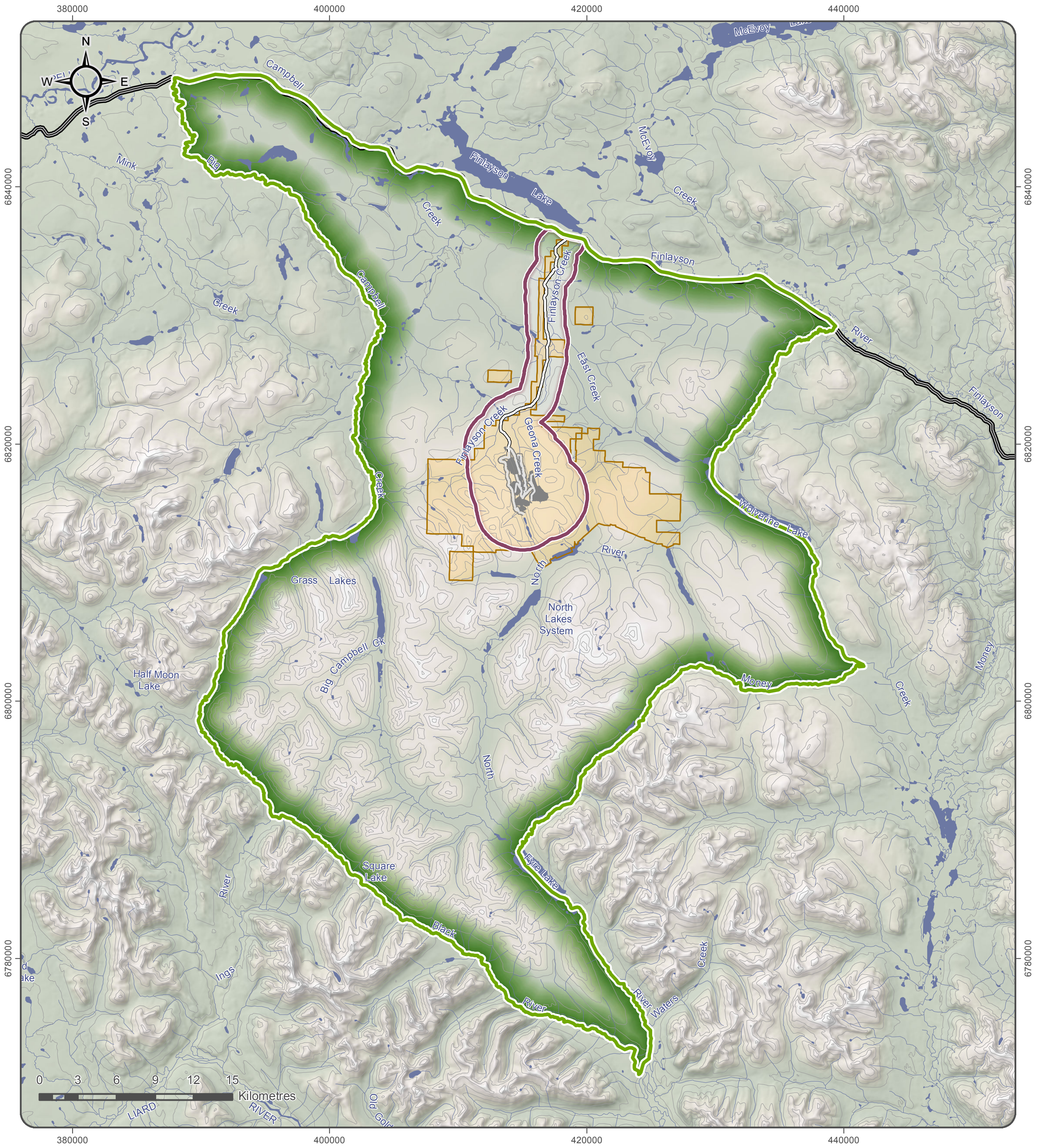
The LSA was defined as the area surrounding and including the tote road, and proposed Project infrastructure footprint, that could be affected directly or indirectly by mine development and operational activity (Figure 4-1). Based on this definition and previous vegetation studies completed for the 1996 IEE, the tote road corridor LSA extends 1.5 km on either side of the road's centerline. The LSA around the proposed mine Project area roughly extends in a 3 km radius from the location of the proposed Project Footprint. Control plots were placed within the LSA where disturbance is not anticipated and at sites east and west of the LSA that match ecosystems that are proposed to be removed due to Project development, as well as in a diverse range of sensitive landscape features, such as alpine vegetation and wetlands. Figure 4-1 also shows the coverage and type of remote imagery available for the vegetation studies.

Desktop analysis relied on 1992 and 1995 historic imagery in preparation for the 2015 vegetation fieldwork. The 1995 historic imagery included a set of 1:10,000 stereographic photographs that covered the proposed mine site area, and the 1992 imagery was 1:40,000 imagery at oblique angles taken for the tote road study corridor, taken prior to building of the road. New aerial photogrammetry of the study area was received in June 2016. The new aerial photogrammetry was used to update and improve upon the vegetation baseline components examined in this report.

LOCAL STUDY AREA EXTENT



REGIONAL STUDY AREA EXTENT



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

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AEG

- ☐ 2016 Aerial Imagery Extent
- ☐ 2015 LiDAR Extent (no imagery)
- ☐ 1995 Imagery Extent 1:10,000 Scale
- ☐ 1992 Imagery Extent 1:40,000 Scale
- ☐ Local Study Area
- ☐ Regional Study Area (Game Management Subzone 10-07)
- ■ Location of Proposed Mine Infrastructure
- ▨ BMC Minerals (No. 1) Ltd. Mineral Claim Areas
- ═ Tote Road/Proposed Access Road
- — Proposed Mine Road

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VEGETATION BASELINE REPORT

FIGURE 4-1

VEGETATION LOCAL AND REGIONAL STUDY AREAS

FEBRUARY 2017

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5 RARE PLANTS

During the last ice age, much of Yukon, Alaska, and parts of the Northwest Territories remained unglaciated. This ice-free area composed part of a sub-continent called Beringia. Some plants that existed during the ice age persevered and are still present today. After the ice age, most of Canada was recolonized by plants that survived south of the ice sheets, yet Yukon already had pre-established flora. Some of the surviving Yukon plants, that originate from Beringia, are considered endemic and rare; they are only found in niche habitats that do not exist in other parts of Canada. Other rare plants known to occur in Yukon are restricted to specific and uncommon habitat types, such as alkaline wetlands or hot springs (YCDC, 2015).

In order to determine if a plant species is rare, the Yukon Conservation Data Centre (YCDC) assigns a rank to the plant using the NatureServe conservation status system methodology. Based on these ranks, YCDC compiles lists of plants that are of global conservation concern, federally listed under the *Species at Risk Act*, or of specific conservation concern in Yukon (YCDC, 2016). The YCDC publishes a *Track List,* which is publicly available and regularly updated for all species of conservation concern with conservation status ranks. It also publishes a *Watch List* for species where there is not enough information to determine conservation concern (YCDC, 2015). The 2016 version of these lists contained 127 plant species in the *Track List* and 195 plant species in the *Watch List.*

5.1 SUMMARY OF HISTORICAL FINDINGS

The IEE conducted in 1996 focused on the characterization and distribution of major vegetation types for the Project area and did not present any data on rare plants.

5.2 2015-16 SURVEYS

5.2.1 Rationale

Habitat that supports rare plants can generally be characterized in two ways: unique or unusual conditions that have very different growth factors than the surrounding landscape (i.e., nutrients, moisture and sunlight), or rich conditions with growth factors that support a wide range of vegetation (Stohlgren *et al.*, 2005). When observing the Project area, these types of habitats included talus deposits, alpine meadows, wetlands, and riparian areas. Talus, scree, or rocky alpine habitats tend to be discrete, isolated patches in the landscape with low moisture and nutrient regimes (McKenna *et al.*, 2004). These growth factors can provide unique habitat for plants, but the patchiness imposes geographic restrictions on specialist species that select for these type of patches, rendering such species rare in the landscape. Conversely, wetland areas are often rich in biodiversity and biomass, having high levels of moisture and soil nutrients (McKenna *et al.*, 2004). Consequently, wetlands provide habitat for both generalist and specialist species.

Rare plants may be particularly sensitive to disturbance due to small populations and often discontiguous distributions. Rare plant surveys are conducted in order to locate and protect unique elements from damage that may occur due to project development. It is important to identify the habitat that supports rare plant species and assemblages, as there are often a particular set of conditions that create a unique ecosystem type. Although rare plant populations are small, they are not insignificant. They may play key roles in supporting wildlife, micro-ecosystems, and local ecology. Furthermore, to successfully manage the territory's natural resoures, a thorough understanding of species distribution, abundance, threats, and trends is necessary (YCDC, 2015).

5.2.2 Methodology

The method used for this survey was composed of two phases. The first phase comprised a desktop review prior to fieldwork to identify habitat with the potential to support rare plants in the study area. The second phase involved a field survey of the identified habitats from phase one to determine if any rare plants exist.

Phase One: Desktop Review

It was determined that nine rare plant species may exist within and around the Project area, based on a review of the YCDC's list of rare plants in the southeast region (Table 5-1; YCDC, 2015). These nine rare plants are presented with their current assigned NatureServe conservation status rank and associated habitats. Preliminary work for the rare plant survey required identifying habitats that could host potential rare plant species through use of aerial photographs taken in 1995 and current maps. The proposed Project development footprint was superimposed on the identified target habitats (Figure 5-1). Added emphasis was placed on the investigation of riparian and wetland areas due to their complexity (Environment Yukon, 2016).

Table 5-1: Species of rare plants that may exist within the Project area

Rare Plant	Yukon Rank	Associated Habitat
Parry's Arnica, also known as Nodding Leopardbane (*Arnica parryi*)	SH – last reported 1944	Alpine meadows, steep ravines and ledges
Northern Beech Fern *(Phegopteris connectillis)*	S1/S2	Moist alpine cliffs and rocky areas
Leafy Thistle (*Cirsium foliosus*)	S2	Moist soil, grasslands, meadows, edges and openings in boreal forest, riverbanks
Mount Sheldon Ragwort (*Senecio sheldonensis*)	S2/S3 – last reported 1970	Sub-alpine meadows, wet to moist meadows, and forest openings in montane to alpine zones
Spiny-spored Quillwort (*Isoetes echinospora*)	S2/S3	Silty lake or pond margins, often submerged, granitic gravel/cobbles
Maritime Quillwort (*Isoetes maritima)*	S2/S3	Shallow water, lakes and streams, granitic gravel/cobbles
Water Mudwort (*Limosella aquatica*)	S2/S3	Semi-aquatic, mud or wet sand adjacent to wetlands or slow moving water

Rare Plant	Yukon Rank	Associated Habitat
Common River Grass (*Scolochloa festucacea*)	S1	Shallow waters or wet marshes
Blunt-leaf Pondweed (*Potamogeton obtusifolius*)	S1	Small, shallow lakes and ponds

Note: NatureServe designates conservation status as follows:
Geographic scale of assesment: G = Global, N = National, S = Subnational.
Rank: 1 = critically imperiled, 2 = imperiled, 3 = vulnerable, 4 = apparently secure, 5 = secure, X = presumed extinct or extirpated, H = historical - possibly extinct or extirpated, NR = status has not yet been assessed, U = unrankable with present information (YCDC, 2015). All rankings presented in the above table relate ONLY to the Yukon.

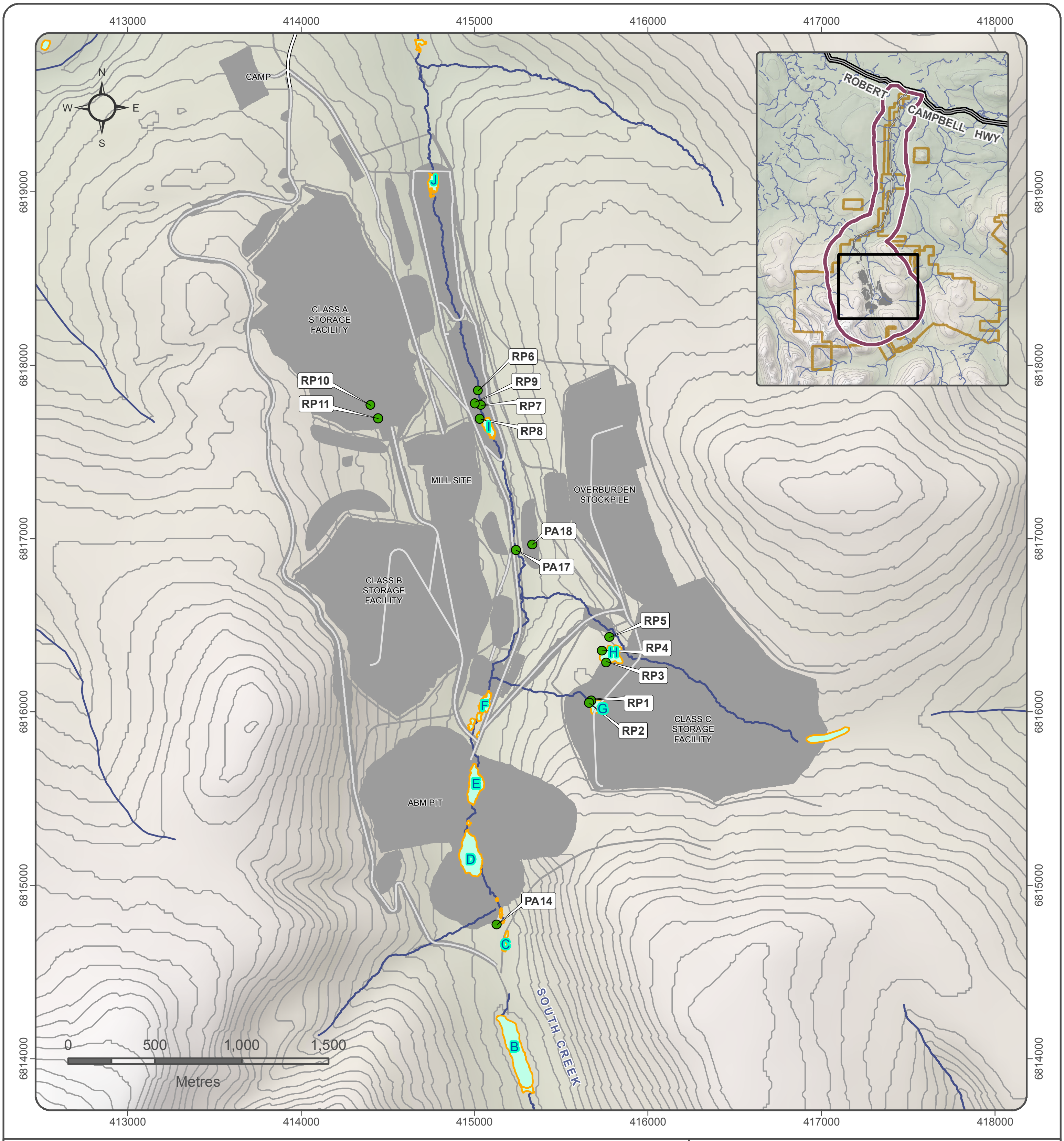
Phase Two: Field Survey

The methodology used for the rare plant field survey was formally conducted using the line transect protocol established by the Alberta Native Plant Council (ANPC, 2012). The line transect protocol was used instead of the quadrat sampling protocol because substantially more ground can be covered utilizing the line transect method, as all plants (rare or not) must be counted during the quadrat sampling. Since plants often have a patchy distribution, the ability to cover a large area of ground with modest resources is an important advantage. During line transect sampling, it is assumed that all plants within the line are detected. Hence, this is a form of plot sampling in which the plots are long and narrow (Buckland *et al*., 2007). Incidental observations of rare plants were also recorded if they were observed during the ecosystem and timber plot surveys.

A rare plant survey was completed on July 8th and 9th, 2015. The survey was conducted on foot at 11 pre-selected locations and three additional surveys sites which were established in the field (Figure 5-1).

Study sites RP1 and RP2 were located near a small wetland towards the south end of the proposed Class C storage facility. Sites RP3, RP4, and RP5 were located at a wetland several hundred metres north of the proposed Class C storage facility. Study sites RP6 and RP7 were located on the east bank of Geona Creek with transects traversing the riparian zone. Site RP8 was located along the southwest side of a wetland created by a beaver dam, and site RP9 was located on the west bank of Geona Creek covering the riparian area. Sites RP10 and PR11 were conducted downslope of the existing tote road in the proposed Class A storage facility. Three additional sites were established in the field in conjunction with ecosystem plots PA17 and PA18 downslope of the proposed Class B facility in proximity to Geona Creek and PA 14 to the south of the proposed open pit.

At each survey location, 50 m transects were laid out with a measuring tape and a rare plant search was conducted along the transect, 1 m on either side of the measuring tape. As rare plants are difficult to find, the survey was a presence/absence search. At each transect, general habitat features were noted as well as common associated vegetation. Unknown plants were indentified using floristic keys and plant reference guides. The results of the the transect line rare surveys are summarized in Table 5-2.



● Rare Plant Transect Location

▭ Rare Plant Perimeter Survey

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

■ Location of Proposed Mine Infrastructure Footprint

▭ Local Study Area

═ Tote Road/Proposed Access Road

— Proposed Mine Road

▭ Waterbody

— Watercourse

— Contour (20 m interval)

KUDZ ZE KAYAH PROJECT VEGETATION BASELINE REPORT

FIGURE 5-1

RARE PLANT TRANSECTS AND PLOTS

DECEMBER 2016

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
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In 2016, AEG obtained updated aerial imagery and a new mine site design. A gap analysis was done to see if the areas to be directly affected by the proposed mine development had been adequately assessed in 2015. It was determined that the wetlands and riparian corridor in the upper Geona Creek Valley required further survey effort, as did some upland areas where infrastructure and storage site locations had changed.

During the 2016 wetland classification survey, July 31st to August 2nd, rare plants were searched for around the margins of each wetland (Figure 5-1). This was a focused approach targeting specific habitat niches of potential rare plants to increase the chance of finding rare plants rather than the transect method employed in 2015. Any unknown plants were collected and identified using floristic keys. Possible rare plant candidates were compared to descriptions, illustrations and photographs of rare plants listed in Table 5-1. Aquatic plants were searched for by wading into wetlands and retrieving plant samples for identification.

Table 5-2: Rare plant survey sites (description and plant community)

Site	Description	Plant Community
2015 Rare Plant Survey		
RP1	Edge of wetland 1 to riparian zone. Elevation 1,489 masl. Transect on north margin of open pond northwest of Geona Valley in proposed waste rock storage facility), upper sub-alpine, level, mineral substrate with angular rocks; sedge dominant with scattered low willows, few forbs.	*Carex aquatilis, Salix myrtillifolia, Salix reticulata, Cardamine* sp., *Lazula* sp.
RP2	Along shore of wetland 1. Elevation 1,489 masl. Transect on south margin of same open pond as above, mineral substrate, some angular rocks, water sedge most dominant cover.	*Carex aquatilis, Salix reticulata, Potamogeton filiformis.*
RP3	Edge of wetland 2 to riparian zone. Elevation 1,436 masl. Along south margin of another open pond approximately 250 m N of RP1 and RP2 wetland, more plant biodiversity, also in proposed waste rock storage facility. Thin, organic substrate (<10 cm), level, low willow and scrub birch in raised portions.	*Carex aquatilis, Salix arbusculoides, Rubus arcticus,* Anemone, Sphagnum, *Aulacomnium palustre*
RP4	Along shore of wetland 2 to riparian zone. Elevation 1,437 masl. Same pond, W shoreline. Willow and scrub birch on higher ground. All willows well to moderately browsed by moose.	*Carex aquatilis, Carex membranacea, Eriophorum* sp., Sphagnum*, Salix reticulata, Dasiphora fruticose, Salix alaxensis, Rubus arcticus*
RP5	Riparian area along outflow from wetland 2. Elevation 1,438 masl. Outflow of pond dominated by tall willows, grasses and mosses. Mix of organic and mineral substrates, very hummocky, high plant diversity.	*Salix barclays, Salix arbusculoides, Salix alaxensis, Salix glauca, Salix reticulata, Dasiphora fruticose, Carex aquatilis, Calamagrostis canadensis, Artemisia norvegica, Senecio lugens, Mertensia paniculata, Rubus arcticus, Pedicularis* sp.*, Equisetum arvense, Equisetum scirpoides, Aconitum delphinifolium*
RP6	From east bank of Geona Creek through riparian zone. Elevation 1,342 masl. Geona Creek riparian and wetland complex, E margin of small pond wetland, sedge dominant.	*Carex aquatilis, Chrysosplenium tetrandrum, Potamogeton filiformis*

Site	Description	Plant Community
RP7	From east bank of Geona Creek through riparian zone, (further south than upstream of RP6, upstream). Elevation 1,342 masl. Riparian corridor E side exposed rocks with vegetation cover of scrub birch, feathermoss and lichen.	*Betula glandulosa, Cladonia stellaris, Stereocaulon* sp., *Rhododendron decumbens, Abies lasiocarpa*
RP8	Along southwest shore of beaver-created wetland in Geona Creek. Elevation 1,341 masl. Open pond, transect along west shoreline.	*Carex aquatilis, Calamagrostis canadensis, Equisetum* sp., *Salix glauca, Salix myrtillifolia*
RP9	From west bank of Geona Creek through riparian zone. Elevation 1,342 masl.	*Carex aquatilis, Salix glauca, Salix myrtillifolia, Equisetum* sp., *Aulacomnium palustre*
RP10	Along west slope, below road, along slope, exposed talus. Elevation 1,370 masl. Transect along east facing slope.	*Betula glandulosa, Cladina* sp., feather moss
RP11	Along west slope, below road, across slope, exposed talus. Elevation 1,384 masl. Transect along east facing slope, rocks, nutrient poor, dry soils.	*Betula glandulosa, Cladina* sp., *Abies lasiocarpa,* feather moss
PA14	Along south boundary of ABM pit. Alluvial fan from fault creek. Elevation 1,377 masl	*Betula glandulosa, Salix sp., Equisetum sp.*
PA17	Along west side of Geona Creek through riparian zone and in proximity to proposed mine road. Elevation 1,359 masl	*Carex aquatilis, Equisetum sp., Salix sp.,* sphagnum
PA18	East side of Geona Creek on west facing slope in proposed topsoil footprint. Elevation 1,365 masl	*Betula glandulosa, Equisetum sp., Salix sp.,* feather moss, sagewort
2016 Rare Plant Survey		
Wetland A	Large wetland to the south of the ABM pit in the North Lake watershed. Elevation 1,375 masl	**Terrestrial plants**: *Carex auatilis, Carex saxatilis, Carex Canescens, Luzulu parviflora* **Aquatic Plants**: *Potamogeton filiformis, Myriophyllum sibricum*
Wetland B	Large wetland adjacent and south of ABM pit and to the north of wetland A. Elevation 1,378 masl	**Terrestrial plants**: *Carex auatilis, Carex saxatilis, Carex Canescens, Luzulu parviflora* **Aquatic Plants**: *Potamogeton filiformis, Myriophyllum sibricum, Hippuris vulgaris*
Wetland C	A collection of 4 small wetlands at the head of Geona creek over lapping the ABM pit extent. Elevation 1,389 masl	**Terrestrial plants**: *Carex auatilis, Luzulu parviflora, Galium trifidium, Poa palustris* **Aquatic Plants:** *Calligeron spp., Potamogeton alpinus, Sparganium hyperboreum, Ranunculus hyperboreus*
Wetland D	Southern portion of ABM pit in the Krakatoa Zone. Elevation 1,382 masl	**Terrestrial plants**: *Carex auatilis, Luzulu parviflora, Juncas castaneus, Glyceria pulchella* **Aquatic Plants:** *Calligeron spp., Scouleria aquatilis*
Wetland E	Northern portion of ABM pit extent connected to wetland D via culvert. Elevation 1,380 masl	**Terrestrial plants**: *Carex auatilis, Luzulu parviflora, Juncas castaneus, Glyceria pulchella* **Aquatic Plants:** *Calligeron spp., Hippuris vulgaris, Sparganium hyperboreum*
Wetland F	Between pit rim pond and ABM pit downstream of wetland E. Elevation 1,379 masl	**Terrestrial plants**: *Carex auatilis, Luzulu parviflora, Juncas castaneus, Glyceria pulchella, Shpagnum spp.* **Aquatic Plants:** *Calligeron spp., Sparganium hyperboreum, Ranunculus hyperboreus*

Site	Description	Plant Community
Wetland G	Isolated basin in the Class C storage facility footprint. Elevation 1,460 masl	**Terrestrial plants**: *Carex auatilis* **Aquatic Plants:** *Sparganium hyperboreum,*
Wetland H	North of wetland G within the Class C Storage facility footprint. Elevation 1,440 masl	**Terrestrial plants**: *Carex auatilis, Luzulu paryiflora* **Aquatic Plants:** *Sparganium hyperboreum and Callerigon spp*
Wetland I	Wetland in the upper water management pond footprint. Elevation 1,345 masl	**Terrestrial plants**: *Carex auatilis, Luzulu paryiflora, Aulocomnium palustre* **Aquatic Plants:** *Callerigon spp*
Wetland J	Wetland in the lower water management pond footprint. Elevation 1,316 masl	**Terrestrial plants**: *Carex auatilis, Luzulu paryiflora, Calamagrostis canadensis* **Aquatic Plants:** *Sparganium hyperboreum and Callerigon spp*

5.2.3 Results

2015 Survey

No rare plants were found during either the line transect surveys or the ecosystem plot establishment.

2016 Survey

No rare plant species were found in 2016 during the surveys conducted at the wetlands nor at the ecosystem and timber estimate plots. More information on the wetland habitats surveyed during the 2016 field season can be found in the TEM report in Appendix A. Descriptions and data relating to the timber estimate plots is located in Chapter 9 of this report.

5.2.4 Discussion

The Project area is not considered part of Beringia and is unlikely to host Beringian floral species. The area does not have unique landscape features such as hot springs, limestone, or alkaline wetlands that are known to be associated with rare plants in the southeast region. Although no rare species were observed during surveys in 2015 and 2016, it cannot be concluded that no rare plants exist within the study area, only that they were not detected in the areas surveyed. Each plant species has a specific seasonal flowering period of which the two surveys may not have overlapped with for all potential rare plants species. By nature of visual identification if the plant was not in flower there is a reduced probability of detection, as plants are often identified by their flowers. Given the sparse abundance of rare plants, detection is difficult.

6 INVASIVE PLANTS

Invasive plants are defined as those that are introduced (i.e., non-native), and once established have a negative effect on the environment, economy, or human health (YISC, 2011). It is important to note that not all introduced plants are invasive; the term is applied to the most aggressive species that reproduce rapidly and consequently cause significant change to colonized areas. By displacing native plants, invasive plants threaten biodiversity, alter landscapes, and change ecosystem functions (Environment Yukon, 2015a). Some invasive plants may take over entire habitats, such as the Asian plant, Kudzu (*Pueraria lobata*) in the United States, thereby extirpating native plants that are wholly dependent on the particular habitat in question (YISC, 2011). Invasive plants can also bring insect pests, invasive animals, and diseases (Line *et al*., 2008).

Invasive plants may adversely affect a range of industries and environments. For example, forage quality and quantity for both domestic and native herbivores can be reduced on farmland, rangeland, or grasslands. Invasive plants can outcompete seedlings in forestry operations, obstruct trails, reduce aesthetics for recreational pursuits, and affect water quality by causing increased erosion or sedimentation (YISC, 2011). Invasive plants also affect highway safety by reducing sightlines and attracting grazing wildlife (Line *et al*., 2008).

In Canada, Yukon is second to Nunavut and Northwest Territories for the least number of introduced plants (Environment Yukon, 2015a). According to the Yukon Invasive Species Council (YISC), there are 154 introduced plant species in Yukon, but only 20 are considered invasive. Since Yukon has so few invasive plants, it is in an enviable position to manage invasive plant infestations before they become so extensive that control becomes expensive and eradication difficult.

Yukon does not have specific legislation regarding invasive species management; however, re-vegetation requirements exist for sites disturbed during natural resource extraction under the *Quartz Mining Act* (2003), the *Placer Mining Act* (2003) and under the Land Use Regulations (C. 17) of the *Territorial Lands (Yukon) Act* (2003). These regulations require vegetated areas disturbed by operational activities to be returned to a state that either allows re-vegetation by native plants, or left in a state that closely resembles the pre-disturbance conditions. Therefore, invasive plants should be managed in order that appropriate re-vegetation can take place during site closure.

Yukon Government, Department of Environment (Bennett, 2011) has published a draft list of invasive plants, *Yukon Invasive Plants by Taxonomy,* which ranks plants on invasiveness as follows:

- 1 - Highly invasive: may displace or replace native ecosystems;
- 2 - Aggressive: widespread, persistent, but may not replace native species or change ecosystem function;

- 3 - Taxa present: not known to be invasive in Yukon but found to be invasive in other jurisdictions;
- 4 - Has been reported: has not been shown to be problematic and may not persist;
- 5 - Species that likely don't persist;
- 6 - False reports; and
- 7 - Native and introduced populations exist.

These rankings are referred to in Table 6-1 and Table 6-2.

6.1 SUMMARY OF HISTORICAL FINDINGS

For many years, the rate that invasive species became established in Yukon was lower than other Canadian jurisdictions because of harsher environmental conditions. However, as climate change has caused warmer and wetter conditions in Yukon, the number of invasive species observed in native ecosystems, along highway right-of-ways and on agricultural properties has increased (Line *et al*., 2008).

In order to develop a strategy to manage invasive plants, Environment Yukon undertook a baseline inventory at campgrounds, rest stops, and gravel pits in 2007. The surveys focused on roads as vectors for invasive plants and was the first study of its kind in Yukon (Line *et al*., 2008). While the study was Yukon-wide, the results presented in Table 6-1 focused on findings from sites on the Robert Campbell Highway between Carmacks and Watson Lake, as this is the closest highway to the Project. Yukon Government researchers surveyed 55 disturbed sites along the Robert Campbell Highway and found 10 non-native species, including seven invasive.

Table 6-1: Observations of non-native plant species on Robert Campbell Highway in 2007

Non-native Species	Number of Sites	Invasiveness Ranking
Smooth Brome (*Bromus inermis*)	6	1
Narrow-leaf Hawksbeard (*Crepis tectorum*)	11	1
White Sweet Clover (*Melilotus alba*)	10	1
Yellow Alfalfa (*Medicago falcata*)	2	1
Tufted Vetch (*Vicia cracca*)	1	1
White Clover (*Trifolium repens*)	8	2
Red Clover (*Triflolium pretense)*	2	2
Field Pennycress (*Thlaspi arvense*)	2	3
Pineapple Weed (*Matricaria discoidea)*	4	3
Common Timothy *(Phelum pretense)*	3	4
Total Number of Observations	**49**	**-**

(Adapted from Line et al., 2008; rankings from Bennett, 2011)

A main component of the study involved detection of white sweet clover (*Melilotus alba*), a tall, robust plant that threatens native ecosystems and poses risks to highway users by reducing visibility and attracting wildlife to roadways. During the 2007 survey, it was found that white sweet clover was introduced along the Robert Campbell Highway between Faro and Frances Lake. The white sweet clover was observed between Ross River and Money Creek (at Frances Lake) in small patches where recent roadwork or other disturbances had occurred, and as small patches or isolated individuals elsewhere (Line *et al*., 2008).

The report concluded that modes of white sweet clover dispersal include disturbed soils from road construction and maintenance work, infested gravel pits used as borrow sources, cleared road shoulders and right-of-ways, infrequently cleaned mowing equipment, and vehicle tires or people inadvertently transporting seeds (Line *et al*., 2008).

No information on invasive plants was included in the 1996 IEE report for the Project.

6.2 2015-16 Surveys

6.2.1 Rationale

In order to evaluate potential effects from invasive plants introduced as a result of the Project, a baseline inventory was completed to determine the current existence and extent of any invasive plant species and vectors of transportation. Furthermore, understanding the biology of any species present is important in deciding appropriate control methods and such treatments must assess the degree of damage and species distribution.

Disturbed areas such as roadsides, clearings, and borrows are particularly vulnerable to invasive plants. That is because invasive plants often flourish in disturbed areas and vehicles and human footwear are important vectors for seed transportation (Line *et al*., 2008). Once invasive plants become established in areas, they often outcompete native plants for growth factors such as nutrients, moisture and sunlight. Since invasive plants typically become established in disturbed areas, baseline survey efforts for invasive species at KZK concentrated on the tote road, and other locations around the Project with recent or historically disturbed ground or soil.

6.2.2 Methodology

2015 Survey

An invasive plant survey was conducted at KZK on August 2, 2015. Areas known to be disturbed during historical exploration activities were surveyed, including the old camp, core shack areas, and access trails in the upper Geona Creek valley (Figure 6-1). These surveys involved visually inspecting the disturbed areas for signs of non-native species. A survey was also undertaken along the 24 km tote road from the current camp to the Robert Campbell Highway (including gatehouse and laydown area). This involved driving the length of the road slowly and visually inspecting the east and west roadsides, and stopping at all borrow sites and other distubed areas to visually inspect the ground.

When invasive plants were found, the coordinates were recorded using a GPS. The plant was identified to species, and notes and photographs were taken on habitat and location. Furthermore, a thorough search of the surrounding area was made to assess the extent of the infestation and determine if other invasive plants were in the vicinity.

Additionally, visual inspections for the occurrence of invasive species were conducted during all vegetation fieldwork in the 2015 season and particularly the ecosystem mapping work.

2016 Survey

The 2016 invasive plant survey was conducted on July 29, 2016. The survey consisted of revisiting all invasive species site locations that were identified in 2015 to determine if there had been any changes in the number of invasive species and the extent of the known infestations. In addition, invasive plants were surveyed for during the ecosystem and wetland investigations in 2016.

6.2.3 Results

2015 Survey

Seven non-native species were detected during the surveys in 2015 (Table 6-2). Most observations were made along the tote road (Figure 6-1). Only one non-native species observation was found within the proposed Project mine site. Smooth brome (*Bromus inermis*), narrow-leaf hawksbeard (*Crepis tectorum*), and oxeye daisy (*Leucanthemum vulgare*) were the species with the highest invasive ranking. Pineapple weed (*Matricaria discoidea)*, alsike clover (*Trifolium hybridum*), perennial ryegrass (*Lalium perenne*), and common timothy (*Phelum pretense*) are less aggressive non-native species with a lower invasive ranking, but may still need to be controlled. Bitter fleabane (*Erigeron acris*), foxtail barley (*Hordeum jubatum*), and horned dandelion (*Taraxacum ceratophorum*) are actually native species that can be easily mistaken as invasive and inadvertently eradicated as part of a control program. With the exception of foxtail barley, native plants should be left to pioneer disturbed areas as they compete with invasive plants to slow the establishment of infestations. Detailed descriptions and photographs of native and non-native plants observed during the survey can be found in Appendix B.

2016 Survey

In addition to the invasive plants that were documented in 2015, five more invasive plant observations were made in 2016 (Table 6-2). Survey areas for 2016 included the tote road at historical and active borrow areas and wetlands around the project area. Two additional observations were made at site IP06, which included field pennycress (*Thlaspi arvense*) and pineapple weed. One additional observation was made at IP07, which included white sweet clover (*Melilotus alba*). Two additional observations were made at a new site (IP09), located at km 6 of the tote road and included common timothy and herb-sophia (*Descurainia sophia*); both are classified as a low invasiveness ranking of 4.

Among the three species of non-native grass observed in 2015, smooth brome and perennial ryegrass were not seen during the 2016 monitoring survey. At present, the only known location where smooth brome was observed was at location IP08 in 2015, but was not observed there in 2016 due to clearing for exploration trails. The source of the smooth brome grass may have been introduced through previous exploration equipment, outfitter livestock feed or through a seed mix used by Cominco to re-vegetate disturbed areas (Dorothy Dick, personal communication).

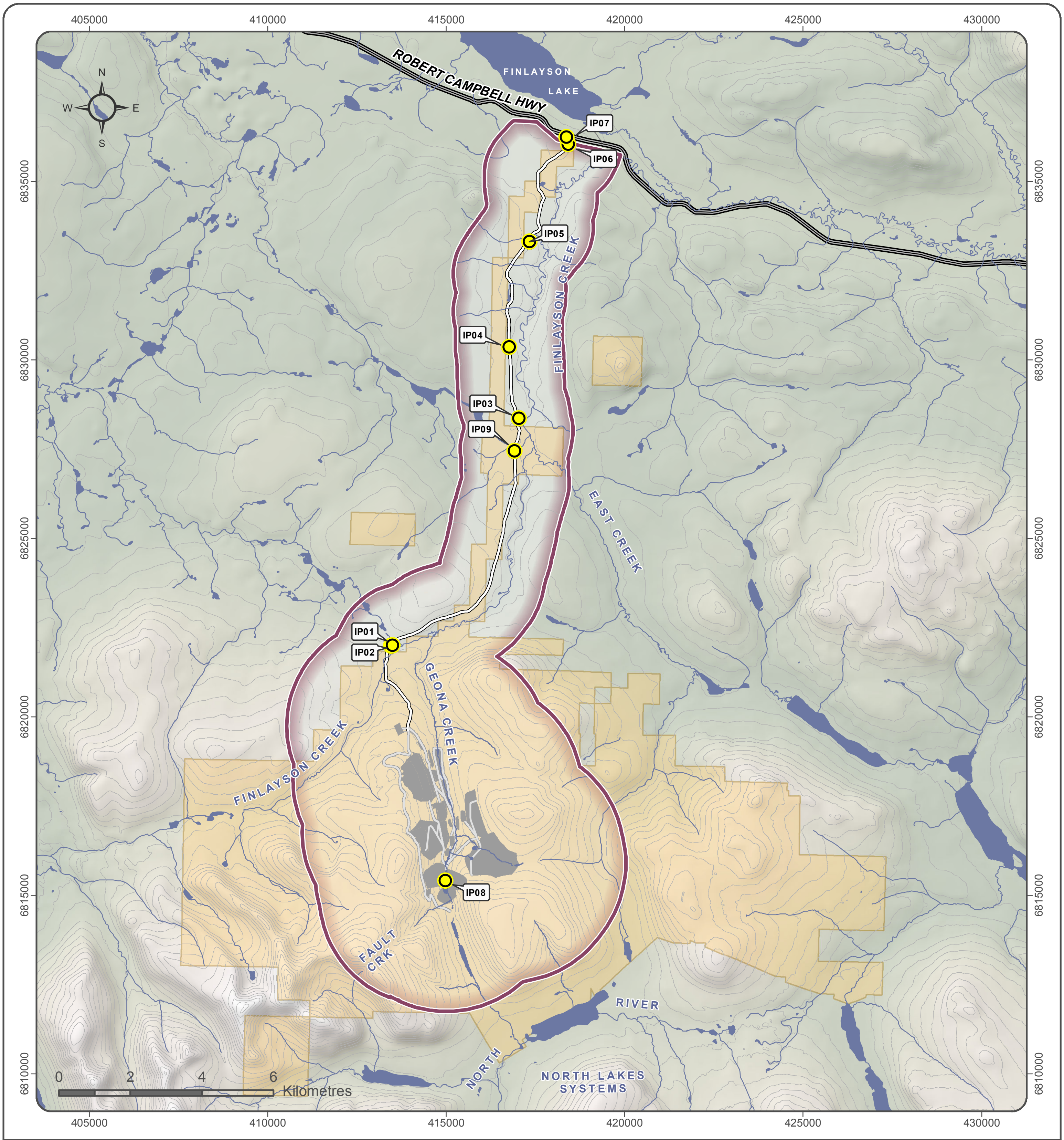
Table 6-2: Results of invasive species surveys in 2015 and 2016

Location	Invasive Species	Comments	Invasiveness Ranking
IP01	Bitter Fleabane (*Erigeron acris*)[1]	Both sides of tote road	Native
IP02	Bitter Fleabane (*E. acris*) Common Timothy (*Phelum pretense*) Foxtail Barley (*Hordeum jubatum*)[2]	In borrow on east side of tote road	Native 4 Native
IP03	Bitter Fleabane (*E. acris*) Foxtail Barley (*H. jubatum*)	Light infestation along tote road	Native Native
IP04	Bitter Fleabane (*E. acris*) Horned Dandelion (*Taraxacum ceratophorum*)[3]	Around culvert along tote road	Native Native
IP05	Foxtail Barley (*H. jubatum*) Oxeye Daisy (*Leucanthemum vulgare*)* Pineapple Weed (*Matricaria discoidea*)	Both sides of tote road	Native 1 3
IP06	Foxtail Barley (*H. jubatum*) Narrow-leaf Hawksbeard (*Crepis tectorum*)* Perennial Ryegrass (*Lolium perenne*) Field Pennycress (*Thlaspi arvense*) Pineapple Weed (*M. discoidea*)	Around gatehouse	Native 1 2
IP07	Alsike Clover (*Trifolium hybridum*) Foxtail Barley (*H. jubatum*) Narrow-leaf Hawksbeard (*C. tectorum*) Pineapple Weed (*M. discoidea*) White sweet clover (*Melilotus alba*),	High infestation around large clearing at beginning of access tote road off the Robert Campbell Highway Three white sweet clover plants were discovered and removed in 2016.	2 Native 1 3 1
IP08	Smooth Brome (*Bromus inermis*)*	Proposed Project mine site; observed at old bridge at south end of proposed tailings pond. Buried during development of exploration trail.	1
IP09	Common timothy (*P. pretense*) Herb-sophia (*Descurainia sophia*)	On east side of pullover across from wetland. Large disturbed area.	4

[1] *Bitter fleabane (Erigeron acris): Is a native pioneer species that often colonizes disturbed areas such as abandoned fields, vacant lots, roadsides, and waste areas. It competes with highly invasive plant species. It is listed here as it is commonly mistaken as an invasive plant.*

[2] *Foxtail barley (Hordeum jubatum): Considered noxious native species as its upward pointing barbs on the bristles can cause injury to grazing animals, particularly their mouth, throat and eyes. It is best to manage this species as it can colonize disturbed areas quickly.*

[3] *Horned Dandelion (Taraxacum ceratophorum): Another native species that pioneers disturbed areas, but does not need to be managed.*



● Location of Invasive Plant Sighting

▭ Local Study Area

▨ Location of Proposed Mine Infrastructure

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

═ Tote Road/Proposed Access Road

═ Proposed Mine Road

— Contour (40 m interval)

— Watercourse

▨ Waterbody

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FIGURE 6-1

LOCATION OF OBSERVED INVASIVE PLANT SPECIES WITHIN THE KZK LSA

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6.2.4 Discussion

Many of the invasive plants found in the Project area are near the existing laydown area, gatehouse, and along the tote road. Vehicles and personnel entering the tote road may inadvertently carry seeds and plant material from other areas. The invasive plants found at KZK and along the tote road are similar to those found along the Robert Campbell Highway. The Robert Campbell Highway is the closest source of invasive plants, which are commonly found at rest stops and along the highway right-of-way.

It is important to note that one of Yukon's most significant invasive plants, white sweet clover was identified at site IP07 during the monitoring survey conducted in July 2016. These three individual plants were pulled, placed into a garbage bag and incinerated. Once present, this plant is very persistent and spreads rapidly, so preventing further dispersal will be important in maintaining native floral communities and achieving successful reclamation.

Oxeye daisy is also a highly invasive species and was observed in the garden around the gatehouse (IP06). The other highly invasive plant found at IP06 and IP07 was the narrow-leaf hawksbeard. Alsike clover, observed at IP07, is historically a species used in revegetation efforts and is now common in Yukon. It can spread into native vegetation communities under ideal conditions and exist as a monoculture. The clover is classified at an invasiveness ranking of 2, defined as aggressive and persistent but can co-exist with native plants.

Foxtail barley was recorded in the Yukon Government's 2007 study, and is considered a native species in the Yukon. However, it is opportunistic, spreads rapidly, forms monocultures, and has harmful effects to grazing animals due to its barbed seeds (Line *et al*., 2008). Foxtail barley should be managed as an invasive plant as per the recommendations of Line *et al*. (2008) and as described in BMC's Invasive Species Management Plan (ISMP). The ISMP was implemented during the 2016 exploration field season and will continue to be implemented in subsequent seasons.

Key recommendations in the ISMP include:

- Continue monitoring current sites containing invasive plants, and remove new growth as soon as practicable;
- During removal of invasive species, try and remove all parts of the plant, especially the root system as this is where the plant will revegetate from;
- All plants, roots, and seeds will be incinerated;
- Educate site visitors to be aware of invasive species and report observations;
- Encourage new personnel and vehicle operators to be aware of invasive species and take precautions to avoid the spread to the site; and
- Prioritize removal of invasive species based on the ranking scheme, and prioritize timing of removal to before it goes to seed.

7 METAL CONCENTRATIONS IN SOILS AND VEGETATION

By their nature, proposed and active mine sites are highly mineralized areas. In situ soils and vegetation growing in the soils may have naturally elevated concentrations of metals due to local mineralization of the surficial parent material or a near surface lithic layer. During the development and operation of a mine site, metals can leach from mining waste into aquatic environments and dust can be transported by wind to terrestrial areas. Metals can accumulate in these receiving environments over time, and while accretion processes are highly complex, plants can be intermediaries or vectors in conveying metals to higher trophic levels when consumed by herbivores, which subsequently become prey for carnivores (CCME, 2006).

Harvesting and consumption of vegetation and mammals by people can also present an exposure pathway for metals to humans. The Project area is within the traditional territory of the Kaska First Nation, whose people have traditionally harvested mammals (particularly caribou from the Finlayson herd) and plants in this area, and will continue to do so.

7.1 CCME GUIDELINES FOR SOIL

The Canadian Council of Ministers of the Environment (CCME) released Canadian Environmental Quality Guidelines (CEQG) to measure parameters in soil and provide “science based goals for the quality of atmospheric, aquatic, and terrestrial ecosystems” (CCME, 2006). The recommended Canadian soil quality guidelines are derived specifically for the protection of ecological receptors in the environment or for the protection of human health associated with four land uses: agricultural, residential and parkland, commercial, and industrial (CCME, 1999). The guidelines for metals in soil are presented in Table 7-1.

CCME guidelines are not available for metals in vegetation. Nevertheless, the determination of metal concentrations in vegetation at the Project site provides a baseline, which can be used for comparison purposes as part of a vegetation monitoring program for the Project. Understanding baseline concentrations will enable monitoring of potential effects on vegetation from project factors such as fugitive dust and metal leaching.

Table 7-1: CCME soil quality guidelines for the protection of environmental and human health

Chemical Name	Chemical Groups	Agricultural	Residential/ Parkland	Commercial	Industrial	Guide-line Date
		Concentration (mg/kg dry weight)				
Antimony	Inorganic Metals	20	20	40	40	1991
Arsenic	Inorganic Metals	12	12	12	12	1997
Barium	Inorganic Metals	750	500	2,000	2,000	2013
Beryllium	Inorganic Metals	4	4	8	8	2015
Boron	Inorganic Metals	2	No data	No data	No data	1991
Cadmium	Inorganic Metals	1.4	10	22	22	1999
Chromium (total)	Inorganic Metals	64	64	87	87	1997
Chromium (Cr(VI))	Inorganic Metals	0.4	0.4	1.4	1.4	1999
Cobalt	Inorganic Metals	40	50	300	300	1991
Copper	Inorganic Metals	63	63	91	91	1999
Lead	Inorganic Metals	70	140	260	600	1999
Mercury	Inorganic Metals	6.6	6.6	24	50	1999
Molybdenum	Inorganic Metals	5	10	40	40	1991
Nickel	Inorganic Metals	45	45	89	89	2015
Selenium	Inorganic Metals	1	1	2.9	2.9	2009
Silver	Inorganic Metals	20	20	40	40	1991
Thallium	Inorganic Metals	1	1	1	1	1999
Tin	Inorganic Metals	5	50	300	300	1991
Uranium	Inorganic Metals	23	23	33	300	2007
Vanadium	Inorganic Metals	130	130	130	130	1997
Zinc	Inorganic Metals	200	200	360	360	1999

7.2 SUMMARY OF HISTORICAL FINDINGS

Baseline concentrations of metals in vegetation at the Project site were evaluated in 1997, based on a small set of vegetation samples. Riparian vegetation, willow (*Salix* spp.), sedges (*Carex* spp.) and horsetail (*Equisetum* spp.) were collected at three sites; while upland vegetation, willow (*Salix* spp.), birch (*Betula glandulosa*), crowberry (*Empetrum nigrum*), Labrador tea (*Rhododendron groenlandicum*), blueberry (*Vaccinium* spp.), and terrestrial lichens (*Cladina* spp.) were collected from two sites. The species of riparian vegetation selected represented plants of value to wildlife, while those in upland areas were seen as potential food sources for caribou and moose, as well as humans (Norecol, Dames & Moore, 1997). Nutrient and metal concentrations were not characterized for soils within the Project study area in 1997.

The 1997 vegetation sample analyses concluded that concentrations of most metals detected at the Project area were within the range of worldwide background concentrations for the same species (Norecol, Dames & Moore, 1997). However, cadmium and zinc concentrations in some species were equal to, or exceeded the upper limits generally found at natural sites (Kabata-Pendias *et al*., 2011). In riparian vegetation, the concentrations of aluminum, cadmium, copper, lead, selenium, and zinc were generally lower in samples from Lower Finlayson Creek and higher in samples from Geona Creek. Sedges contained higher levels of aluminum than other species, while willows had the highest levels of zinc. No correlations were found between species or location and copper, lead, or selenium data (Norecol, Dames & Moore, 1997). There were no consistent differences in metal concentrations among sites for upland vegetation. Woody species, such as birch and willow, had higher zinc levels than other shrub and herb species (Norecol, Dames & Moore, 1997). Overall, differences in metal concentrations were found between different plant species at the same site and the same plant species at different sites (Norecol, Dames & Moore, 1997).

7.3 2015-16 SURVEYS

7.3.1 Rationale

The objective of the soil and plant tissue sampling program was to better understand the pre-development levels of metals contained in local soils and vegetation. Of particular interest were metals with that could accumulate in plants and move to higher trophic levels through the food web. This study presents baseline information regarding concentrations of metals in vegetation. By providing this baseline, any changes in plant metal concentrations can be monitored and further investigations and mitigation actions can be implemented, as required. In addition to metal analysis, soil samples were analyzed for nutrients to determine local growth conditions to support the closure and reclamation planning.

The plant species selected for tissue sampling were based on the dietary preferences of moose, caribou, birds, and anticipated First Nation harvest species. Criteria for plants to be selected for the sampling program included:

- Plants consumed by wildlife, which are hunted and consumed by humans (e.g. moose);
- Plants gathered by First Nations; and
- Plants well distributed over the district so they are easy to find within the selected study areas.

Plants selected for sampling and rationale for selection included:

- Various species of willow (*Salix* spp.) and horsetail (*Equisetum* spp.) – both consumed by moose and caribou;
- Various species of lichen (*Cladina* spp.) – consumed by caribou are good indicators for monitoring the effects of dust on vegetation;
- Various species of grasses (graminoids) – consumed by mice, pika, marmots, arctic ground squirrels, bears, sheep, caribou, as well as some bird species; and
- Lowbush cranberry, also known as lingonberry (*Vaccinium vitis-idaea*), and bog blueberry (*Vaccinium uliginosum*) – both commonly harvested berries by humans and eaten by various wildlife.

Soil and plant tissue samples were collected in locations that represented different ecosystems present within the study area. More details on survey methodology are presented in the following section.

7.3.2 Methodology

7.3.2.1 Desktop Study

A desktop exercise was undertaken to determine the location of permanent ecosystem plots; the selection parameters for plot locations were based on the terrestrial ecosystem mapping. For the purposes of the soil and plant tissue sampling program, it is appropriate to note that plot locations were representative of the various vegetation communities in the Project area. Soil and vegetation sampling was completed at all of the permanent ecosystem plots. Use of permanent plots ensures that monitoring can continue and changes to the soil/vegetation interface can be documented over time.

7.3.2.2 Field Survey

2015

Soil samples were collected at 19 of 20 sample sites (Table 7-2; Figure 7-1). At each site (except site PA13), a pit was excavated and a 200 g sample was collected from the rooting zone using a clean trowel. Samples were labelled with site number, date and samplers, and field data was recorded on ecosystem plot data sheets that are summarized with photos in the TEM report in Appendix A. Soil samples were analyzed for total metal concentrations, available nitrogen, phosphorus, potassium, and sulfur (N,P,K,S), pH, total carbon, texture, conductivity and cation exchange capacity. Where possible at each site, the same person did not sample soil and vegetation to prevent cross-contamination of samples. A soil sample was not collected at PA13 because it was a boggy site containing organic material and no mineral soil was available for collection. A duplicate sample was collected at site PA12 and labelled as site PA21.

Vegetation samples were collected at 19 of 20 sample sites and analyzed for elemental metal concentrations. Samples were not collected at site PA04 because no vegetation existed at that site. Sites PA09, PA10, PA11, PA12, and PA20 were identified as control plots outside the LSA, where they will not be exposed to mining activity (i.e. no potential for direct or indirect effects).. A total of 40 vegetation tissue samples were collected immediately next to the soil sample collection pits. Vegetation samples included 11 grass and 3 grass root (*Festuca altaica)*, 19 willow leaf (*Salix* spp.), 3 horsetail *(Equisetum arvense)*, 2 berries from lowbush cranberry (*Vaccinium vitis-idaea*), and 2 berries from bog blueberry (*Vaccinium uliginosum*) (Table 7-2). The type of vegetation sample collected at each site varied depending on habitat, and not all plant types sampled were present at all sites. All soil and vegetation samples were kept cool with ice packs prior to and during shipping to Maxxam Analytics lab in Burnaby, British Columbia.

At each site, suitable plants for sampling were identified and collected as close to the soil pit as possible trying to minimize contamination with the soil. At least 200 g of each sample was collected using clean nitrile gloves, which were changed for each vegetation type and between sample locations. For willow samples, leaves and terminal stems were collected (as would be eaten by moose) by stripping the vegetation into a Ziploc bag. For grass samples, leaves were cut with a knife that was washed with distilled water before use. Horsetail and berry samples were picked by hand using clean nitrile gloves. Root samples were collected by removing the above ground vegetation and as much soil as possible before bagging the roots. The root samples were later washed with distilled water to try and remove more soil. Each sample was labelled with site number, date and sampler names, and field data was recorded on ecosystem plot data sheets.

2016

The same methodology was employed for the 2016 soil and vegetation sampling locations. Soil samples were collected at 11 of the 12 sites, excluding PA53 as suitable soil conditions were not encountered. Thirty vegetation samples were collected between all 12 sites and consisted of as many of the target species that were present. The samples were taken at the ecosystem and timber ground plots adjacent to the soil pit and sampling locations (Figure 7-1). 2016 species collection focused on the collection of willow (*Salix* sp.), horsetail (*Equisetum Arvense*), bog blueberry (*Vaccinium uliginosum*), and lichen *(Cladina stellaris*) and are summarized by plot in Table 7-2.

Table 7-2: Location and types of soil and vegetation samples taken for 2015 and 2016 analyses

Location	Vegetation Samples Collected								Soil
	None	Graminoids (Leaves)	Graminoids (Roots)	*Salix* spp. (Leaves)	*Equisetum* spp. (Leaves)	*Vaccinium vitis-idaea* (Berries)	*Vaccinium uliginosum* (Berries)	*Cladina stellaris* (Leaves)	
2015									
PA01		✓		✓					✓
PA02				✓					✓
PA03				✓					✓
PA04	✓								✓
PA05		✓		✓					✓
PA06		✓		✓					✓
PA07				✓					✓
PA08				✓					✓
PA09		✓		✓		✓			✓
PA10				✓			✓		✓
PA11				✓		✓			✓
PA12		✓		✓					✓
PA13					✓				
PA14		✓	✓	✓	✓				✓

Location	**Vegetation Samples Collected**								**Soil**
	None	**Graminoids (Leaves)**	**Graminoids (Roots)**	***Salix* spp. (Leaves)**	***Equisetum* spp. (Leaves)**	***Vaccinium vitis-idaea* (Berries)**	***Vaccinium uliginosum* (Berries)**	***Cladina stellaris* (Leaves)**	
PA15		✓	✓	✓			✓		✓
PA16		✓		✓					✓
West of PA17		✓		✓					✓
PA18				✓					✓
PA19		✓		✓					✓
PA20		✓	✓	✓	✓				✓
2016									
PA42				✓	✓				✓
PA45				✓				✓	✓
PA51				✓			✓	✓	✓
PA52				✓				✓	✓
PA53				✓				✓	
PA54				✓	✓				✓
PA55				✓				✓	✓
PA56				✓	✓			✓	✓
PA57				✓				✓	✓
PA58				✓	✓			✓	✓
PA59				✓	✓		✓	✓	✓
PA60				✓			✓	✓	✓

7.3.2.3 Laboratory Analysis

Maxxam Analytical (Maxxam) in Burnaby, BC performed all laboratory analyses. Maxxam is certified with the Canadian Association for Environmental Analytical Laboratories (CAEAL). The certificates of analysis provided by Maxxam for the 2015 and 2016 soil samples are included in Appendix C and plant tissue samples in Appendix D.

A summary of the analytical technique used for each constituent and the source method upon which the analyses were based are presented below in Table 7-3 to Table 7-6.

Soil pH in calcium chloride ($CaCl_2$) is the standard method of measuring soil pH. An air dried soil sample is mixed with five times its weight of a dilute concentration (0.01 M) of $CaCl_2$, shaken for one hour, then the pH is measured using an electrode. The results are expressed as pH($CaCl_2$). The soil pH in the 2:1 test uses distilled water instead of 0.01M $CaCl_2$ to calibrate readings, and results are expressed as pH(w). The pH($CaCl_2$) test is the more accurate of the two pH tests, as it reflects what the plant experiences in the soil. The values of pH($CaCl_2$) are normally lower than pH(w) by 0.5 to 0.9 (Charman & Murphy, 2000).

Table 7-3: Analytical methods used for analyzing the physical, chemical, and nutrient constituents in soil samples

Constituent	Units	Reporting Detection Limit	Analytical Method	Source Method
Cation Exchange Capacity	cmol+/Kg	10	Auto Calc	AB WI-00065
Conductivity	dS/m	0.02	SM 22 2510 B m	AB SOP-00033 / AB SOP-00004
Elements by ICPMS (total)	mg/kg	Per element	EPA 6020a R1 m	BBY7SOP-00001
Nitrate-N (Available)	mg/kg	5	SM 22 4110 B m	CAL SOP-00152 / AB SOP-00023
Potassium (Available) (1)	mg/kg	2.0	EPA 200.7 CFR 2012 m	CAL SOP-00153 / AB SOP-00042
Phosphorus (Available by ICP) (1)	mg/kg	1.0	EPA 200.7 CFR 2012 m	CAL SOP-00152 / AB SOP-00042
Sulphur (Available) (1)	mg/kg	2.0	EPA 200.7 CFR 2012 m	AB SOP-00029 / AB SOP-00042
pH @25C (1:2 Calcium Chloride Extract) (1)	pH	N/A	BCMOE BCLM Mar2005 m	AB SOP-00033 / AB SOP-00006
pH (2:1 DI Water Extract)	pH	N/A	BCMOE BCLM Mar2005 m	BBY6SOP-00028
Soluble Paste (1)	N/A	0.01	BCMOE BCLM Mar2005 m	AB SOP-00033
Total Carbon in Soil by LECO (1)	mg/kg	0.02	LECO 203-821-170 m	AB SOP-00035 / CAL SOP-00243
Texture by Hydrometer (1)	%	2	Carter 2nd ed 55.3 m	AB SOP-00035 / AB SOP-00030
Texture Class (1)	NA	NA	Auto Calc	AB SOP-00030

*N/A – Not applicable
(1)– Reporting Detection Limit raised for some samples due to sample matrix

Table 7-4: Analytical methods used for analyzing the metal constituents in soil samples

Constituent	Units	Reporting Detection Limit	Analytical Method	Source Method
Aluminum	mg/kg	100	ICP-MS	EPA 6020a R1 m 1
Antimony	mg/kg	0.1	ICP-MS	EPA 6020a R1 m 1
Arsenic	mg/kg	0.5	ICP-MS	EPA 6020a R1 m 1
Barium	mg/kg	0.1	ICP-MS	EPA 6020a R1 m 1
Beryllium	mg/kg	0.4	ICP-MS	EPA 6020a R1 m 1
Bismuth	mg/kg	0.1	ICP-MS	EPA 6020a R1 m 1
Cadmium	mg/kg	0.05	ICP-MS	EPA 6020a R1 m 1
Calcium	mg/kg	100	ICP-MS	EPA 6020a R1 m 1
Chromium	mg/kg	1.0	ICP-MS	EPA 6020a R1 m 1
Cobalt	mg/kg	0.30	ICP-MS	EPA 6020a R1 m 1
Copper	mg/kg	0.5	ICP-MS	EPA 6020a R1 m 1
Iron	mg/kg	100	ICP-MS	EPA 6020a R1 m 1

Constituent	Units	Reporting Detection Limit	Analytical Method	Source Method
Lead	mg/kg	0.10	ICP-MS	EPA 6020a R1 m 1
Lithium	mg/kg	5.0	ICP-MS	EPA 6020a R1 m 1
Magnesium	mg/kg	100	ICP-MS	EPA 6020a R1 m 1
Manganese	mg/kg	0.2	ICP-MS	EPA 6020a R1 m 1
Mercury	mg/kg	0.05	ICP-MS	EPA 6020a R1 m 1
Molybdenum	mg/kg	0.10	ICP-MS	EPA 6020a R1 m 1
Nickel	mg/kg	0.8	ICP-MS	EPA 6020a R1 m 1
Phosphorus	mg/kg	10	ICP-MS	EPA 6020a R1 m 1
Potassium	mg/kg	100	ICP-MS	EPA 6020a R1 m 1
Selenium	mg/kg	0.5	ICP-MS	EPA 6020a R1 m 1
Silver	mg/kg	0.05	ICP-MS	EPA 6020a R1 m 1
Sodium	mg/kg	100	ICP-MS	EPA 6020a R1 m 1
Strontium	mg/kg	0.1	ICP-MS	EPA 6020a R1 m 1
Thallium	mg/kg	0.05	ICP-MS	EPA 6020a R1 m 1
Tin	mg/kg	0.1	ICP-MS	EPA 6020a R1 m 1
Titanium	mg/kg	1.0	ICP-MS	EPA 6020a R1 m 1
Uranium	mg/kg	0.05	ICP-MS	EPA 6020a R1 m 1
Vanadium	mg/kg	2.0	ICP-MS	EPA 6020a R1 m 1
Zinc	mg/kg	1.0	ICP-MS	EPA 6020a R1 m 1
Zirconium	mg/kg	0.5	ICP-MS	EPA 6020a R1 m 1

Table 7-5: Analytical methods used for analyzing the physical, chemical, and nutrient constituents in plant tissue samples

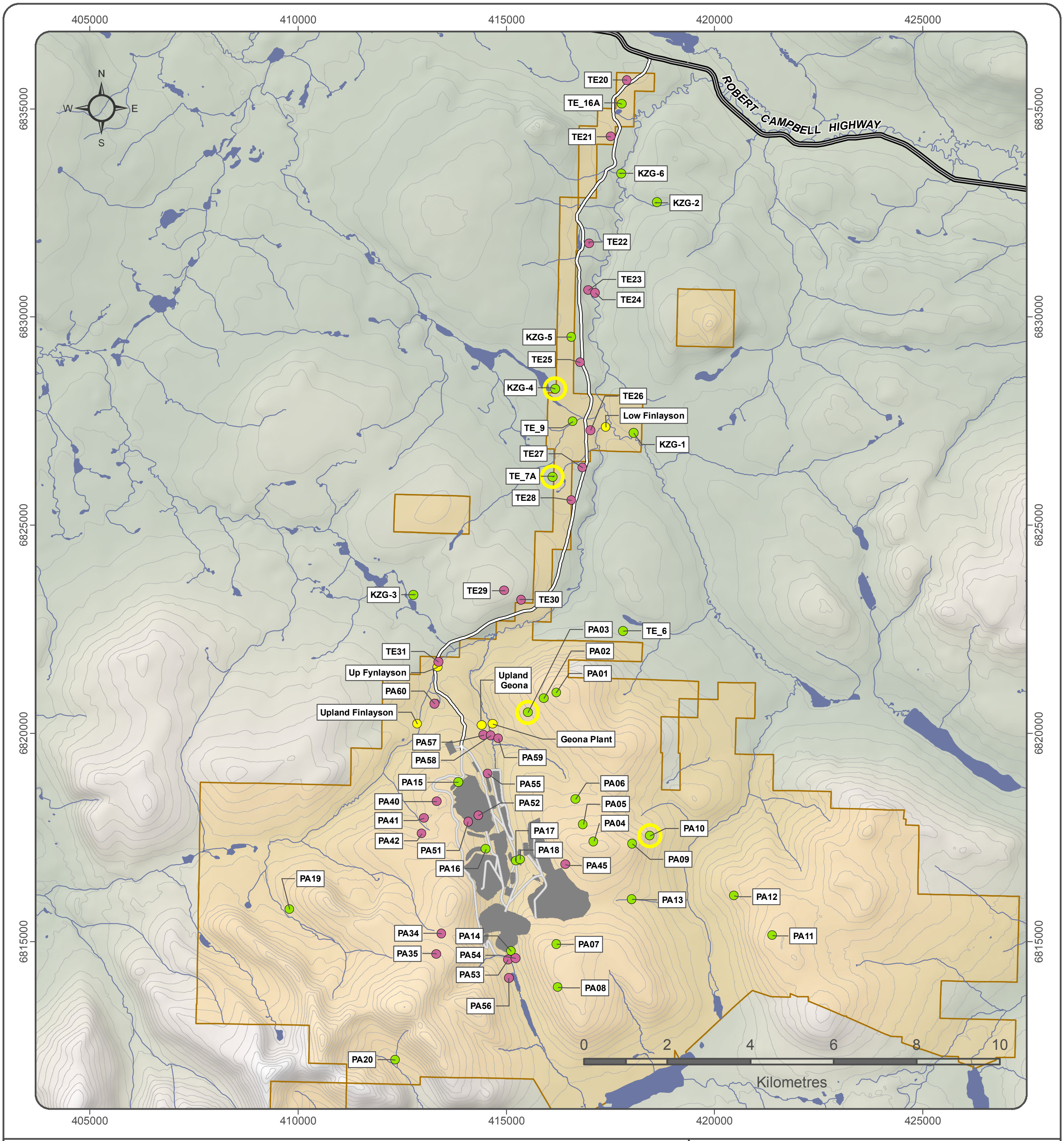
Constituent	Units	Reporting Detection Limit	Analytical Method	Laboratory Method
Elements by ICP-MS (total) – Dry Weight	mg/kg	Per element	EPA 6020A R1 m	BBY7SOP-00002
Elements by ICP-MS (total) –Wet Weight	mg/kg	Per element	EPA 6020a,200.3 R1 m	BBY7SOP-00002/21
% Moisture	%	0.3	OMOE E3139 3.1 m	BBY8SOP-00017

Table 7-6: Analytical methods used for analyzing the metal constituents in plant tissue samples

Constituent	Units_1	Reporting Detection Limit	Analytical Method
Aluminum	mg/kg	1.0	ICP-MS
Antimony	mg/kg	0.05	ICP-MS
Arsenic	mg/kg	0.025	ICP-MS
Barium	mg/kg	0.1	ICP-MS
Beryllium	mg/kg	0.01	ICP-MS

Constituent	Units[1]	Reporting Detection Limit	Analytical Method
Bismuth	mg/kg	0.1	ICP-MS
Boron	mg/kg	2.0	ICP-MS
Cadmium	mg/kg	0.01	ICP-MS
Calcium	mg/kg	10	ICP-MS
Chromium	mg/kg	0.2	ICP-MS
Cobalt	mg/kg	0.02	ICP-MS
Copper	mg/kg	0.05	ICP-MS
Iron	mg/kg	10	ICP-MS
Lead	mg/kg	0.010	ICP-MS
Magnesium	mg/kg	10	ICP-MS
Manganese	mg/kg	0.10	ICP-MS
Mercury	mg/kg	0.01	ICP-MS
Molybdenum	mg/kg	0.050	ICP-MS
Nickel	mg/kg	0.05	ICP-MS
Phosphorus	mg/kg	10	ICP-MS
Potassium	mg/kg	10	ICP-MS
Selenium	mg/kg	0.05	ICP-MS
Silver	mg/kg	0.02	ICP-MS
Sodium	mg/kg	10	ICP-MS
Strontium	mg/kg	0.10	ICP-MS
Thallium	mg/kg	0.002	ICP-MS
Tin	mg/kg	0.10	ICP-MS
Titanium	mg/kg	0.250	ICP-MS
Uranium	mg/kg	0.002	ICP-MS
Vanadium	mg/kg	0.20	ICP-MS
Zinc	mg/kg	0.20	ICP-MS
Zirconium	mg/kg	0.20	ICP-MS

1 – Units are reported in mg/kg wet weight and dry weight



- ● 1997 Sampling Event
- ● 2015 Sampling Event
- ● 2016 Sampling Event
- ○ Proposed Monitoring Control Site
- Tote Road/ Proposed Access Road
- Proposed Mine Road
- ▨ Location of Proposed Mine Infrastructure
- ▨ BMC Minerals (No. 1) Ltd. Mineral Claim Areas
- ▨ Waterbody
- Watercourse
- Contour (40 m interval)

KUDZ ZE KAYAH PROJECT VEGETATION BASELINE REPORT

FIGURE 7-1

LOCATION OF 2016, 2015 AND 1997 SOIL AND PLANT TISSUE SAMPLING SITES

NOVEMBER 2016

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 9N

AEG

BMC MINERALS

7.3.3 Soil Results

7.3.3.1.1 Metals

CCME soil guidelines for industrial sites has established soil guidelines for 19 metals. These 19 metals were analyzed in all soil samples collected as part of this baseline study. Of the 19 metals, four exceeded the guidelines including arsenic, copper, selenium, and zinc, respectively (Table 7-7). The arsenic guideline was exceeded at eight out of 19 sites. The mean arsenic concentration among the 19 samples was 17 mg/kg (standard deviation of 18 mg/kg), exceeding the guideline of 12 mg/kg. Copper, zinc, and selenium exceeded the guidelines at three, two, and one site, respectively. Spatial distributions for arsenic, copper, zinc and selenium in soils compared to CCME guidelines are presented in Figure 7-2, Figure 7-3, Figure 7-4, and Figure 7-5.

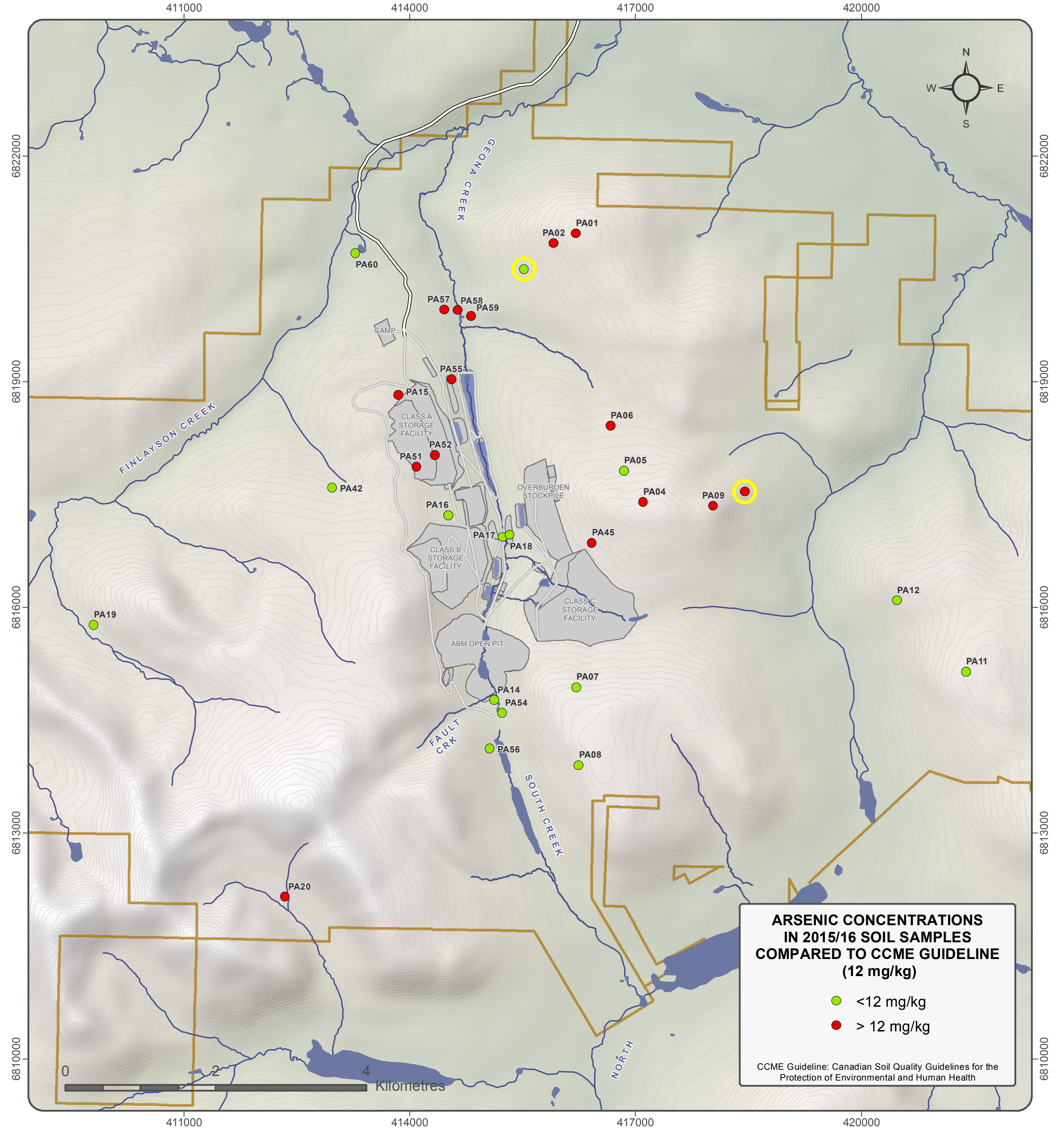
During the 2015 monitoring program, field replicate PA21 was collected at site PA12 to determine field variability between simultaneous soil grab samples. Relative percent difference (RPD) was calculated between the replicate soil samples and only one parameter, clay content, exceeded the 25% RPD threshold; however, it did not meet the practical quantitation limit (PQL). During the 2016 sampling program field replicate PA72 was collected at site PA42 to determine field variability between samples. A comparison was made between the replicate samples and 16 of the 31 metal analytes exceeded the 25% RPD threshold and of those 16 exceedances 15 met the PQL. Laboratory conducted internal QA/QC was within thresholds for spiked blanks, RPD, method blanks, and QC standard suggesting the variability is likely attributed to insufficient field homogenization. Additionally, it was noted that the soil pit where these samples were garbed consisted of discontinuous horizons as a result of permafrost mixing within the soil profile. A complete list of RPD values for the 2015 and 2016 replicate samples can be found in Appendix F. Full laboratory analysis of soil texture, metal, pH, and nutrient contents are available in Appendix C.

Table 7-7: Soil sample concentrations compared to CCME industrial soil guidelines for metals

Element	Units	CCME Industrial Guideline	Sites Exceeding CCME Guideline	Sample Size (n)	Min	Max	Mean	Standard Deviation	95th Percentile
Aluminum	mg/kg	-	-	30	7,570	27,300	13,605	4,392	25,430
Antimony	mg/kg	40	none	30	<0.10	1.78	0.38	0.30	1.21
Arsenic	mg/kg	12	PA01, PA02, PA04, PA06, PA09, PA10, PA15, PA20, PA45, PA51, PA52, PA55, PA57, PA58, PA59, PA72	30	2.39	96	17	18	71

Element	Units	CCME Industrial Guideline	Sites Exceeding CCME Guideline	Sample Size (n)	Min	Max	Mean	Standard Deviation	95th Percentile
Barium	mg/kg	2,000	none	30	54	838	170	141	591
Beryllium	mg/kg	8	none	30	<0.40	0.61	0.26	0.26	0.59
Bismuth	mg/kg	-	-	30	0.13	1.03	0.27	0.16	0.71
Cadmium	mg/kg	22	none	30	0.09	7.84	0.91	1.42	4.89
Calcium	mg/kg	-	-	30	1,370	19,900	5,269	3,542	16,215
Chromium	mg/kg	87	none	30	15	80	37	16	79
Cobalt	mg/kg	300	none	30	4.41	38	14	7.20	32
Copper	mg/kg	91	PA02, PA16, PA17	30	3.52	192	40	37	145
Iron	mg/kg	-	-	30	14,500	58,100	30,993	11,455	56,340
Lead	mg/kg	600	none	30	10	72	28	17	70
Lithium	mg/kg	-	-	30	5.90	23	14	4.09	23
Magnesium	mg/kg	-	-	30	2,510	21,200	7,721	3,834	17,020
Manganese	mg/kg	-	-	30	112	1,320	572	288	1,282
Mercury	mg/kg	50	none	30	<0.05	0.14	<0.05	--	--
Molybdenum	mg/kg	40	none	30	0.63	9.11	1.89	1.54	6.11
Nickel	mg/kg	89	none	30	9.96	71	32	15	68
Phosphorus	mg/kg	-	-	30	439	3,930	1,061	638	2,775
Potassium	mg/kg	-	-	30	439	4,540	1,340	961	4,133
Selenium	mg/kg	2.9	PA02	30	<0.5	6.52	<0.5	--	--
Silver	mg/kg	40	none	30	<0.05	1.45	0.28	0.38	1.44
Sodium	mg/kg	-	-	30	<100	159	<100	--	--
Strontium	mg/kg	-	-	30	9.24	72	24	16	67
Thallium	mg/kg	1	none	30	0.06	0.43	0.15	0.08	0.35
Tin	mg/kg	300	none	30	0.15	1.14	0.47	0.23	0.97
Titanium	mg/kg	-	-	30	122	1,350	606	344	1,323
Uranium	mg/kg	300	none	30	0.66	9.50	1.77	1.65	6.12
Vanadium	mg/kg	130	none	30	19	122	51	26	122
Zinc	mg/kg	360	PA16, PA20	30	28	784	161	141	593
Zirconium	mg/kg	-	-	30	<0.5	4.98	1.37	1.19	4.50

** 95th percentile is where statistically 95% of the time the value will be at or below this value.*



○ Proposed Monitoring Control Site

Contour (20 m)

Tote Road/Proposed Access Road

Proposed Mine Road

▨ Location of Proposed Mine Infrastructure

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

KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 7-2

ARSENIC CONCENTRATION IN SOIL COMPARED TO CCME GUIDELINE

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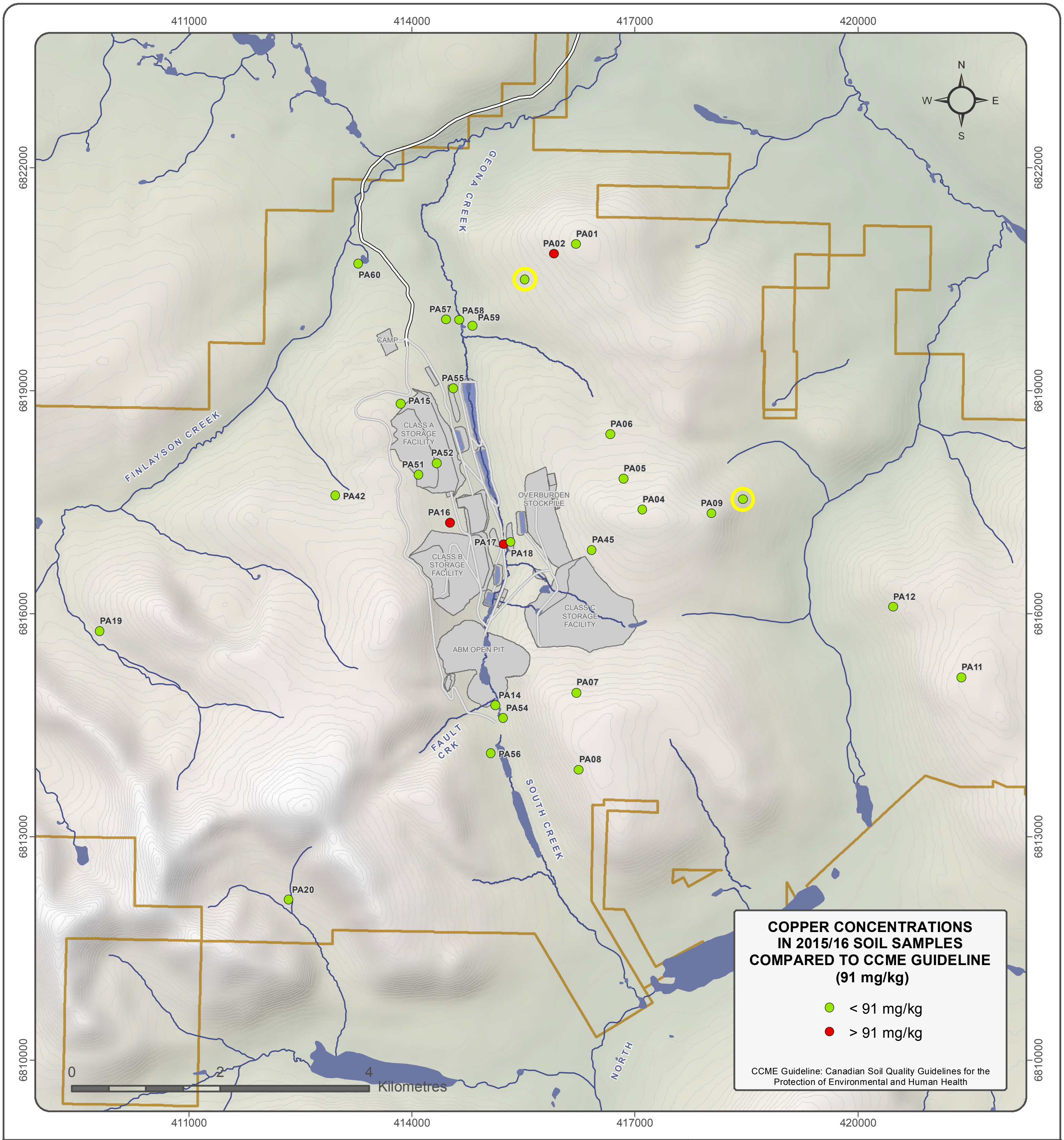

○ Proposed Monitoring Control Site

Contour (20 m)

═ Tote Road/Proposed Access Road

═ Proposed Mine Road

▨ Location of Proposed Mine Infrastructure

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

KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 7-3

COPPER CONCENTRATION IN SOIL COMPARED TO CCME GUIDELINE

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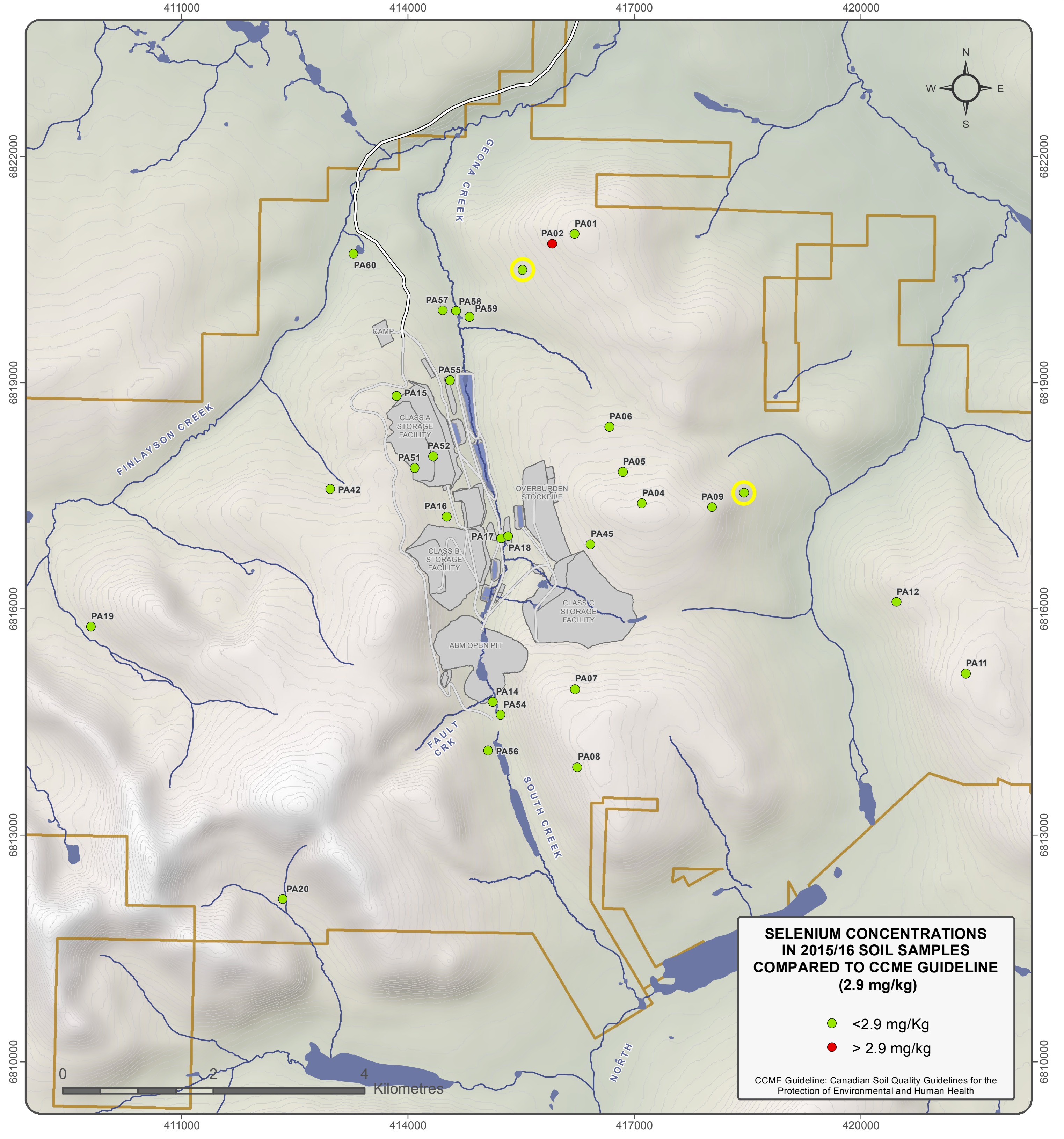

○ Proposed Monitoring Control Site

Contour (20 m)

Tote Road/Proposed Access Road

Proposed Mine Road

▨ Location of Proposed Mine Infrastructure

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VEGETATION BASELINE REPORT

FIGURE 7-4

SELENIUM CONCENTRATION IN SOIL COMPARED TO CCME GUIDELINE

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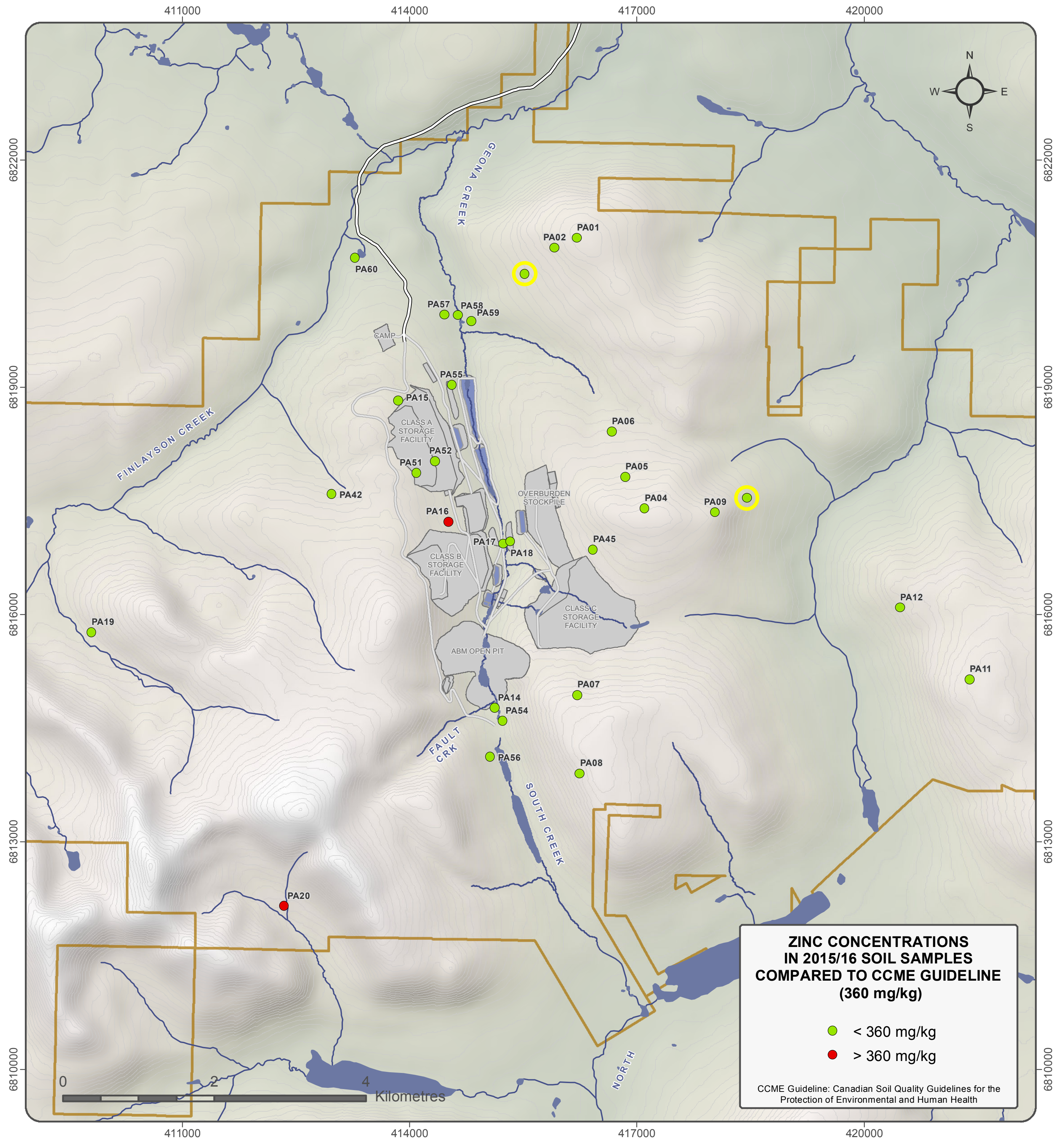

○ Proposed Monitoring Control Site

Contour (20 m)

Tote Road/Proposed Access Road

Proposed Mine Road

▨ Location of Proposed Mine Infrastructure

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

KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 7-5

ZINC CONCENTRATION IN SOIL COMPARED TO CCME GUIDELINE

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7.3.3.1.2 pH

The CCME window for pH is between 6 and 8 pH units. Six of the thirty soil samples are within the CCME range for pH measured by the $CaCl_2$ method and 16 of the 30 sites using the soluble (2:1) method. No samples had greater pH then the CCME range; however, multiple samples had lower values in more acidic soil. Sites with the lowest pH included PA01, PA06, PA11, and PA45. Sites with the highest pH included PA20, PA55, and PA58. Table 7-6 presents the results of the pH analysis respective to the CCME guideline range.

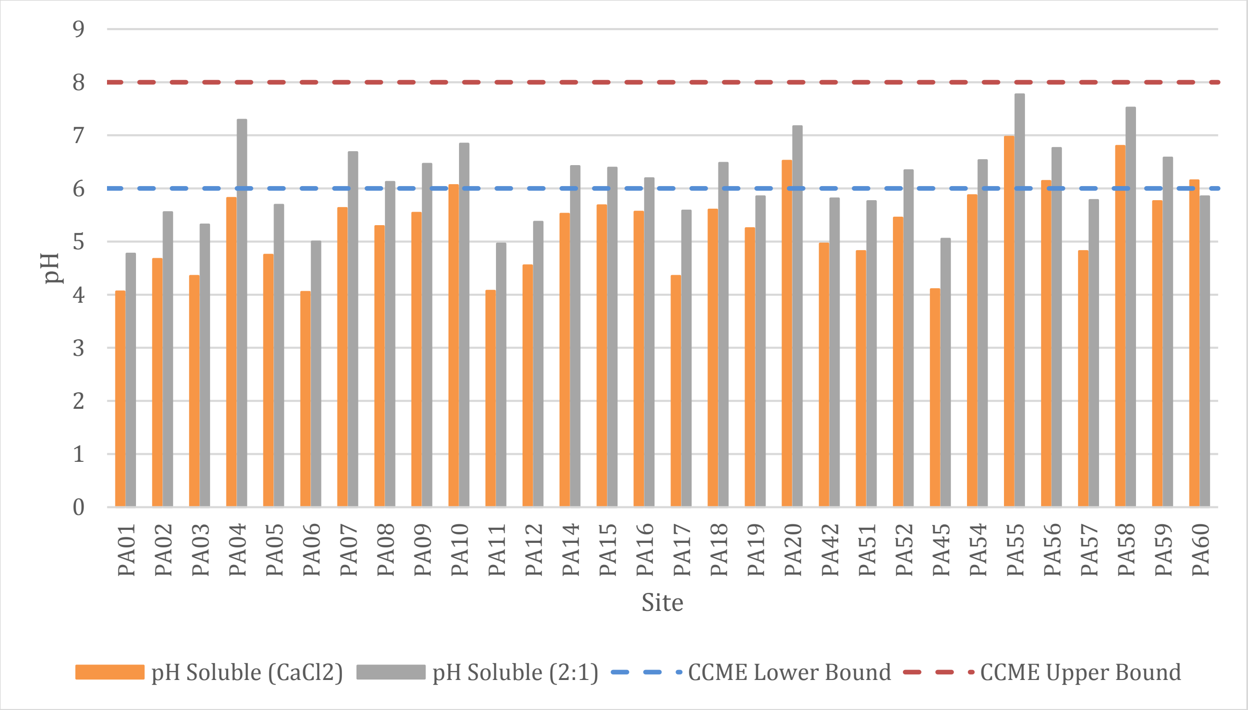


Figure 7-6: pH of soil samples using the pH($CaCl_2$) and pH(w) methods

7.3.3.1.3 Cation Exchange Capacity and Conductivity

The cation exchange capacity provides information on the available micronutrients in soil for plants. The greatest cation exchange capacity occurred at sites PA10, PA16, and PA54, respectively. Fourteen of thirty sites had a cation exchange capacity below the limit of detection (<10 cmol+/kg). Soil conductivity is a measurement that correlates with soil properties that affect crop productivity (Grisso *et al.*, 2006). Site PA20 had the highest conductivity at 0.34 dS/cm, while the least conductive soil came from site PA11, 0.029 dS/m (Figure 7-7).

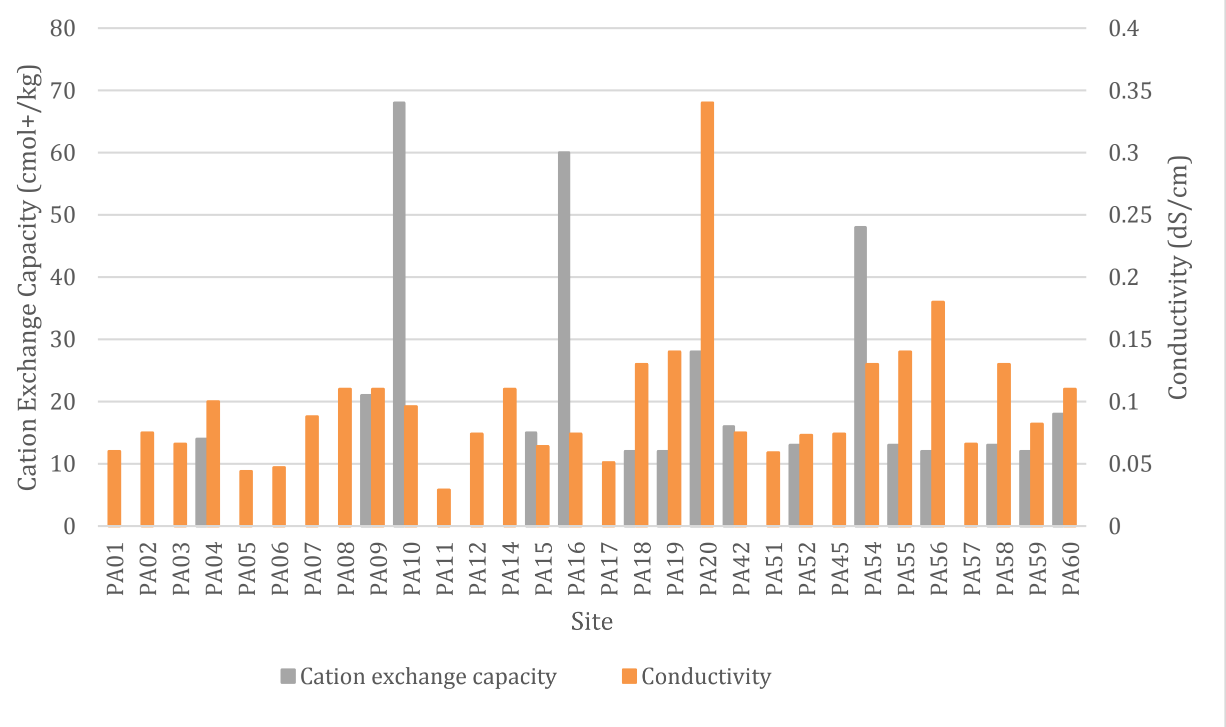


Figure 7-7: Soil cation exchange capacity and conductivity

7.3.3.1.4 Nutrients (N, P, K, S)

In general, among the four available nutrients (N, P, K, S), phosphorus and potassium had the highest concentrations in the 2015 and 2016 soil samples (Figure 7-8). Only two sample sites (PA42 and PA54) had nitrogen concentrations above the detection limit. Likewise, only seven sample sites had sulphur concentrations above the detection limit. The site with the highest sulphur concentration was PA20 with a concentration of 35 mg/kg. All sites except one had potassium concentrations above the limit of detection. Only four sample sites had phosphorus concentrations below the limit of detection. Three sites (PA16, PA57, PA60) had only one nutrient concentration above the limit of detection. Five sites (PA19, PA20, PA42, PA55, PA58) had three nutrient concentrations above the limit of detection. Only one site (PA54), had all four nutrients above the limit of detection.

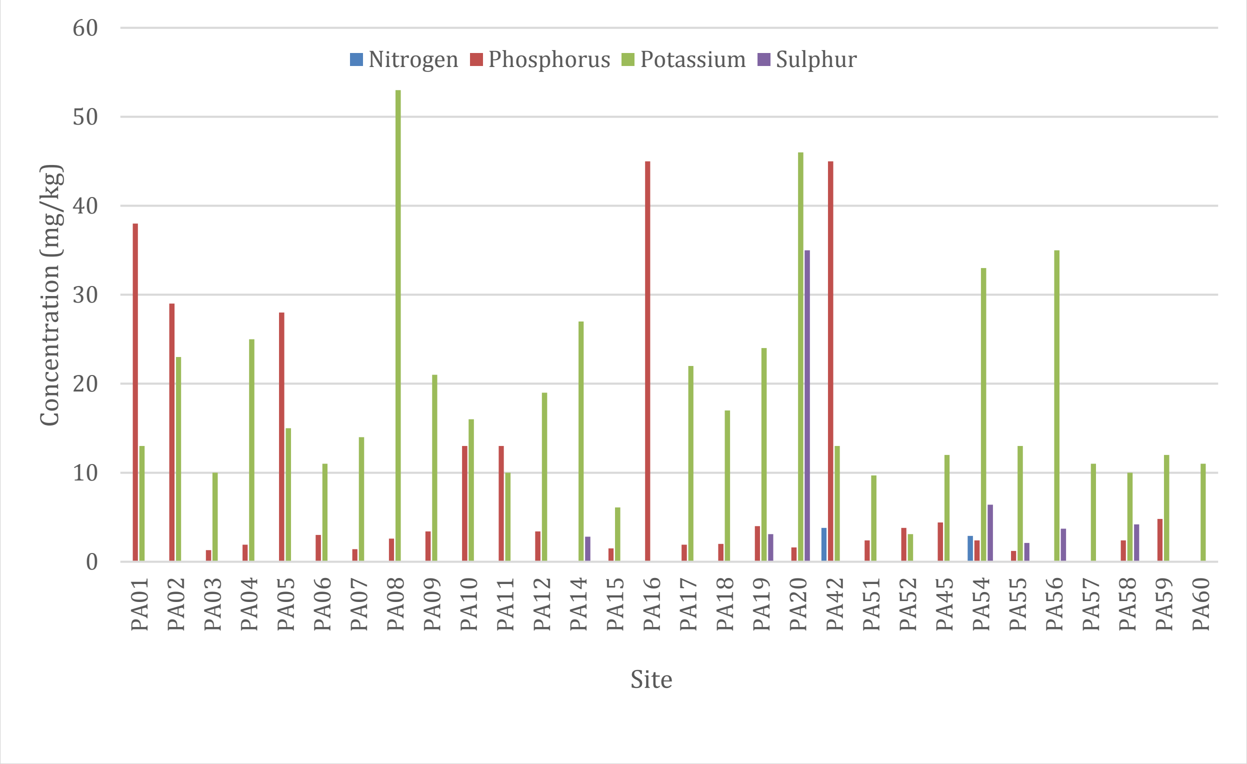


Figure 7-8: Soil nutrient levels (Nitrogen, Phosphorus, Potassium, Sulphur)

7.3.4 Vegetation Results

Table 7-8 presents a summary of the results of the metals concentrations measured in vegetation. Arsenic, mercury, chromium, titanium, vanadium, and uranium had concentrations below the detection limit in all vegetation samples except grass roots. Beryllium and bismuth had no results above the detection limit in any vegetation type.

The site PA14, grass root sample, showed the highest concentration readings for silver, aluminum, arsenic, chromium, lead, iron, antimony, selenium, titanium, thallium, uranium, vanadium, and zinc over all the plant tissue samples collected. This particular sample was taken from the upper Geona valley at the proposed ABM pit. This area is known to be highly mineralized and the root system of plants are reflective of the increased supply of certain metals.

During the 2015 sampling, duplicate samples of willow collected at PA12 were compared to replicate sample PA21 to determine field variability between simultaneous vegetation grab samples. RPD was calculated between the replicate willow samples and marginally exceeded the 25% threshold for total lead, manganese, and phosphorus but only met PQL for manganese (RPD of 27%) and phosphorous (RPD of 30%). During the 2016 sampling event three sets of field replicate samples were collected for vegetation to examine field variability. Replicate sample PA74 horsetail was compared to PA54 horsetail resulting in cadmium, copper, lead, manganese, and sodium exceeding the RDL and meeting PQL. Replicate sample PA75 salix was compared to PA55 salix resulting in aluminum, boron, lead, and zinc exceeding the RPD threshold with all but boron meeting the PQL. Replicate sample PA75 lichen was compared to PA55 lichen with copper being the only metal exceeding the RPD threshold and meeting PQL. A complete list of RPD values for the replicate samples can be found in Appendix F and full laboratory results reporting wet and dry weight concentrations are available in Appendix D.

Table 7-8: Mean and standard deviation concentrations of metals in vegetation samples (2015 to 2016)

Total Metals Dry Weight (mg/kg)	Bog Blueberry (n=4)		Lowbush Cranberry (n=2)		Grass (n=11)		Grassroot (n=3)		Horsetail (n=9)		Willow (n=32)		Lichen (n=11)	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Aluminum (Al)	1.3	1.0	21.3	19.9	7.5	4.0	620.7	707.5	4.2	1.4	17.7	27.8	41.1	19.7
Antimony (Sb)	<0.0050	0	<0.0050	0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Arsenic (As)	<0.025	0	<0.025	0	<0.050	0	0.6	0.8	0.1	0.1	<0.050	0	0.1	0.0
Barium (Ba)	5.9	4.8	20.8	4.4	26.8	17.3	57.2	17.4	42.3	16.7	59.0	59.5	5.6	2.6
Beryllium (Be)	<0.010	0	<0.010	0	<0.10	0	<0.10	0	<0.10	0	<0.10	0	<0.10	0
Bismuth (Bi)	<0.10	0	<0.10	0	<0.10	0	<0.10	0	<0.10	0	<0.10	0	<0.10	0
Boron (B)	5.0	5.4	5.9	0	3.0	0.5	2.6	0.9	12.5	3.6	5.5	3.1	3.6	0.7
Cadmium (Cd)	0.2	0.1	0.0	0.0	0.1	0.1	2.4	1.5	0.6	0.6	5.7	5.4	0.2	0.1
Calcium (Ca)	907	939	2205	134	3735	1338	7543	1641	22833	4828	16234	7257	811	336
Chromium (Cr)	<0.20	0	<0.20	0	0.2	0	1.9	2.1	0.2	0	<0.20	0	0.3	0
Cobalt (Co)	<0.020	0	<0.020	0	0.1	0.0	0.9	1.0	0.1	0.1	0.7	0.8	0.1	0.0
Copper (Cu)	2.4	2.6	10.5	4.8	3.1	0.8	6.8	2.9	5.0	1.6	3.9	1.0	0.9	0.2
Iron (Fe)	2.4	0.3	23.0	4.2	37.8	5.7	1463.7	1667.1	42.6	11.2	43.6	10.3	64.5	28.2
Lead (Pb)	0.0	0.0	<0.010	0	0.1	0.0	3.6	5.2	0.1	0.1	0.1	0.1	0.2	0.1
Magnesium (Mg)	290.6	279.5	817.0	175.4	790.7	220.4	976.7	397.0	4171.1	1745.7	3734.5	2063.0	274.6	83.0
Manganese (Mn)	43.6	32.4	555.5	84.1	280.9	220.2	417.3	93.9	38.8	20.8	258.4	214.2	70.0	55.8
Mercury (Hg)	<0.010	0	<0.010	0	0.0	0	0.1	0.0	0.0	0.0	0.0	0	0.0	0.0
Molybdenum (Mo)	0.2	0.3	0.5	0	0.7	0.6	0.5	0.3	0.5	0.4	0.3	0.4	<0.050	0
Nickel (Ni)	0.3	0.3	1.1	0.2	2.3	2.3	2.6	1.6	0.6	0.8	5.4	4.8	0.3	0.1
Phosphorus (P)	631	621	1455	247	1858	841	685	190	1542	407	2155	1447	536	122
Potassium (K)	3485	3474	7735	1025	12507	4392	2000	363	36856	8681	11047	3996	1307	257
Selenium (Se)	<0.050	0	<0.050	0	0.1	0.0	0.3	0.2	1.4	2.5	0.4	0.5	0.1	0
Silver (Ag)	<0.020	0	<0.020	0	<0.020	0	0.2	0.1	0.1	0.0	<0.020	0	0.0	0.0
Sodium (Na)	2.2	0	<10	0	<10	0	18.3	6.1	51.6	31.9	24.3	18.0	14.6	2.4
Strontium (Sr)	3.3	3.7	3.5	0.8	10.7	3.5	25.0	5.9	62.7	15.6	52.9	27.1	2.1	0.8
Thallium (Tl)	<0.0020	0	<0.0020	0	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0
Tin (Sn)	0.3	0.5	0.9	0.6	0.2	0	0.2	0.0	0.1	0	<0.10	0	0.1	0
Titanium (Ti)	<0.25	0	<0.25	0	1.0	0	30.3	32.9	<1.0	0	1.4	0	2.0	0.9
Uranium (U)	0.0	0	<0.0020	0	<0.0020	0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Vanadium (V)	<0.20	0	<0.20	0	<0.20	0	2.2	1.7	<0.20	0	<0.20	0	<0.20	0
Zinc (Zn)	11.7	10.9	14.8	2.1	35.6	23.1	127.6	121.7	47.7	27.2	223.0	228.0	23.7	8.1

Table 7-9: Mean and standard deviation concentrations of metals in vegetation samples 1997

Total Metals Dry weight (mg/kg)	**Blueberry**		**Horsetail**			**Willow**		**Lichen**			**Sedge**		**Scrub Birch**		**Labrador Tea**			**Crowberry**	
Sample Size	n=3	n=4	1	n=4	n=3	n=3	n=3	n=3	n=3	n=3	n=4	n=3	n=3	n=3	n=3	n=3	n=3	n=3	n=3
Location	Geona Creek Upland	Geona Creek Riparian	Lower Finlays on Creek	Geona Creek Riparian	Lower Finlays on Creek	Upper Finlays on Creek	Geona Creek Upland	Finlays on Creek	Geona Creek Upland	Finlays on Creek	Geona Creek Riparian	Lower Finlays on Creek	Upper Finlays on Creek	Geona Creek Upland	Finlays on Creek	Geona Creek	Finlays on Creek	Geona Creek Upland	Finlays on Creek
Aluminum (Al)	68 ± 84	57 ± 34	108	12 ± 13	6 ± 0.6	8 ± 1	18 ± 4.5	13 ± 1.5	155 ± 78	83 ± 23	763 ± 719	204 ± 244	490 ± 114	21 ± 2.5	16 ± 2.9	63 ± 35	28 ± 10	20 ± 3.5	30 ± 10
Cadmium (Cd)	1.6 ± 0.2	3.5 ± 1.1	3.5	2.3 ± 1.1	0.7 ± 0.2	1.8 ± 0.6	5.4 ± 2.3	7.8 ± 2.0	<0.3 ± 0.1	<0.2	0.8 ± 0.5	0.3 ± 0.2	0.4 ± 0.2	<0.2 ± 0.1	0.5 ± 0.1	<0.2	<0.2	<0.2	<0.2
Copper (Cu)	7.6 ± 0.5	10.2 ± 1.7	10.3	6.9 ± 2.1	6.6 ± 1.1	6.2 ± 0.9	3.8 ± 0.3	5.2 ± 0.7	4.4 ± 4.3	1.2 ± 0.4	10.2 ± 2.2	7.0 ± 1.5	8.40 ± 2.7	7.0 ± 0.9	6.1 ± 1.0	7.5 ± 0.8	5.1 ± 0.3	4.8 ± 1.3	3.6 ± 0.5
Lead (Pb)	0.7 ± 0.5	<0.4 ± 0.1	0.3	<0.3	<0.3	<0.3	<0.3 ± 0.1	<0.6 ± 0.5	2.4 ± 2.4	0.9 ± 0.7	<0.9 ± 0.9	<0.7 ± 0.7	<0.6 ± 0.5	<0.3 ± 0.1	<0.4 ± 0.1	1.6 ± 2.0	0.9 ± 0.4	0.9 ± 0.6	0.5 ± 0.1
Selenium (Se)	<0.5 ± 0.2	0.6 ± 0.6	0.4	0.4 ± 0.4	0.3 ± 0.1	0.6 ± 0.2	0.4 ± 0.3	0.8 ± 0.2	<0.3 ± 0.1	<0.2	0.8 ± 0.5	0.5 ± 0.2	0.5 ± 0.2	0.6 ± 0.2	0.5 ± 0.4	0.3 ± 0.1	0.7 ± 0.4	0.6 ± 0.2	0.4 ± 0.1
Zinc (Zn)	94.6 ± 29.6	54.6 ± 5.5	53.9	232 ± 77.1	136 ± 7.1	238 ± 45.6	336 ± 121	205 ± 57.7	59.1 ± 11.8	32.1 ± 4.6	96.9 ±40.7	40.2 ± 19.4	61.3 ± 9.6	410 ± 97.4	266 ± 39.4	53.6 ± 10.3	30.2 ± 0.7	35.1 ± 8.4	25.8 ± 5.1

*Mean concentration ± one standard deviation

7.3.5 Discussion

The Project area is known to be a mineralized site and can be expected to have naturally elevated soil concentrations of a range of metals relative to typical background levels. At the Project, there were only some minor exceedances indicating that mineralization does not appear to be expressed at surface. The main purpose for collecting soil metal and nutrient profiles is to assess the magnitude and extent of metal concentrations that occur in the Project area. This baseline will help in monitoring potential changes in metal concentration in the environment during the Project's lifetime. Knowledge of both nutrient and metal parameters within Project site soils will aid in evaluating the potential use of soils for reclamation and closure activities. Results generally show that soils stripped for construction of the facilities can be used for reclamation without concern over high metals. Further soil amendments will be necessary since soil nutrients are low.

The concentrations of metals in vegetation that can be digested by wildlife could accumulate in animal tissues and enter the food web and transfer to other trophic levels. The plant species chosen for sampling in this study are known to be consumed by wildlife or humans, and the metal analysis of plant tissues gives a baseline for what levels wildlife may be ingesting through their food source.

Willow and other vegetation samples are known to absorb minerals and metals through their root systems (Kuzovkina *et al*., 2004), particularly metals that are necessary for enzymatic function. For example, high concentrations of potassium, calcium, magnesium, and phosphorus are not unexpected as these metals are essential plant nutrients that are readily absorbed as cations by the roots and transport into the plant (Alder *et al*., 2002). Metal uptake by plants is a complex process and is reliant on many variables such as metal form and solubility, soil pH, cation exchange capacity, and bacterial and chelating effects. Different plant parts were sampled to determine where metals had accumulated within the plant. This is important given our knowledge of wildlife feeding behaviour. Currently, there are no threshold guidelines for metal concentrations contained in plant tissues. Guidelines are available for livestock, but wildlife are not confined to limited areas which makes it difficult to estimate quantities of browse consumed from specific areas and prevents a meaningful comparison to guidelines.

There were seven different types of vegetation sampled during the 2015 and 2016 surveys resulting in a total of 73 individual plant tissues analyzed. In addition to the small set of samples collected in 1997. Eight of the plots where samples were collected (PA14-PA18, PA51, PA52, PA55) will be removed during construction of the Project. Other plots are near the mine site that will not disturbed can be selected for monitoring. Control plots that are further away and outside the ZOI can be used as controls to compare changes in metal concentrations to soils and vegetation during the mine life.

Concentrations of arsenic, copper, selenium, and zinc in soils were the only metals above CCME industrial guidelines for soil. Distribution of the higher metal concentrations did not appear to be related to the location of the proposed open pit.

Soil nutrients can vary widely from site to site; even within a short distance, soil characteristics can differ immensely. Nutrients were measured to give an overall indication of soil fertility. As expected, soils in the Project area are, in general, nutrient poor and acidic. It would be difficult to find any sites that would be a source of high concentrations of macro and micronutrients; instead the focus needs to be on retaining soils in situ where possible. If an area needs to be cleared, soil should be stockpiled for future use in reclamation. Amendments can be added when the stockpiled soils are used.

8 WETLANDS CHARACTERIZATION

Wetlands are productive and diverse ecosystems with a multitude of intrinsic values such as filtering surface water, recharging groundwater systems, storing carbon and providing wildlife habitat (S, n.d.). Less than 5% of Yukon is covered by wetlands (Smith *et al*., 2004), which is not extensive compared to other areas of northern Canada. Most wetlands exist in Yukon as complexes with upland ecosystems (McKenna *et al*., 2004). At a territory-wide scale, wetlands in Yukon provide critical migration habitat for waterfowl and shorebirds during spring and fall migrations. The early open water present in wetlands in springtime provides key feeding and staging zones for migratory bird species at a time of year when other open water areas with sufficient food sources are limited (Sinclair *et al*., 2003). Wetlands also support a diversity of local or non-migratory birds, as well as vegetation and mammal species such as moose, beaver, and muskrat. In addition, wetlands have both ecological and anthropogenic local-scale value in communities (Sinclair *et al*., 2003).

8.1 SUMMARY OF HISTORICAL FINDINGS

Table 8-1 lists the vegetation categories reported near wetlands in the 1996 IEE. No specific information was included in the IEE on the number or type of wetlands within the Project study area, nor was the percentage of land covered by wetlands calculated.

Table 8-1: Vegetation categories present near wetlands (1996)

Category	Vegetation Present*	Soil Type	Location	% Coverage in 1995 Study Area
Open Canopy White Spruce Forest	Dominated by white spruce, black spruce and sub-alpine fir present. Well-developed, rich shrub and herb layers, including abundant horsetail.	Alluvial sites	Along rivers and lakes	Relatively rare: 1% to 2% of study area
Willow Tall Shrub: wet riparian	Dominated by willow. Dwarf birch in shrub layer. Herb layer well developed by not species-rich. Sphagnum moss.	Organic veneers over fluvial deposits/ fluvial mineral soils	Along Geona and Finlayson Creek and tributaries	Relatively uncommon: 2% to 5% of study area
Wet Sedge Herb: riparian wetland	Dominated by sedges. Low diversity of other herbaceous species.	Veneer of organic material over fluvial deposits	Shores of small lakes, riparian floodplains, depressions in creek valleys	Relatively rare: 1% of study area

**Taken from Norecol, Dames & Moore, 1997.*

8.2 2015 SURVEYS

Wetlands were surveyed to assess the potential for passive and semi-passive water treatment at the site. This potential is based on available biogeochemical processes that can improve water quality through means such as a constructed wetland treatment system (CWTS) (Contango Strategies Ltd, 2016; provided as Appendix E-7 to the KZK Project Proposal). In this study, vegetation, sediment, and associated beneficial microbes in wetlands were explored in the context of water chemistry ranges naturally present at the Project area.

The CWTS site assessment focused on natural wetland and creek areas at in the Project area. Sampling locations were selected based on the 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 (Contango Strategies Ltd, 2016). This study did not assess or classify all wetlands in the KZK Project area so further classification was carried out by AEG in 2016 and can be found in Appendix A. The information presented below is therefore a characterization of a subset of wetlands that were selected for a specific purpose, rather than a broad-scale assessment of wetlands within the Project area. Eleven areas were sampled during the site assessment (Table 8-2). The detailed methodology and lists of samples taken during the CWTS site assessment are presented in Contango Strategies Ltd, 2016.

Table 8-2: Sites selected for characterization during constructed wetland treatment system study

Sites	Location description
KZ-G-creek	An area of Geona Creek: upstream of KZ9 monitoring location and downstream of KZ7 monitoring location.
KZ-NW, KZ-SW, KZ-NE, KZ-SE	Locations located on the respective west and east side of KZ-G-creek sampling site.
KZ-9-east Seep, KZ9-shallow1, KZ9-shallow2, KZ9-deep	Locations that receive seepage from the KZ9-east seep groundwater monitoring location.
KZ22-DS	An area of Geona creek: downstream of KZ22 monitoring location.
Pond	A wetland to the northeast of Geona Creek.

8.3 CHARACTERIZATION OF SITES FOR CONSTRUCTED WETLAND TREATMENT SYSTEM STUDY

The CWTS study concluded that the Project area has several natural ponds, wetlands, and aquatic vegetation in creeks. It is therefore expected to be conducive to the implementation of treatment wetlands. The KZK Project area is hilly resulting in catchment areas forming creeks rather than large flat wetland areas. However, there are several examples of large natural wetlands in the area (e.g., "Pond" site) (Contango Strategies Ltd, 2016).

The wetland plant species *Carex*, and specifically *C. aquatilis*, was thriving at all sites sampled, with only the "Pond" site having growth of *C. utriculata.* 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. Aquatic mosses were present at sites KZ-SE, KZ9-deep, KZ22-DS, and the "Pond"; all of which have diverse water quality and sediment characteristics (Contango Strategies Ltd, 2016).

9 FOREST PRODUCTIVITY AND TIMBER VOLUMES

The entire Project site is located in the alpine and sub-alpine bioclimatic zones where forest growth is limited to lower slopes and valley bottoms. The treeline is at approximately 1,500 m and tree cover that does exist is sparse, and defined as between 10% to 25% crown cover. The tote road corridor is mainly situated in the boreal high bioclimatic zone and has more forested areas. However, crown cover is mostly sparse even at these lower elevations and tree productivity is poor. This is due to the marginal growth conditions provided by poor nutrient availability in the peat dominant substrate that is common in the study area.

9.1 SUMMARY OF HISTORICAL FINDINGS

No timber estimates were provided by Norecol, Dames & Moore Inc. during the IEE conducted in 1996. A forest cover map does exist for the area created by the YG Forest Management Branch. This cover map is at a scale of 1:50,000 and only identifies the leading tree species, structure stage, and forest type coverage via polygon areas.

9.2 2015-16 SURVEYS

9.2.1 Rationale

Stand density and volume estimates give an indication of possible timber quantity and carbon storage potential within the LSA. These two parameters can be used as a preliminary assessment for firewood harvest potential, and to determine whether firewood harvest is feasible given the quantity of standing timber and site conditions for access. They are also a broad inventory of forest type in the area and contribute to the understanding of existing wildlife habitat in the LSA.

9.2.2 Methodology

Field Measurements

The timber measurements needed for wood volume estimates were taken in conjunction with the ecosystem plot surveys. Timber plots were located near the ecosystem plots, where there was forest cover but did not overlap, so disturbance to ecological attributes were kept to a minimum. The timber plots were located along the existing tote road study corridor and the lower elevations at the proposed mine site where there was adequate forest cover (>10%).

A variable size or prism sweep method was used to select trees to measure. This approach selects trees based on basal area, which gives the area occupied by the cross-section of tree trunks at their diameter at breast height (DBH) per unit of land area.

The trees that are screened within the prism sweep are numbered starting from the north and counting "in trees" going in a clockwise direction. Ideally, the prism size used (5) will select four to six individual trees per timber plot. Then the species, DBH, and height of each counted tree was measured and recorded on a tally sheet (Appendix E). The tree with the largest DBH was chosen to be aged using an increment bore and the growth rings were counted in the field for an approximate age. None of the trees were graded, so no volume deductions were calculated. Trees that had a DBH of less than 7.0 cm or less than 3 m in height were not measured, as harvest of such small trees is not cost effective.

Timber Volume Estimates

Aerial photography interpretation was used to determine number of stems per hectare. A grid with cells measuring 100 m by 100 m (1 hectare) was overlaid on selected forested polygons to be counted. These cells were then randomly selected for counting the number of trees that occurred within them (Figure 9-1). Figure 9-2 shows the location of 2015 and 2016 timber estimate plot locations.

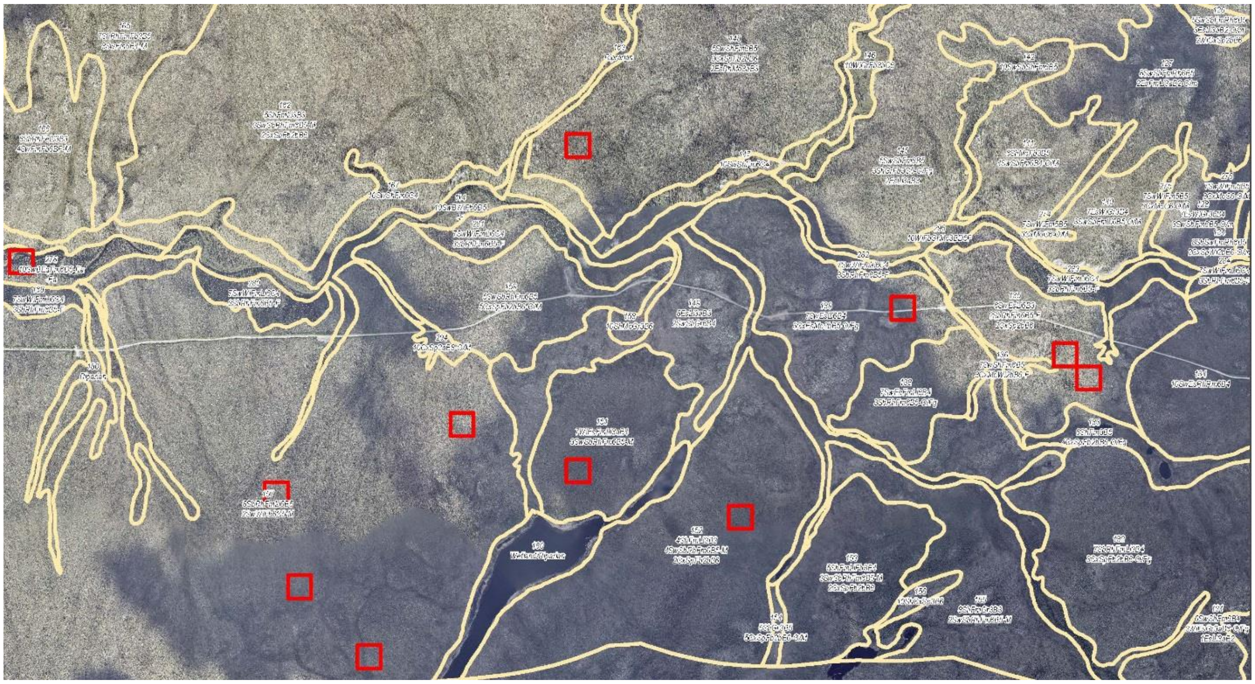
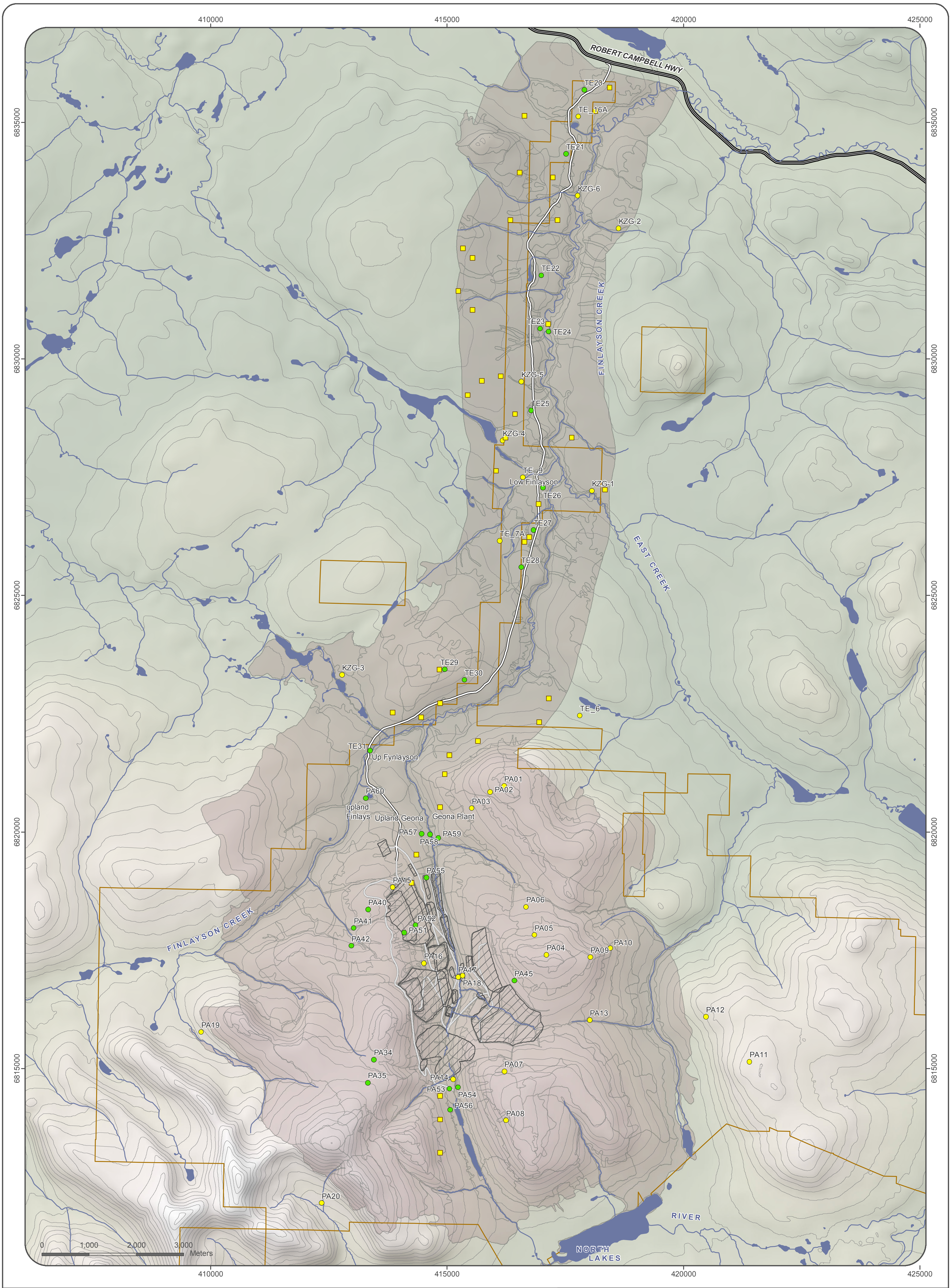


Figure 9-1: Example of cells used in timber volume estimates



● 2015 Terrestial Plot

● 2016 Terrestial Plot

🟨 Sample Grid for Timber Estimate

▨ Terrestrial Ecosystem Mapping Extent

═ Tote Road/Proposed Access Road

— Proposed Mine Road

▨ Location of Proposed Mine Infrastructure

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

BMC MINERALS

KUDZ ZE KAYAH PROJECT VEGETATION BASELINE REPORT

FIGURE 9-2

TIMBER ESTIMATE PLOT LOCATIONS

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.

Datum: NAD 83; Projection UTM Zone 9N

ALEXCO ENVIRONMENTAL GROUP

FEBRUARY 2017

D:\Project\AllProjects\Kudz_Ze_Kayah\Maps\03_Study\Vegetation\Timber_Density\Timber_Count_20161130.mxd
(*Last edited by: amatlashevska;02/02/2017/16:26 PM*)

There were a total of seventeen timber plots with a total of 77 trees measured over two field seasons, 2015 and 2016. This is a small sample size, but adequate to determine average volumes per forested polygon. Many of the polygons selected for timber measurements had very few trees per hectare, which reduced variability in tree size. Most polygons were less than 200 stems per hectare and the maximum stem count per hectare was approximately 312, which occurred in only one polygon.

The number of trees per forested polygon was taken as the average number of trees counted per cell within the polygon (total number of trees counted divided by number of cells in that specific polygon) then multiplied by the total area (hectares (ha)) of the same polygon.

Volume was then calculated using the metrics recorded in the timber plot samples. The metrics were averaged for each species: white spruce (*Picea glauca*), black spruce (*Picea mariana*), and sub-alpine fir (*Abies lasiocarpa*). No tapering model was used in the calculation of timber volume and trees were not categorized by stratum. Volume yields calculated by this method will be higher than if a tapering model was applied, but will reveal a relative volume per tree species within forested polygons.

9.2.3 Results

The average volume per tree per species was calculated using the average diameter to derive the average circumference by the average height. The volume calculation, where $V = \pi r^2 \times h$, produces a volume value for a cylinder, the results are presented in Table 9-1. White spruce had the highest volume per tree followed by sub-alpine fir and black spruce.

Table 9-1: Average tree volume by species

Tree Species	Species code	Average DBH (m)	Average Height (m)	Average Circumference (m^2)	Volume Calculation (m^3)
White Spruce	Sw	0.208	10.9	0.034	0.37
Black Spruce	Sb	0.117	4.4	0.011	0.05
Sub-alpine Fir	F	0.144	6.6	0.016	0.11

Table 9-2 presents the average number of trees per hectare and volume by polygon. The average was derived from counting the number of stems in the randomly selected one-hectare cell applied to the forested polygons where tree measurement plots were located. Volume was calculated for each species, based on the plot species percent representation, that two-thirds of the volume is contributed by white spruce and one-third of the volume is contributed by sub-alpine fir, in mixed white spruce and fir forested polygons. In white and black spruce forested polygons, white spruce accounts for 79 percent of the wood volume and black spruce 21 percent. Table 9-2 shows the timber density by species per ha and volume calculated for each polygon that had timber measurement plots established.

It should be emphasized that the methodology used in this study is a basic timber inventory, meant to show relative wood volumes associated with each forested polygon.

Table 9-2: Timber density and volume by polygon

Polygon Number	Dominant Tree Species	Avg. # of Trees per Ha	Polygon Area (Ha)	Stems per Polygon	Total Timber Volume (m^3) per Polygon	Volume of Sw (m^3) per Polygon	Volume of Sb (m^3) per Polygon	Volume of F (m^3) per Polygon
7	F /Sw	146	106	15,476	4,341	3,779	-	562
86	F /Sw	81	59	4,779	1,340	1,167	-	173
93	F /Sw	121	99	11,979	3,360	2,925	-	435
96	F /Sw	75	96	7,200	2,019	1,758	-	261
104	F /Sw	196	343	67,228	18,857	16,417	-	2,440
116	F /Sw	300	184	55,200	15,484	13,480	-	2,004
135	Sw/Sb	131	53	6,943	2,102	2,029	73	-
148	Sw/Sb	198	193	38,214	11,571	11,170	401	
151	Sw/Sb	144	35	5,040	1,526	1,473	53	-
152	Sw/Sb	156	154	24,024	7,274	7,022	252	-
157	Sw/Sb	92	539	49,588	15,016	14,495	521	-
172	Sw/Sb	105	127	13,335	4,038	3,898	140	-
173	Sw/Sb	315	164	51,660	15,642	15,100	542	-
188	Sw/Sb	234	62	14,508	4,392	4,240	152	-
189	Sw/Sb	182	212	38,584	11,683	11,278	405	-
194	Sw/Sb	315	37	11,655	3,529	3,407	122	-
208	Sw/Sb	298	143	42,614	12,903	12,456	447	-
211	Sw/Sb	254	109	27,686	8,384	8,092	291	-

9.2.4 Discussion

Overall, the trees measured were of poor timber quality. Sinuous stems were common due to active permafrost. White spruce, were mature to old (80-200 yrs) and exhibited signs of pathology. Black spruce were mainly small and spindly with little volume yield per tree, the larger trees are approximately 130 years old. Sub-alpine fir were in better condition and younger than the spruce with less pathology apparent, but coverage was sparse.

Prior to any harvesting endeavour, the Yukon Government Forestry Branch will need to complete a harvest plan to assess the available timber and environmental considerations before cutting permits are issued.

This simplified timber cruise was done in conjunction with the ecosystem plots. Combining timber measurements with the permanent ecosystem plots allows for change in tree growth and species composition to be monitored over time.

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APPENDIX A:

TERRESTRIAL ECOSYSTEM MAP AND REPORT

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TERRESTRIAL ECOSYSTEM MAP REPORT

KUDZ ZE KAYAH PROJECT

BMC-16-01-345_004_Terrestrial Ecosystem Map Report_RevB_161202

December 2016

Prepared for:

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ALEXCO ENVIRONMENTAL GROUP INC. SIGNATURES

Report prepared by:

12/5/2016

Lisa Knight, B.Sc. B.Ed., R.P.Bio.
Senior Environmental Scientist

12/5/2016

Mitchell Heynen, B.Sc., A.Ag
Environmental Scientist / GIS Technician

Report reviewed by:

12/5/2016

Jenifer Hill, B.Sc., M.Sc. R.P.Bio.
Principal, JLH Environmental

12/5/2016

Scott Keesey, B.Sc. EP
Senior Environmental Manager

EXECUTIVE SUMMARY

The Kudz Ze Kayah (KZK) Project ecosystem map was developed to provide information about existing plant communities, growth conditions, and ecosystem distribution to fulfill regulatory baseline requirements.

Ecosystem mapping and interpretation is a means of understanding the interplay of abiotic and biotic elements that occur in patterns across a landscape. Units of the landscape that have similar vegetation and terrain characteristics can be delineated into polygons on a base map. This is accomplished using aerial photograph stereo-pairs, satellite imagery and various other spatial information sources. The study area can be divided into biophysical units, and with increasing information and detail, classified further into ecosystem types. The resulting map gives a spatial representation of the study area such that forest types, riparian corridors, sensitive areas, anthropogenic disturbances and key wildlife habitat can be easily viewed in association to each other.

The ecosystem map accompanying this report encompasses a total area of 124 km^2, which includes the linear Tote Road study area (46 km^2), and the Project study area (78 km^2). A level two survey intensity was used given the size of the local study area mapped (Environment Yukon, 2016). A total of 320 ecosystem based polygons were defined from aerial photographs and labelled with an ecosystem unit(s) code to denote vegetation, structural stage, nutrition and moisture regime plus the underlying surficial material. Ten wetlands that are within the proposed Project site were classified according to the Canadian Wetland Classification System. The wetlands were also integrated into the Terrestrial Ecosystem Map (TEM) and assigned labels with classification definitions. A total of 37 ground plots and 22 ground inspections were surveyed, in addition to 45 visual checks to verify the classifications delineated from the aerial photographs.

The intended uses for the Project ecosystem map and report are to:

- Integrate abiotic and biotic ecosystem components on one map;
- Develop a record of current ecological site conditions that can be used as a framework for monitoring ecosystem response to changes (e.g. climate change, revegetation progress, fire, terrain failures, development footprint);
- Provide basic information on the distribution of ecosystems from which land management decisions can be based;
- Quantify the amount and types of ecosystems being affected by the development, operation and closure of the Project;
- Prepare habitat suitability maps for wildlife valued components;
- Provide in situ templates for revegetation efforts;
- Identify possible locations for seed collection and plant stock that match the environmental conditions of vegetated areas and needs of those requiring revegetation;
- Establish a network of permanent ecological plots reflective of the different ecosystems found in the study area; and
- Establish control ecosystem plots that are near the Project site, but remain in a natural state, to represent vegetation and soil characteristics of the areas proposed to be altered.

ACRONYMS

ALP	Alpine
B.C	British Columbia
BOH	Boreal High
BOL	Low Boreal
BOS	Boreal Subalpine
C:N	Carbon to Nitrogen Ratio
CWCS	Canadian Wetland Classification System
ELC	Ecological and Landscape Classification
IEE	Initial Environmental Evaluation
KZK	Kudz Ze Kayah
LSA	Local Study Area
masl	metres above sea level
TAW	Wooded Taiga
TEM	Terrestrial Ecosystem Map
TAS	Taiga Shrub
TUN	Tundra
YBIS	Yukon Biophysical Inventory System
YESAB	Yukon Environmental and Socio-economic Assessment Board
AT	Alpine Tundra
PMG	Pacific Maritime Glacierized
ARDS	Arctic Dwarf Shrub
ARLS	Artic Low Shrub
SUS	Subarctic Subalpine
SUW	Subarctic Woodland

GLOSSARY

Alpine (Bioclimate Zone): High elevation ecosystems occurring at > 1,550 masl associated with mountain environments. Typically comprised of dwarf shrubs, herb/cryptograms, and lichen as the dominant vegetation type. In very high elevation areas, bare rock, colluvium or ice/snow may be the dominant condition.

Bioclimate Region: Bioclimate regions represent areas of broad, relatively homogeneous climatic conditions (Grods & McKenna, 2006).

Bioclimate Subzones: Bioclimate subzones have characteristic vegetation communities reflective of each bioclimate zone: ALP, BOS and BOH.

Bioclimate Unit (Ecosite): Bioclimate units (ecosites) exist within a bioclimate subzone and are organized along a landscape position or toposequence diagram.

Bioclimate Zone: The bioclimate zones are broad areas of similar regional climate that are characterized by distinctive plant communities and their distribution on the landscape (Environment Yukon, 2016).

Boreal Subalpine (Biocliamte Zone): Sparsely forested areas of moderate to high elevation (1,300 – 1,550 masl) situated above the boreal high and below the Alpine zone. The subalpine is a transitional zone from the forested boreal and higher elevation non-forested. Comprised of open canopy conifer forest and tall shrub communities. Subalpine fir is the predominant tree species.

Boreal High (Bioclimate Zone): Middle to upper elevations (900 – 1,300 masl) of forested area found above the boreal low zone in large valleys. Characterized by white and black spruce forests with well developed shrub and moss understories.

Digital Elevation Model: a digital model or 3D representation of a terrain's surface.

Ecodistricts: A subdivision of an ecoregion characterized by relatively homogeneous biophysical and climatic conditions (Smith et al., 2004).

Ecoregion: Ecoregions represent smaller areas of ecozones characterized by distinctive physiography and ecological responses to climate as expressed by the development of vegetation, soil, water, and fauna (Smith et al., 2004).

Ecozone: Ecozones are large and generalized ecological units characterized by interactive abiotic factors. Five ecozones are recognized in Yukon: Southern Arctic, Pacific Maritime, Taiga Plain, Boreal, and Taiga Cordillera. Boreal and Taiga are the dominant units. The Project is in the Boreal and Taiga Cordillera Ecozones (Smith et al., 2004).

Fen: A category of wetland that is fed by mineral-rich surface or groundwater. They are characterized by a neutral pH and are usually dominated by grasses and sedges.

Forb: A herbaceous flowering plant that are found in boreal forest understory and alpine meadows.

Geographic Information System: a computer system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.

Graminoid: Herbaceous plants with a grass-like morphology. Includes the families Poaceae (grasses), Cyperaceae (sedges), and Juncaceae (rushes). Graminoids are often dominant in open habitat comprising grasslands, marshes, and alpine meadows.

Initial Environmental Evaluation: a previous body of work completed at Kudz Ze Kayah in the 1990's by Cominco, which included wildlife baseline surveys.

Local Study Area: the area encompassing a 3km buffer surrounding the proposed Project infrastructure and a 1.5 km buffer around the Tote Road.

Regional Study Area: the area encompassed by Game Management Subzone 10-07. This area was used for wildlife surveys and was selected because of the strong interconnectivity between vegetation cover and composition and wildlife.

Riparian: The interface between terrestrial and river or stream ecosystems.

Yukon Environmental and Socio-economic Assessment Board: an independent arms-length body, responsible for implementation of the assessment responsibilities under the *Yukon Environmental and Socio-economic Assessment Act*.

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1 INTRODUCTION

The main objective in developing an ecosystem map for the Kudz Ze Kayah (KZK) Project and Tote Road areas is to inventory the vegetative communities and growth conditions that currently exist in the local study area (LSA). This baseline information is required by the Yukon Environmental and Socio-economic Assessment Board (YESAB) in the Project Proposal such that impacts to ecosystems from the proposed development can be properly assessed. In addition, the ecosystem information contained within this report and displayed on the Terrestrial Ecosystem Map (TEM), presented in Appendix A, are designed to be used as a tool in making land management decisions as mine development proceeds.

The intended uses for the Project ecosystem map and report are to

- Integrate abiotic and biotic ecosystem components on one map;
- Develop a record of current ecological site conditions that can be used as a framework for monitoring ecosystem response to changes (e.g. climate change, revegetation progress, fire, terrain failures, development footprint);
- Provide basic information on the distribution of ecosystems from which land management decisions can be based;
- Prepare habitat suitability maps for wildlife species of concern;
- Provide in situ templates for revegetation efforts;
- Identify possible locations for seed collection and plant stock that match the environmental conditions of vegetated areas and needs of those requiring revegetation;
- Establish a network of permanent ecological plots reflective of the different ecosystems found in the study area; and
- Establish control ecosystem plots that are near Project area, but remain in a natural state, to represent vegetation and soil characteristics of the areas proposed to be altered.

2 BIOPHYSICAL BACKGROUND

The KZK Project (the Project) is located in the northeastern foothills of the Pelly Mountains, approximately 260 km northwest of Watson Lake, 115 km southeast of Ross River and 24 km south of Finlayson Lake, Yukon (Figure 2-1). The Project area is on the east side of the drainage divide in the Finlayson River watershed, which is part of the Liard River watershed and a large tributary of the Mackenzie River. Elevations in the LSA range from approximately 1,000 m to 1,900 m above sea level (masl). The LSA is comprised of 46 km^2 around the planned mine infrastructure and 78 km^2 along the Tote Road corridor for a total of 124 km^2.

The Project site and associated infrastructure is primarily situated in the subalpine bioclimatic zone, from an elevation of 1,300 masl to approximately 1,550 masl, with some development anticipated to extend into the lower range of the alpine zone (Figure 2-2).

The most common vegetation species found within the study area include scrub birch (*Betula glandulosa*), willows (*Salix sp*.), subalpine fir (*Abies lasiocarpa*), and stands of white spruce (*Picea glauca*) at lower subalpine elevations. Along either side of the Tote Road a mixed forest of white and black spruce (*Picea mariana*) exists. The forests are composed of mainly mature trees (>100 years); some of the white spruce encountered are older (>160 years) and are likely survivors of historic fires.

The riparian systems within the LSA are of two basic types: slow flowing creek/fen complexes with associated wetlands, or faster flowing creeks confined to deep valleys with definitive floodplains, such as Finlayson Creek. The first type of riparian system contains organic substrates derived from sphagnum mosses and graminoids. Acid tolerant plants such as Labrador tea (*Rhododendron groenlandicum*), bog blueberry (*Vaccinium uliginosum*), and cloudberry (*Rubus chamaemorus*) grow in amongst the moss hummocks. The second type of riparian system has a rocky substrate; sediment is composed mostly of sand and gravel. The vegetation associated with this system are tall willows, balsam popular (*Populus balsamifera*) and white spruce on upper terraces.

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KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 2 -1
LOCATION OF KUDZ ZE KAYAH PROJECT

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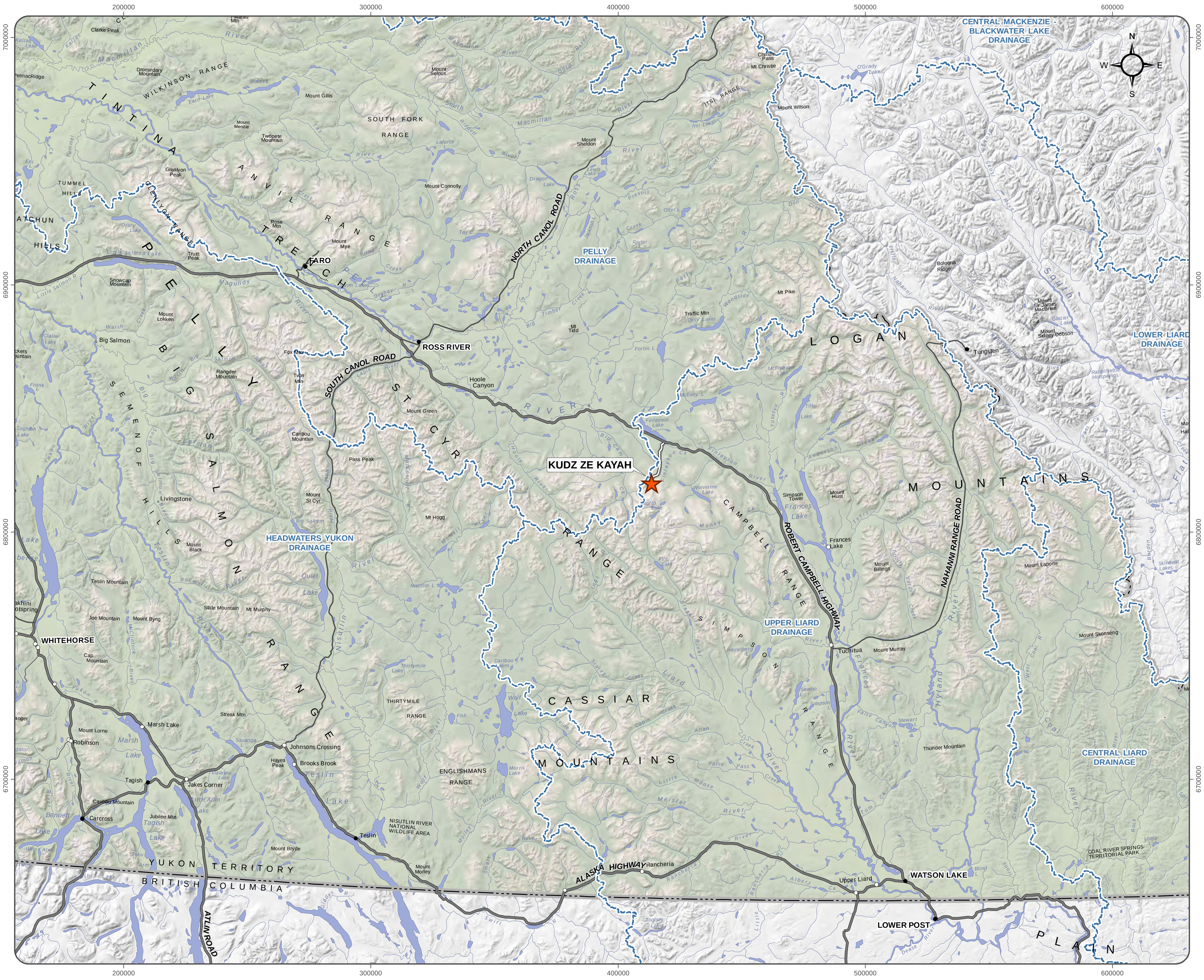

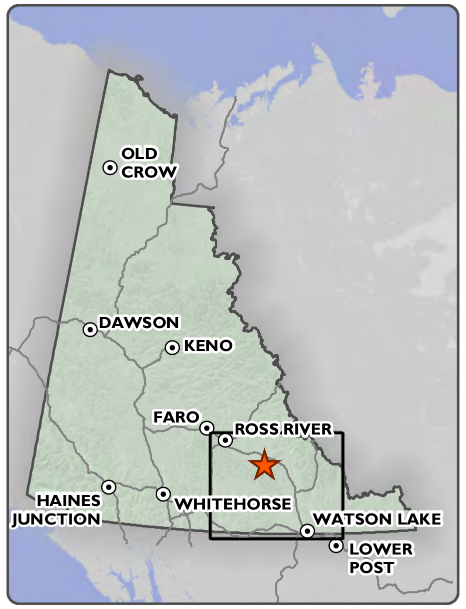

★ KUDZ ZE KAYAH PROJECT

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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.
Drainage areas obtained from National Hydrology Network 2011

Datum: NAD 83; Projection UTM Zone 9N

1:1,500,000 when printed on 11 x 17 inch paper

0 20 40 60 80

Kilometres

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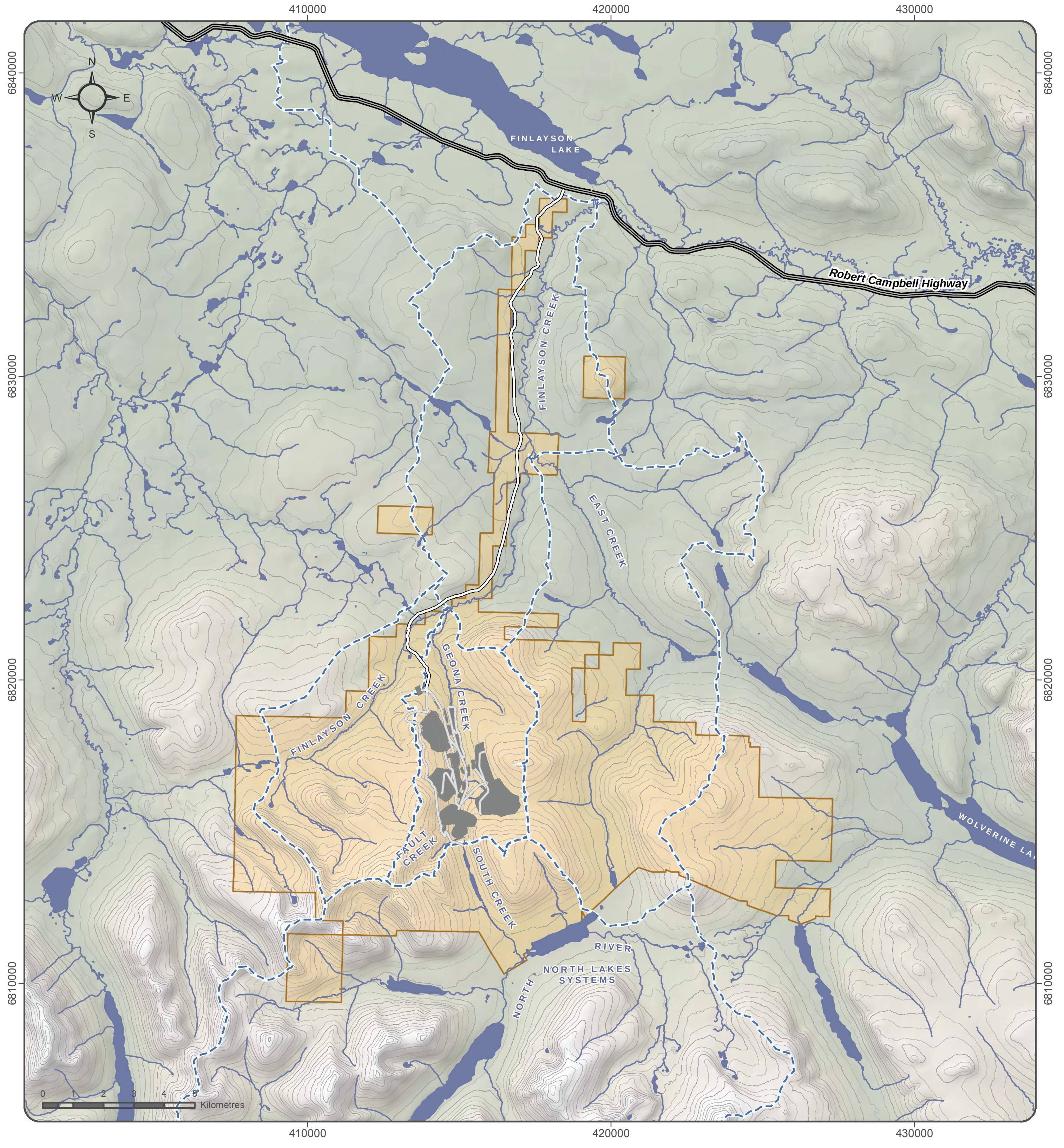

★ Kudz Ze Kayah Project Location

▭ Selected Regional Catchments

■ Location of Proposed Mine Infrastructure

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

═ Robert Campbell Highway

═ Tote Road/Proposed Access Road

— Proposed Mine Road

KUDZ ZE KAYAH PROJECT

FIGURE 2-2

PROJECT SITE OVERVIEW, PROPOSED INFRASTRUCTURE AND EXISTING TOTE ROAD

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Datum: NAD 83; Projection: UTM Zone 9N

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2.1 GLACIAL HISTORY

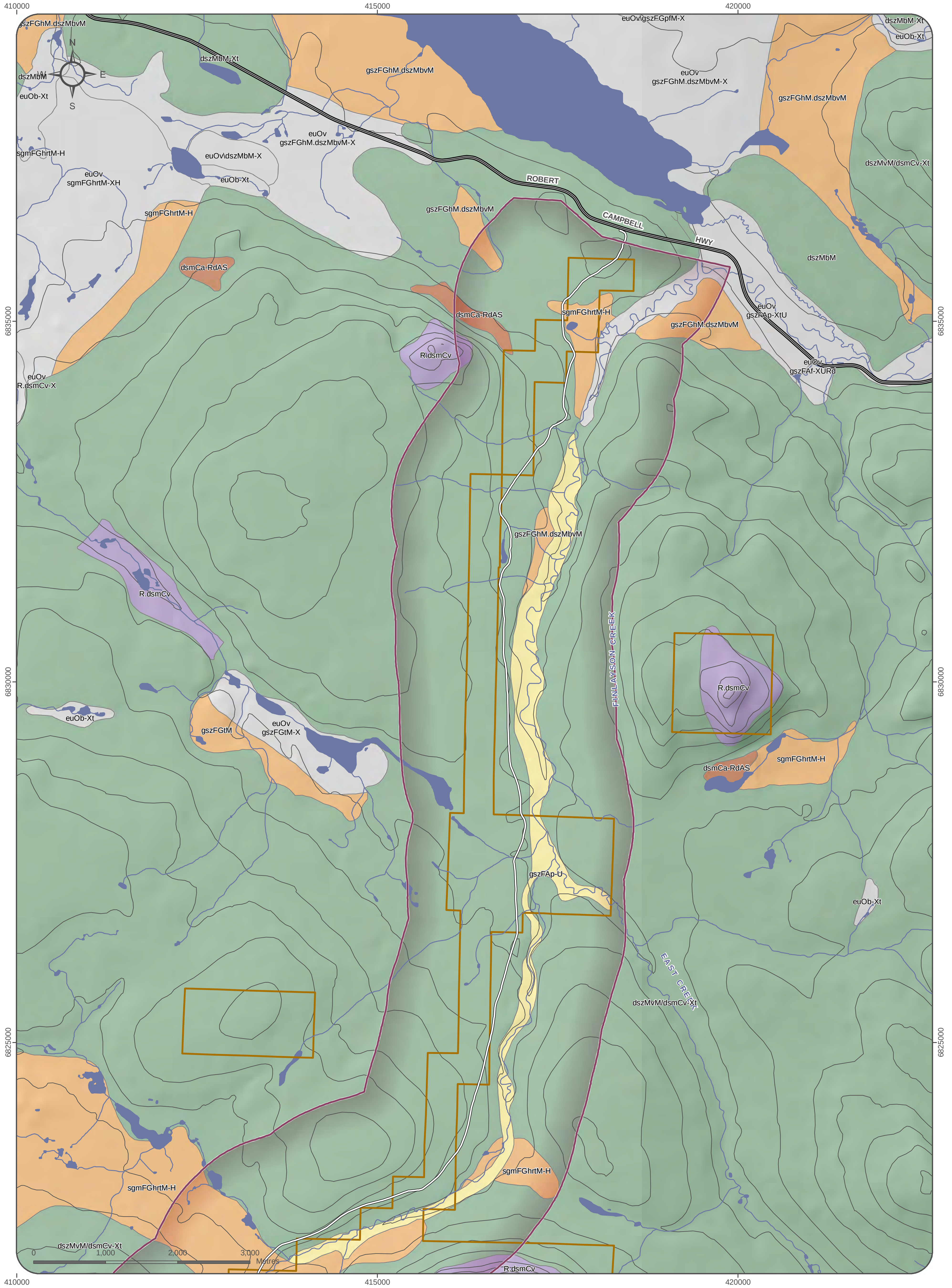
The landscape covering the Project area was formed by past glacial and interglacial activity that occurred during the Quaternary period over the last 2 million years. The most recent ice advances, in geological terms, were the Reid glaciation that occurred at least 200,000 years ago and the McConnell glaciation that occurred 27,000 to 10,000 years ago. The surface features and deposits of the area (NTS map 105G) are associated with the most recent McConnell glaciation, which is believed to have covered south and central Yukon between 26,500 and 10,000 years ago. Late glacial deposition of glaciofluvial sediment and melt out till is common in the Finlayson valley area (Bond, 2001).

The mountains immediate to the Project are rounded. Exposed bedrock shows striations caused by the wear of glacial movement. One sharp edged peak located at the head of Fault Creek, may have existed above the ice cap. It is more characteristic of the taller peaks of the Saint Cyr range of the Pelly Mountains, found south of the Project (AEG, 2015).

2.2 SURFICIAL GEOLOGY

Glacial, periglacial (ice related) and fluvial processes have shaped the local landforms, and are the origin of surficial deposits within the Project area. There are three main surficial deposit types: colluvial, glaciofluvial, and morainal. Colluvial is loose earth material that has accumulated at the base of a slope, through the action of gravity, as piles of talus, avalanche debris, and sheets of detritus moved by soil creep or frost action. Glaciofluvial deposits are the result of water processes from the melting of glaciers and ice sheets. Moraine deposits are the result of direct glacial advancement and retreat. In general, valley bottoms are infilled with sand and gravel deposits from alluvial and glaciofluvial processes, to depths of up to 20 m. There are some glaciofluvial deposits on the west side of Geona Creek near the confluence with Finlayson Creek where a deposit in excess of 40 m thick has been left. Silty sand and gravel till deposits overlie much of the Project area, ranging in thickness from less than 1 m to up to 10 m. The thickness of these deposits generally decreases with increasing elevation. Above about 1,500 masl elevation, the surficial deposits consist of a layer of organic material less than 0.5 m thick, overlying colluvium. The latter originates from frost loosening and shattering of bedrock (AEG, 2015).

The surficial material of the Tote Road and Project area are presented in Figure 2-3 and Figure 2-4, respectively.



Surfical Material

🟫 Colluvium	🟩 Morainal	☐ Local Study
🟨 Fluvial	⬜ Organic	☐ BMC Minerals (No. 1) Ltd. Mineral Claim Areas
🟧 Glaciofluvial	🟪 Bedrock	🟦 Waterbody

═ Tote Road/ Proposed Access Road

— Contour (40 m interval)

— Watercourse

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Datum: NAD 83; Projection: UTM Zone 9N

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KUDZ ZE KAYAH PROJECT

FIGURE 2-3

SURFICIAL GEOLOGY FOR PROJECT TOTE ROAD AREA

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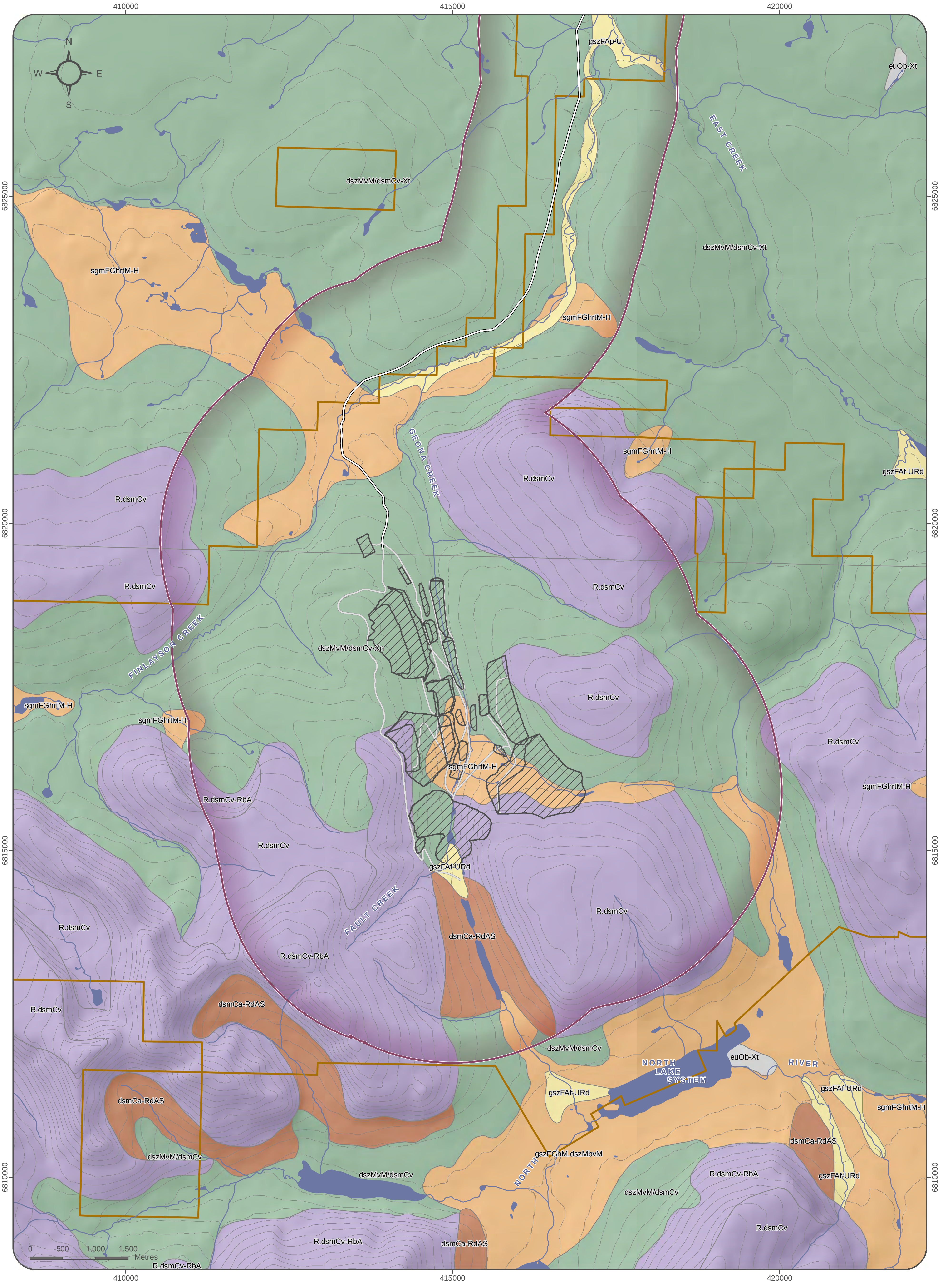

Surfical Material

🟫	Colluvium	🟩	Morainal
🟨	Fluvial Active	⬜	Organic
🟧	Glaciofluvial	🟪	Bedrock

- ▭ Local Study Area
- ▭ BMC Minerals (No. 1) Ltd. Mineral Claim Areas
- ■ Waterbody
- ═ Tote Road/ Proposed Access Road
- ═ Proposed Mine Road
- — Contour (40 m interval)
- — Watercourse

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Datum: NAD 83; Projection: UTM Zone 9N

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KUDZ ZE KAYAH PROJECT

FIGURE 2-4
SURFICIAL GEOLOGY FOR PROJECT AREA

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2.3 TOPOGRAPHY

Topography relates to the physical features of the landscape such as mountains, lowlands, valleys, terraces, and bodies of water. Topography influences the local climate of an area as temperatures are affected by elevation, and the presence of mountains can alter wind direction and precipitation patterns. Local relief ranges from the 1,000 masl elevation at the beginning of the Tote Road to 2,000 masl at the southwestern extent of the Project area.

The Tote Road gradually climbs through a gently rolling plateau that is networked with small creeks and wetland complexes. To the east of the road is Finlayson Creek which lies within a large, steep-sided ravine. At approximately 19 km, the road fords Finlayson Creek and ascends into the Pelly Mountain Range foothills which are characterized by rounded glaciated mountains. The upper Geona Creek valley, where the Project area is situated, is surrounded by larger steeper sided mountain slopes. The valley bottom has been previously dammed by beavers, which has created a series of shallow wetlands strung along Geona Creek. Side valleys east of the Geona Valley are relatively broad and 'U-shaped". The headwaters of tributaries that feed Geona Creek drain small ponds and fens that have collected water, shed from the alpine and subalpine slopes. Tributaries such as Fault Creek, are high velocity streams that have incised the mountain slopes depositing sediment into Geona creek.

2.4 CLIMATE

The Project is considered to be within the Yukon Plateau-North Ecoregion, which is part of the Canadian Boreal Cordillera Ecozone. The upper Geona Valley where the Project is situated is in a transitional climatic zone bordering on three different ecoregions: the Yukon Plateau-North, the Liard Basin to the east, and the higher elevational Pelly Mountains Ecoregion to the south (Smith et al., 2004) (Figure 3-1).

The following climate information was gathered from the historical records provided by seven regional Environment Canada meteorological stations located at Hour Lake, Tuchitua, Ketza River Mine, Swift River, Ross River A, Ross River YTG, and Watson Lake A.

The area has a typical northern interior climate, with cool and short summers and long and very cold winters. The mean annual temperatures range from -4.7°C at Ross River to -2.2°C at Ketza River Mine, and extreme annual temperatures range from -59.4°C at Ross River in December to 35.4°C at Watson Lake in July. The frost-free period is generally 40 to 60 days, although frost can occur in any month. Long-term temperature trends were analyzed at six regional stations (the two Ross River station were combined). All stations displayed an increasing trend over the period of record for average minimum, average maximum, and mean monthly temperatures (AEG, 2016).

Mean annual precipitation ranges from 210.4 mm at Ross River YTG to 709.8 mm at Ketza River Mine and the greatest amount of precipitation typically falls between June and September for all stations. The proportion of total annual precipitation falling as rain ranges from 39% at Ketza River Mine up to 70% at

Ross River and Faro. No clear pattern emerges when looking at long-term total precipitation trends; however, the proportion of total precipitation falling as rain displays an increasing trend at all stations, consistent with the rising trends observed in air temperature (AEG, 2016).

2.5 PERMAFROST

The study area is within the Extensive Discontinuous Permafrost Zone (Yukon Permafrost Network, 2016). Permafrost is defined as ground that remains at or below 0°C for two or more years (Northern Climate Exchange, 2011). Permafrost is commonly encountered under the organic layers that cover the Geona and upper Finlayson valleys. Permafrost is typically located under poorly drained areas, northerly aspects and upper elevations. Permafrost related ground movement or solifluction is apparent on upper to middle elevation slopes (AEG, 2015).

2.6 SOILS

There were thirty soil samples taken in 2015 and 2016 in the LSA which were analyzed for metals, nutrients, pH and texture (see Vegetation Baseline Report). In general, the soils in the LSA are generally slightly acidic sandy loams, and nutrient-poor. Organics occur on gentle slopes and valley bottoms in association with upland bogs and fens found along drainages.

The most common soil order encountered during the 2015 and 2016 ecosystem surveys were cryosols. Cryosols are soils that overlay shallow permafrost (1 to 2 m below the surface) especially on the north aspects in spruce/ feathermoss forests and in the valley bottoms where thick organic layers insulate mineral soils from solar radiation. The other orders of mineral soils encountered within the study area were dystric brunisols found on south facing mountain slopes and old alluvial plains. Regosols are mainly located in the alpine, where soils evolve slowly or floodplain corridors where there is repeated disturbance by high water events. Dystric brunisols and regosols are young soils with a poorly developed B horizon.

2.7 VEGETATION

Since soil is limited and conditions are harsh on mountain tops, only small low-growing plants such as sedges, grasses, forbs, and dwarf shrubs can exist at alpine elevations. Dwarf shrubs are an assemblage of ericaceous plants consisting of four-angled mountain heather (*Cassiope tetragona*), bog blueberry, lingonberry (*Vaccinium vitis-idaea),* crowberry (*Empetrum nigrum*), bearberry (*Arctostaphylos rubra*). Other low growing shrubs that were often observed at these high elevations included: mountain aven (*Dryas integrifolia*), willow species (*Salix arctica, reticulata and polaris*), and diminutive scrub birch.

As the elevation decreases, alpine ecosystems are gradually replaced by the subalpine plant communities. This is commonly a matrix of scrub birch and willows with an occasional stunted subalpine fir poking over the shrub canopy. Meadows also occur in the subalpine zone, populated by grasses, sedges, mosses, and a variety of forb species. On the top of mossy hummocks, the dwarf ericaceous shrubs still persist and

Labrador tea appears. The subalpine fir become larger and tend to grow in isolated clumps; on the mid and lower slopes of the Project area are open to sparse subalpine fir and white spruce forests.

The primary tree species along the Tote Road are white spruce and black spruce. Understorey shrubs include Labrador tea, scrub birch, and willows. Balsam poplar are found along creek sides and were also seen regenerating along the road edges. Trembling aspen (*Populus tremuloides*) are uncommon, but were found along the Tote Road at the Finlayson Creek Bridge on the steep south facing slopes. Small aspen stands were also at lower elevations on well drained soils on moderate to steep south facing slopes. Aspen is a successional species occurring where there has been recent disturbance, such as spot fires or soil erosion.

2.8 FIRE HISTORY

Fires have not been a major influence on vegetation in the Project area; records have been kept since 1946. The main source of disturbance has been anthropogenic from past and current exploration activities.

2.9 PREVIOUS VEGETATION AND SOIL INVENTORIES

Pre-2015 Data

Data collected from the Initial Environmental Evaluation (IEE) in 1995 by Norecol, Dames and Moore (1996) provided an overview of major vegetation types and were named according to the best fit of plot data with those types identified by Geomatics International southeast Yukon study. Ecosystem polygons were delineated on 1:40,000 scale, black and white aerial photography flown in 1992. The polygons were labelled with up to three distinct vegetation associations and an estimated proportion of each association (to the nearest 10%).

The Norecol, Dames and Moore report (1996) identified and detailed five types of forested ecosystem, nine types of shrub ecosystem and three types of herb ecosystem. In addition, the report characterized these vegetation types in terms of suitability for wildlife habitat. See Table 2-1 for a summary of this information.

Table 2-1: Vegetation Types, Abundance, and Habitat Significance from the 1996 IEE

Forested Vegetation Types	Occurrence	Habitat Suitability
Closed-canopy trembling aspen forest	Rare, less than 1% of study area	Limited food for ungulates and carnivores.
Open-canopy subalpine fir forest	Common, 6-10% of study area	Cover for moose and caribou in summer/fall/early winter. Limited use by furbearers.
Open-canopy black spruce forest (on mineral soil)	Abundant, 15% of study area	Early summer range for moose; spring/ fall migrations of caribou; good habitat for black bear, small carnivores, furbearers, small birds. Winter range for caribou north of site.
Open-canopy black spruce forest (on organic soil)	Uncommon, 2-5% of study area	Used by carnivores, furbearers and birds. Winter range for caribou north of site.
Open-canopy white spruce forest	Rare, 1-2% of study area	Cover/food for moose in spring/summer/winter; spring/fall caribou migrations; good habitat for black bear, small carnivores, furbearers, variety of birds.
Shrub Vegetation Types	**Occurrence**	**Habitat Suitability**
Dwarf birch tall shrub: herb poor-moss rich	Common, 10% of study area	Cover/limited food for moose in summer/fall/early winter; cover/limited food for caribou in summer; limited use by carnivores, furbearers, small birds; cover/food for ptarmigan in winter.
Willow tall shrub	Uncommon, 2-5% of study area	Cover/food for moose in spring/summer/fall; cover/food for caribou; food for bears in spring/summer; cover for ptarmigan in winter.
Willow tall shrub: wet, riparian	Uncommon, 2-5% of study area	As above.
Willow-dwarf birch tall shrub: herb rich	Common, 10% of study area	Cover/food for moose in summer/fall; cover for caribou in fall/ early winter; food for bears in summer; ptarmigan year-round.
Willow-dwarf birch tall shrub: herb poor	Common, 6-10% of study area	As above.
Dwarf birch dwarf shrub	Uncommon, 2-5% of study area	Food for caribou in summer/fall/early-winter; some cover/food for ptarmigan.
Willow dwarf shrub	Uncommon, 2-5% of study area	As above.
Subalpine fir tall shrub	Uncommon, 2-5% of study area	Cover for moose, and caribou migrations in summer/fall; habitat for carnivores, furbearers and small birds.
Alpine dwarf shrub	Common, 6-10% of study area	Food for caribou in spring/summer/early winter; cover/food for ptarmigan.
Herb Vegetation Types	**Occurrence**	**Habitat Suitability**
Woodrush herb	Uncommon, 2-5% of study area	Food for caribou in summer/fall.
Wet sedge herb: riparian wetland	Rare, about 1% of study area	Food for bears in summer.
Mesic mixed herb	Uncommon, 2-5% of study area	Food for caribou in summer/fall; food for ptarmigan.

In total, 17 ecosystem types were described from data collected over an elevation range from 1,040 masl at the Tote Road junction with the Robert Campbell Highway to 2,040 masl alpine mountain tops that surround the Project site.

There were two distinctive parts to the study area that were mapped:

1. The higher elevation Geona Creek and surrounding landscape (Project area) located in the shrub dominated subalpine; and

2. Finlayson Creek north of the Geona Creek confluence (Tote Road / proposed access road corridor) generally predominated by boreal forest, grading into shrub vegetation types as it approaches the Project site.

2.10 2015 AND 2016 DATA COLLECTION

In 2015, ground surveys were conducted that described and inventoried the ecosystem types that existed on and around the Project LSA. Nineteen plots were located in the upper Geona area. These plots were marked and staked so relocating them would be easier for future monitoring. Other information collected included ecological conditions, vegetation composition, and percent cover. Soil and vegetation samples were taken for lab analysis to determine metal concentration profiles and plant growth conditions.

In June 2016, new aerial imagery of the Project area was collected by BMC. The new imagery was in colour, at a scale of 1:15,000, and at an enhanced resolution. A review and gap analysis was conducted to determine where changes were warranted in updating the TEM. Polygon boundaries were reassessed and corrected as vegetation changes could be better discerned. In some polygons, vegetation associations were reinterpreted, additional sites selected, and then ground-truthed.

3 TEM BACKGROUND

The discipline of classifying ecosystems within the landscape is referred to as Ecological and Landscape Classification (ELC). This section outlines the different scales, conventions and methods that are used to classify ecosystems from broad scale nationwide classification to fine scale project specific classification. An ecosystem has been defined as “An observable unit of the landscape with relatively uniform vegetation (a plant community) occurring on relatively uniform soil conditions” (ELC, 2012).

3.1 ECOLOGICAL AND LANDSCAPE CLASSIFICATION

The main premise of the Yukon ELC system is that climate is the foundational environmental factor that influences the type of ecosystems found in the territory. The ELC system begins at a broad spatial level and then as the scale increases more detailed information regarding climate, terrain, soil, and vegetation can be integrated such that localized ecosystems can be recognized and classified. Over thirty years of research has gone into developing a Yukon focused ecosystem classification system and a formalized approach is an objective of the ELC (ELC, 2013). One result of the work is a uniform framework for Yukon ecological landscape classification and mapping published by Environment Yukon in 2016. The ecosystem mapping for the Project drew upon the main concepts that are currently recommended by the ELC. However, it must be recognized that information available at this point in time is limited as the ecoregions associated with the Project have only recently been classified to Bioclimate Zone level. Also, there were no previous ecosystem plot data found that was relevant to the location of the Project in the Yukon Biophysical Inventory System (YBIS), so the ecosystem typing is reliant on the limited set of field data collected in the LSA.

The regional classification hierarchy is briefly described below. More information is presented in the 2016 Yukon Ecosystem and Landscape Classification and Mapping Guidelines (Environment Yukon, 2016).

Ecological landscape classification is conducted in a hierarchal structure starting from small generalized scale to increasingly detailed large scale. Three levels of the National Ecological Framework are used in Yukon. From the most generalized to the most detailed they are:

Ecozones

Ecozones are large and generalized ecological units characterized by interactive abiotic factors. Five ecozones are recognized in Yukon: Southern Arctic, Pacific Maritime, Taiga Plain, Boreal, and Taiga Cordillera. Boreal and Taiga are the dominant units. The Project is in the Boreal and Taiga Cordillera Ecozones.

Ecoregions

Ecoregions represent smaller areas of ecozones characterized by distinctive physiography and ecological responses to climate as expressed by the development of vegetation, soil, water, and fauna (Smith et al., 2004). The Project is situated in a transitional climatic zone bordering on three different ecoregions: the Yukon Plateau-North, the Liard Basin to the east, and the higher elevational Pelly Mountains Ecoregion to the south (Smith et al., 2004; Figure 3-1). The Tote Road is entirely within the Yukon Plateau-North Ecoregion.

Ecodistricts

Ecodistricts are defined as subdivisions of ecoregions due to “distinctive climate, landforms and vegetation associations”. Ecodistricts are discrete polygons which nest within ecoregions. The differentiating characteristics of ecodistricts are: regional landform, local surface form, permafrost distribution, soil development, textural group, vegetation cover/land use classes, range of annual precipitation, and mean temperature. Ecodistrict size is a function of regional variability of these defining attributes, and the minimum size is approximately 100,000 ha (McKenna et al., 2010). The Yukon Plateau-North Ecoregion, in which the study area lies, has not yet been classified to the ecodistrict scale by Yukon Government.

The following two ecosystem categories are Territorial-based and reflect climatic interactions with more local landscapes:

Bioclimate Region

Bioclimate regions represent areas of broad, relatively homogeneous climatic conditions (Grods & McKenna, 2006). The location and orientation of major mountain ranges and plateaus, interacting with territorial-scale weather patterns, create distinct regional climates throughout Yukon. Bioclimate regions generally correspond to Yukon ecoregions (Smith et al., 2004), with a few exceptions. There are ten recognized bioclimate regions identified within Yukon, but these are considered provisional as research is still ongoing. The Project is within the northern portion of the Interior Plateau bioclimate region.

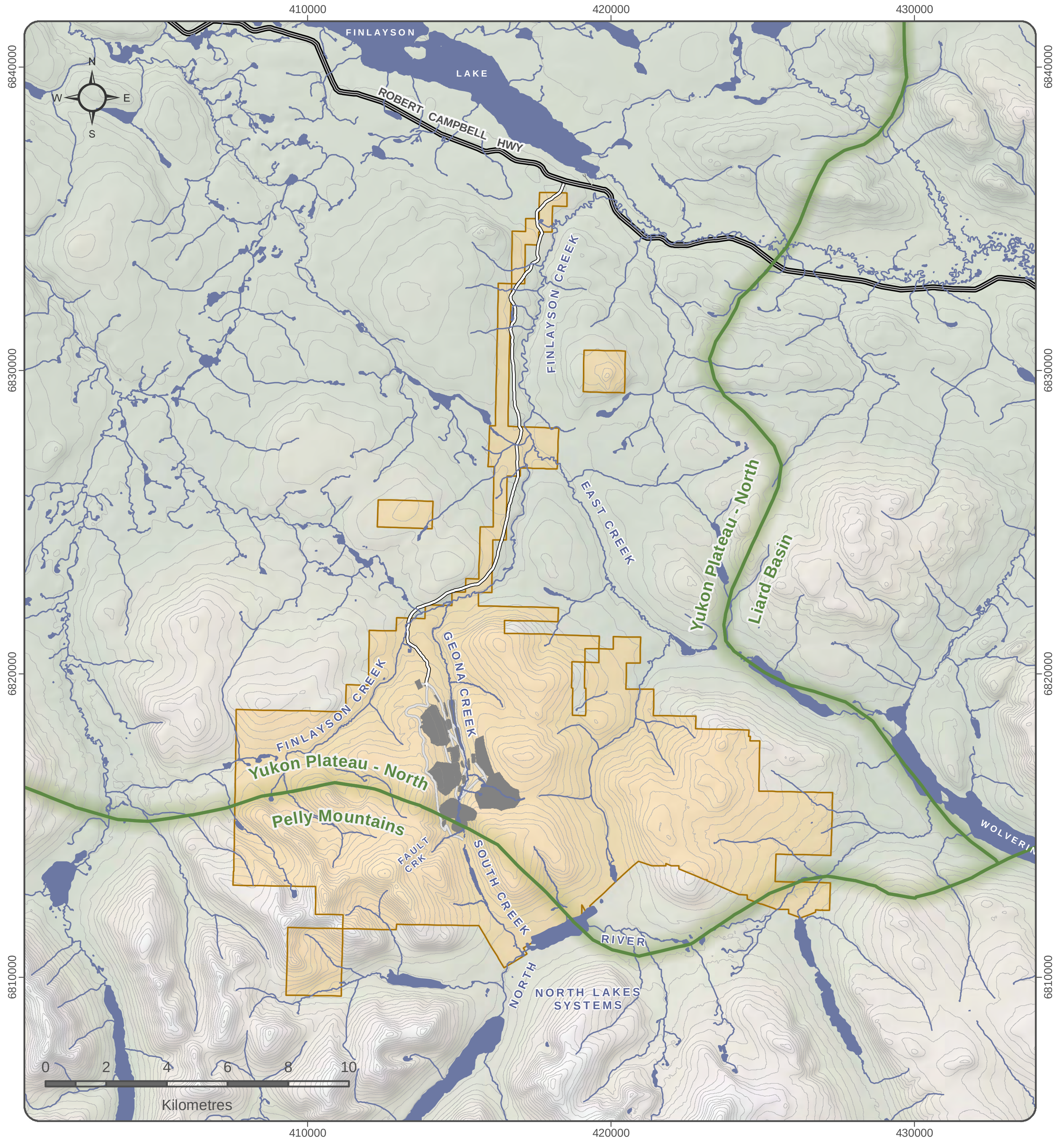
Bioclimate Zone

The bioclimate zones are broad areas of similar regional climate that are characterized by distinctive plant communities and their distribution on the landscape (Environment Yukon, 2016).

Bioclimate zones result primarily from changes in elevation and/or latitude. Within each bioclimate region, a bioclimate zone has a characteristic range in elevation and corresponding temperature and precipitation conditions. In mountainous areas, bioclimate zone boundaries are visible as relatively abrupt changes in general vegetation communities along an elevation gradient. In lower elevations or rolling terrain, bioclimate zone boundaries may be subtle and transitional.

Nine bioclimate zones are recognized in Yukon: Alpine Tundra (AT); Pacific Maritime Glacierized (PMG), Arctic Dwarf Shrub (ARDS), Arctic Low Shrub (ARLS), Subarctic Subalpine (SUS), Subarctic Woodland (SUW), Boreal Subalpine (BOS); Boreal High (BOH), and Boreal Low (BOL) (Environment Yukon, 2016).

The three bioclimate zones that exist within the Project LSA are: Boreal High (BOH), Boreal Subalpine (BOS), and Alpine Tundra (AT). The zones are presented in Table 3-1 and Figure 3-2. At higher latitudes the boundaries of these bioclimate zones decrease in elevation as annual temperatures are lower and soil development and nutrient cycling is slower. In the Project LSA the treeline is at approximately 1,490 masl on northern aspects and 1,550 masl on southern aspects. The LSA is between 1,000 m to 2,000 masl elevation range which excludes the Boreal Low (BOL) bioclimate zone, as its upper elevation extent is below 1,000 masl. The majority of the local study area is in the BOH bioclimate zone.



▭	Ecoregion Boundary
■	Location of Proposed Mine Infrastructure
▨	BMC Minerals (No.1) Ltd. Mineral Claim Areas
═	Tote Road/Proposed Access Road
═	Proposed Mine Road
—	Contour (40 m interval)
—	Watercourse
■	Waterbody

KUDZ ZE KAYAH PROJECT
VEGETATION BASELINE REPORT

FIGURE 3-1
ECOREGION BOUNDARIES NEAR THE KUDZ ZE KAYAH PROJECT AREA

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Datum: NAD 83; Projection: UTM Zone 9N

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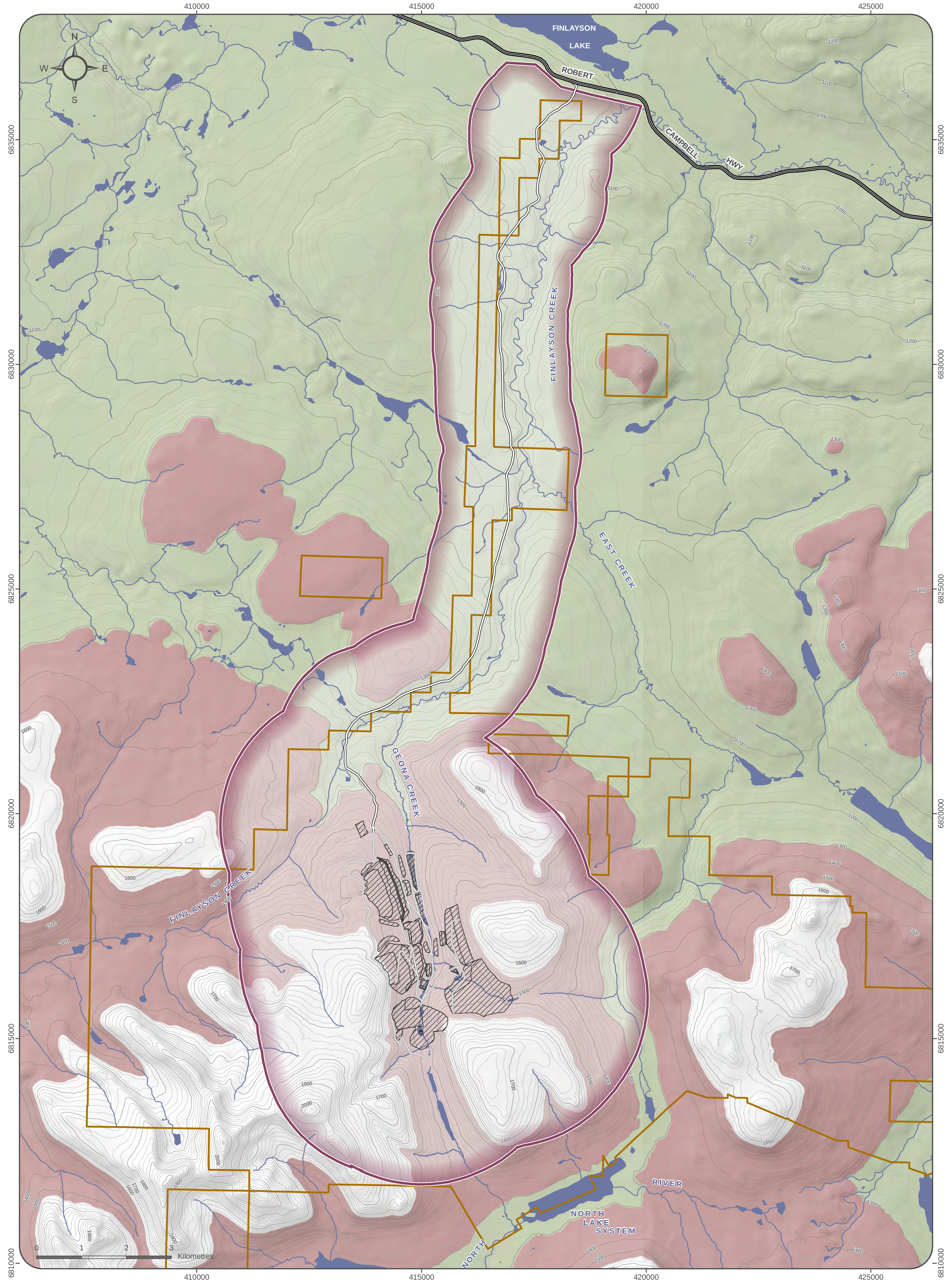

Bioclimate Zone

- 🟩 Boreal High (850-1300m)
- 🟥 Subalpine (1300-1550m)
- ☐ Alpine (>1550m)

- ═ Tote Road/ Proposed Access Road
- ─ Proposed Mine Road
- ─ Contour (20 m interval)
- ─ Watercourse
- ■ Waterbody

- ☐ Local Study
- ▨ Location of Proposed Mine Infrastructure
- ☐ BMC Minerals (No. 1) Ltd. Mineral Claim Areas

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Surficial Geology recieved from Yukon Geological Survey mapped by Jackson, 1993, Rainbow Creek, GSC Mp 1797A

Outlines of the WRSA C (PAC), WRSA B (WPAG) reproduced (hand-digitized) from Figure 2-16 of the Initial Environmental Assessment Report (Cominco, 1996) and represent the Year 9 configuration. They are presented here for context only.

Datum: NAD 83; Projection: UTM Zone 9N

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KUDZ ZE KAYAH PROJECT

FIGURE 3-2

BIOCLIMATE ZONES OF THE PROJECT STUDY AREA

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Table 3-1: Bioclimate Zones and Definitions for the Project Site

Bioclimatic Zone (elevation range)	Percentage of Total Area	Definition
Boreal High (BOH) (850 masl – 1,300 masl)	49.7 km^2 40.0%	Boreal highland forested areas are a mix of subalpine fir with a lichen and moss understory on the majority of the slopes and subalpine fir-willow in drainage areas and upper elevation forests, with white spruce and subalpine fir. The canopy tends to be more open then Boreal Low with a moderate to well-developed shrub layer. Non forested areas include: wetlands, riparian, avalanche tracks, exposed soil/rock and anthropogenic structures.
Boreal Subalpine (BOS) (1,300 masl – 1,550 masl)	49.6 km^2 40.0%	Open to sparse forest canopy cover, main trees species are subalpine fir and white spruce which became less frequent at higher elevations. A well-developed shrub layer composed mainly of scrub birch, willow and *Vaccinium* ssp. replaced forest cover with only a few widely scattered subalpine fir. At the higher extent of this zone small woody shrubs, Dryas, mosses and lichen grew on exposed bedrock or talus piles.
Alpine (ALP) (1,550 masl+)	25.0 km^2 20.0%	Alpine communities include dwarf ericaceous shrubs (*Ericaceae*), scrub birch, willow, grass/sedges (*Gramineae*), forbs, lichen and often gravel, talus and bedrock at elevations above tree line.

Bioclimate Subzones

Bioclimate subzones have characteristic vegetation communities reflective of each bioclimate zone: ALP, BOS and BOH. Different ecoregions are influenced by different climates. For example, the plant communities that grow in the Kluane and Ruby Range bioclimate region will be different than in the Interior Plateau bioclimate region. The Interior Plateau ecoregion and adjacent ecoregions have not been subdivided into bioclimate subzones at the time this report was written.

Bioclimate Unit (Ecosite)

Bioclimate units (ecosites) exist within a bioclimate subzone and are organized along a landscape position or toposequence diagram. Toposequence diagrams illustrate the characteristics that define how ecosites occur at predictable locations on the landscape based on slope, aspect, surficial material, and nutrient and moisture regime (Environment Yukon, 2016). A reference ecosite is a site that best reflects the climate of that specific bioclimate subzone. The reference ecosite would be in a neutral landscape position that has an equal water balance where moisture is accumulated and dissipated at a similar rate. The nutrient content of the soil is average and the aspect of the slope would be orientated where exposed to a moderate amount of solar radiation.

Characteristics of a reference ecosite include:

- Flat to moderate slopes;
- Middle slope position that is neither shedding or receiving excess water;
- Medium soil texture (loam);
- Medium nutrient regime;
- Moderately well-drained soils; and

- No root restricting layers.

Ecosites are defined based on moisture and nutrient availability and landscape position (Figure 3-3). Ecosites are the most detailed division of ecosystem classification and are applied at a large scale (Figure 3-4). For example, a ridge would shed water faster than it would collect water, so this landscape position would be considered dry and nutrient poor in relation to the reference site. As described above, a reference ecosite is an ecosystem unit that best reflects the local climate. Other ecosites within the same bioclimate zone are compared to the reference site according to the differences in moisture and nutrient availability and landscape position. So, lower slopes would be moister, richer sites with vegetation associations that have plants that require more water for growth, as opposed to higher or more exposed sites that would host different plants that are drought resistant. Ecosites have characteristic vegetation associations that are described based on their mature or relatively stable successional phase.

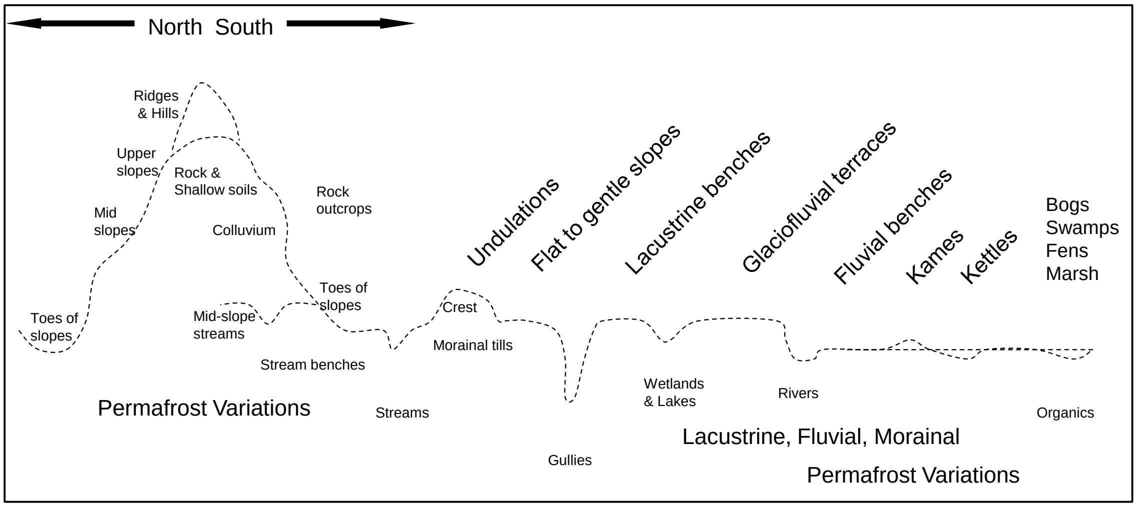


Figure 3-3: Generic Toposequence Diagram (Adapted from ELC, 2012, p.29)

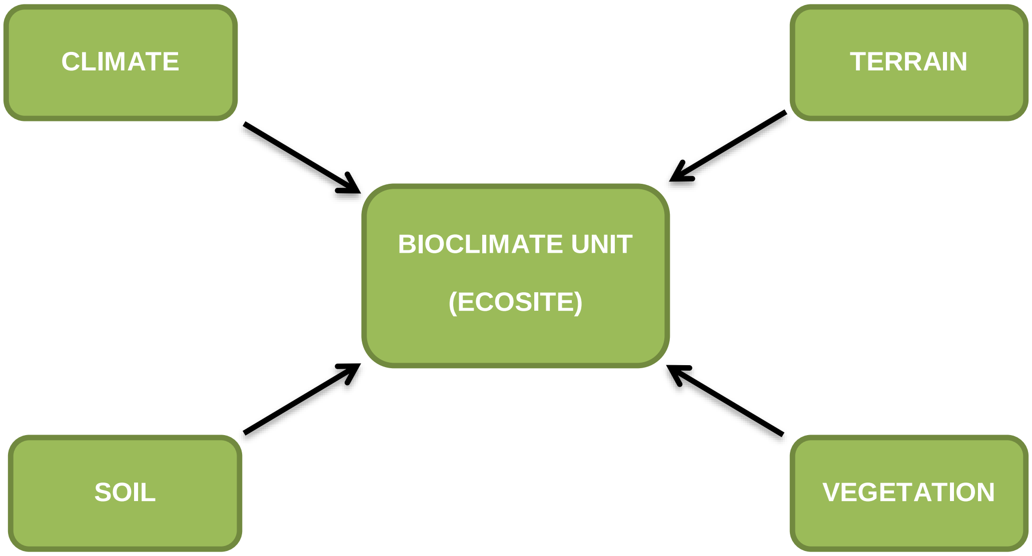


Figure 3-4: Components of an Bioclimate Unit (Adapted from ELC, 2012, p.7)

3.2 ECOSYSTEM POLYGONS

Uniform landscape features may have similar vegetative patterns, but not host a homogenous ecosystem. Often there are small-scale differences in moisture and nutrient availability that foster variation in plant communities sharing similar landscape position. As an example, in the subalpine there can be extensive swaths of willows and scrub birch with a moss groundcover intermixed with wet meadows composed of graminoids and forbs due to subsurface groundwater seeps. These two different ecosystems are grouped into one polygon as the mosaic of these two ecosystems form a recognizable and distinct pattern in comparison to neighboring areas.

Each ecosite is identified on the ecosystem map using an alphanumeric code. The alpha portion, or letter codes, describes the vegetative part of the unit, referring to the dominant and/or indicator plants present in that ecosystem type. The letter codes and names of the plants they represent are provided in Table 3-2. The numeric code is a number that represents the relative moisture regime that a particular plant community is correlated to and these are presented in Table 3-2.

Table 3-2: Edatopic Codes Groupings Representing Soil Moisture Conditions and Landscape Locations (adapted from Environment Yukon, 2016).

Numeric Code	Landscape Locations	Soil Moisture Condition
01	Reference site	Mesic
02-19	Upland	Xeric to dry
20-39	Upland	Mesic to moist
40-49	Wetland	Moist to wet
50-69	Fens, marshes, swamps	Wet, seasonal fluctuations
70-79	Shallow open water	Wet, year-round

Larger wetlands: fens, marshes, swamps, and open water will be classified by Canadian Wetland Classification System (CWCS) (see Section 7) and are shown on the map.

When two ecosystem codes are needed, deciles are put in front of each ecosystem unit to indicate the percentage of each unit that is present in the polygon. An example ecosystem unit code is as follows:

60% ecosite 01, sandy silt, e-alpine fir-scrub birch-willow-feathermoss, mature forest

↖

(6)01SZ-FEsWiFm6
(4)23SZ-EsWiFm-3b-Cv/M

↙

40% ecosite 23, sandy silt, scrub birch-willow-feathermoss, high shrub on colluvial moraine

Plant associations change in response to different soil moisture and nutrient regimes. Many northern plants have broad growth requirements and thrive over a variety of site conditions. An example of such a generalist plant is scrub birch (*B. glandulosa*) which can be found in subxeric to wet sites, as well as in nutrient poor to rich sites. Scrub birch is ubiquitous throughout the Project LSA, and in Yukon as a whole due to its generalist growth requirements. In contrast, some other plants are specialists and need a particular set of growth conditions. These plants are considered indicator plants, their presence indicates specific growth conditions and are helpful in assessing the nutrient and moisture conditions of a site. An example of an indicator plant is mountain monkshood (*Aconitum delphinifolium*), usually restricted to moist and nutrient rich meadows.

Vegetation Codes

The list of plants used in representing vegetation associations are presented with their common and Latin names and the codes used in labelling the TEM ecosystem polygons are presented in Table 3-3. This tables also presents the letter codes for plants assigned to represent the ecosystem where they dominate percent cover and/or are indicators of specific site conditions (e.g., sphagnum moss indicates high moisture and poor nutrient conditions often found in lowlands).

Table 3-3: Plant Codes

Code Letters	Botanical Name	Common Name
A	*Populus tremuloides*	Trembling aspen
Auco	*Aulacomnium palustre*	Glow Moss
B	*Populus balsamifera*	Balsam poplar
Caaq	*Carex aquatilis*	Water sedge
Cl	*Cladina sp.*	Reindeer lichen
Cx	*Carex sp.*	Sedge species
Ds	*Low growing shrubs commonly found in the Alpine and Subalpine includes members of Genera: Vaccinium, Arctostaphylos, Cassiope, Empetrum, Dryas and low growing willows.*	Dwarf shrubs
Emni	*Empetrum nigrum*	Crowberry
Er	*Eriophorum sp.*	Cottongrass
Es	*Betula glandulosa*	Shrub birch
Eq	*Equisetum sp.*	Horsetails
F	*Abies lasiocarpa*	Subalpine fir
Fb	*Herbaceous plants*	Forb species
Fm	*Pleurozium schreberi, Hylocomnium splendens*	Feathermoss
Gr	*Grasses, Juncus, Luzula*	Graminoids
He	*Cassiope tetragona*	Arctic White Heather
Li	*Mainly refers to Cladina, Cladonia and Stereocaulon sp.*	Lichen species
Lu	*Lupine arcticus*	Arctic Lupine
Mo	*Dicranium, Aulacomnium, Tomenthypnum, Polytrichum, Calliergon*	Mosses (other than feather moss or sphagnum)
Rh	*Rhododendron groenlandicum*	Labrador tea
Sb	*Picea mariana*	Black spruce
Sire	*Salix reticulata*	Net-veined willow
Sp	*Sphagnum species*	Sphagnum moss
Sw	*Picea glauca*	White spruce
Wi	*Salix sp.*	Willow species
Non-vegetation Codes		
R		Bedrock
TA		Talus
W		Water

Plant associations are denoted by using a combination of up to four plant codes. The ecosite label has the numeric code representing the site soil moisture and nutrient conditions (Table 3-2) in the beginning, followed by the phase. The ecosite phase indicates a soil property that has a strong effect on growth conditions; for example, a high percentage of coarse fragments will reduce moisture retention at the site regardless of slope position. Not all ecosite units have a designated phase. The most representative plant association of the polygon is the next component (i.e., FEsWiFm denotes Subalpine fir forest with scrub birch and willow understorey and feathermoss as the predominant groundcover).

Structural Stages

The structural stage category (Table 3-4) is used to describe the existing dominant stand appearance or physiognomy. The ecosystem unit stand structure substages can be used to better differentiate non-forested categories (e.g., forb-dominated 2a, versus graminoid-dominated herb stage 2b). Table 3-4 is adapted from *B.C. Field Manual for Describing Terrestrial Ecosystems* (BC MoFR and BC MoE, 2010).

Table 3-4: Structural Stages and Codes

Number Code	Stage and Substages	Description of Stage
1	Sparse/Bryoid	Initial stages of primary and secondary succession; bryophytes and lichens often dominant, can be up to 100%; time since disturbance less than 20 years for normal forest succession, may be prolonged (50–100+ years) where there is little or no soil development (bedrock, boulder fields); total shrub and herb cover less than 20%; total tree layer cover less than 10%.
1a	Sparse	<10% vegetation cover.
1b	Bryoid	>50% Bryophyte and lichen in vegetation cover.
2	Herb	Early successional stage or herbaceous communities maintained by environmental conditions or disturbance (e.g., snow fields, avalanche tracks, wetlands, grasslands, flooding); dominated by herbs (forbs, graminoids, ferns); some invading or residual; tree layer cover less than 10%, shrub layer cover less than or equal to 20%, herb cover >20%.
2a	Forbs	Forb-dominated communities (greater than 1/2 of the total herb cover) by non-graminoid herbs, including ferns.
2b	Graminoids	Graminoid dominated. Herbaceous communities dominated (greater than 1/2 of the total herb cover) by grasses, sedges, reeds, and rushes.
2c	Aquatic	Aquatic herbaceous communities dominated (greater than 1/2 of the total herb cover) by floating or submerged aquatic plants; does not include sedges.
2d	Dwarf Shrubs	Dwarf shrub communities dominated (greater than 1/2 of the total herb cover) by dwarf woody species such as four-angled mountain heather (*Cassiope tetragona*), bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea),* crowberry (*Empetrum nigrum*), bearberry (*Arctostaphylos rubra*) and prostrate growing willows e.g. *Salix reticulata,* (See list of dwarf shrubs assigned to the herb layer in the *Field Manual for Describing Terrestrial Ecosystems)*.
3	Shrub/Forb	Early successional stage or shrub communities maintained by environmental conditions or disturbance (e.g., snow fields, avalanche tracks, wetlands, grasslands, flooding, intensive grazing, intense fire damage); dominated by shrubby vegetation; seedlings and advance regeneration may be abundant; tree layer cover less than 10%, shrub layer cover greater than 20% or greater than or equal to 1/3 of total cover.
3a	Low Shrub	Low shrub communities: dominated by shrub layer vegetation less than 2 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; seedlings and advance regeneration may be abundant; time since disturbance less than 20 years for normal forest succession.
3b	High Shrub	Tall shrub communities: dominated by shrub layer vegetation that are 2–10 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; seedlings and advance regeneration may be abundant; time since disturbance less than 40 years for normal forest succession.
4	Pole Sapling	Dense growth, have overtopped shrub and herb layers; younger stands are vigorous (usually greater than 15 years old); self-thinning and vertical structure not yet evident in the canopy – this often occurs by age 30 in vigorous broadleaf stands, which are generally younger than coniferous stands at the same structural stage; time since disturbance is usually less than 40 years.
5	Young Forest	Self-thinning has become evident and the forest canopy has begun differentiation into distinct layers (dominant, main canopy, and overtopped); vigorous growth and a more open stand than in the pole/sapling stage; time since disturbance is generally 40–80 years.
6	Mature Forests	Trees established after the last disturbance have matured; a second cycle of shade tolerant trees may have become established; understories become well developed as the canopy opens up; time since disturbance is generally 80–140 years.
7	Old Forests	Old, structurally complex stands composed mainly of shade-tolerant and regenerating tree species, although older seral and long-lived trees from a disturbance such as fire may still dominate the upper canopy; snags and coarse woody debris in all stages of decomposition typical, as are patchy understories; time since disturbance generally greater than 140 years.

Soil Moisture Regime

Moisture regime is classified between 0 and 9, based on an assessment of environmental factors, soil properties, and indicator plants (Table 3-5). The definitions for classes are based on the *B.C. Field Manual for Describing Terrestrial Ecosystems* (BC MoFR and BC MoE, 2010).

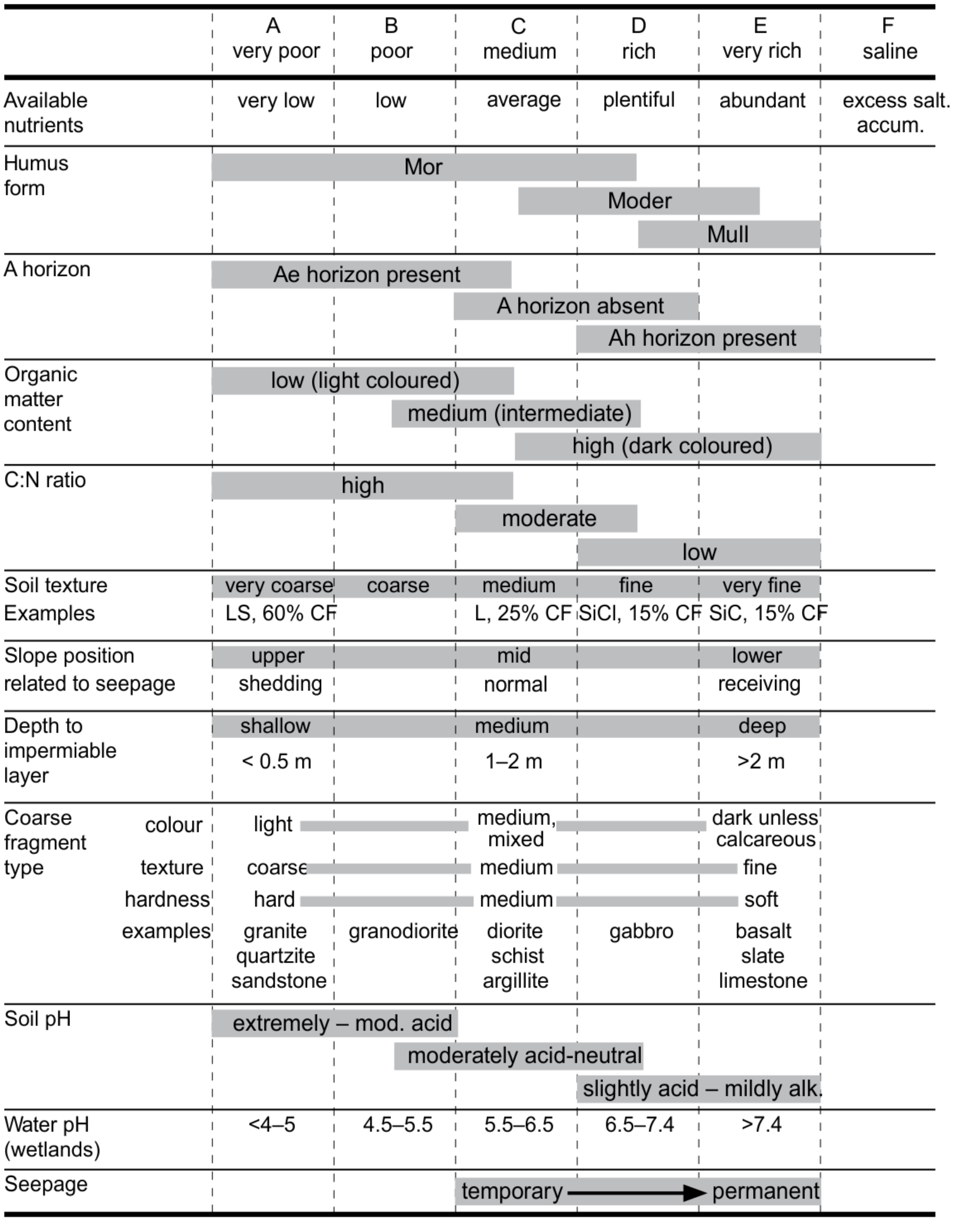
Table 3-5: Soil Moisture Regime Classes

Number Code	Moisture Regime	Description
0	*Very Xeric*	Water removed extremely rapidly in relation to supply; soil is moist for a negligible time after precipitation. Precipitation is the primary water source.
1	*Xeric*	Water removed very rapidly in relation to supply; soil is moist for brief periods following precipitation. Precipitation is the primary water source.
2	*Subxeric*	Water removed rapidly in relation to supply; soil is moist for short periods following precipitation. Precipitation is the primary water source.
3	*Submesic*	Submesic: water removed readily in relation to supply; water available for moderately short periods following precipitation. Precipitation is the primary water source.
4	*Mesic*	Water removed somewhat slowly in relation to supply; soil may remain moist for a significant, but sometimes short period of the year. Available soil moisture reflects climatic inputs. Precipitation in moderate- to fine-textured soils and limited seepage in coarse-textured soils is the primary water source.
5	*Subhygric*	Water removed slowly enough to keep soil wet for a significant part of growing season; some temporary seepage and possibly mottling below 20 cm. Precipitation and seepage are the primary water sources.
6	*Hygric*	Water removed slowly enough to keep soil wet for most of growing season; permanent seepage and mottling; gleyed colours common. Seepage is primary water source.
7	*Subhydric*	Water removed slowly enough to keep water near at or near surface for most of year; gleyed mineral or organic soils; permanent seepage <30 cm below surface. Seepage or permanent water table is primary water source.
8	*Hydric*	Water removed so slowly that water table is at or above soil surface all year; gleyed mineral or organic soils. Permanent water table is primary water source.

Nutrient Regime

Nutrient regime is classified between A and F, based on an assessment of soil properties, indicator plants and site characteristics (Table 3-6). Very rich (E) and saline (F) soil nutrient regimes were not found within the study area and are unlikely to exist due to poor soil and low average temperatures. The definitions for nutrient regimes are based on the *B.C. Field Manual for Describing Terrestrial Ecosystems* (BC MoFR and BC MoE, 2010).

Table 3-6: Nutrient Regime Classes and Relationship to Soil Properties



		A very poor	B poor	C medium	D rich	E very rich	F saline
Available nutrients		very low	low	average	plentiful	abundant	excess salt. accum.
Humus form		Mor					
				Moder			
					Mull		
A horizon		Ae horizon present					
				A horizon absent			
					Ah horizon present		
Organic matter content		low (light coloured)					
			medium (intermediate)				
				high (dark coloured)			
C:N ratio		high					
				moderate			
					low		
Soil texture		very coarse	coarse	medium	fine	very fine	
Examples		LS, 60% CF		L, 25% CF	SiCl, 15% CF	SiC, 15% CF	
Slope position		upper		mid		lower	
related to seepage		shedding		normal		receiving	
Depth to impermiable layer		shallow		medium		deep	
		< 0.5 m		1–2 m		>2 m	
Coarse fragment type	colour	light		medium, mixed		dark unless calcareous	
	texture	coarse		medium		fine	
	hardness	hard		medium		soft	
	examples	granite quartzite sandstone	granodiorite	diorite schist argillite	gabbro	basalt slate limestone	
Soil pH		extremely – mod. acid					
			moderately acid-neutral				
					slightly acid – mildly alk.		
Water pH (wetlands)		<4–5	4.5–5.5	5.5–6.5	6.5–7.4	>7.4	
Seepage				temporary →		permanent	

Modified from Banner et al. 1993 abd LMH25 1st Ed.

Surficial Material (Parent Material)

The surficial material codes have been adopted from *B.C. Field Manual for Describing Terrestrial Ecosystems* (Table 3-7) (BC MoFR and BC MoE, 2010). There have been a few modifications to the codes for this project: Gf is the code used for Glacial fluvial to make it easier to label maps. Fluvial is used to indicate upper stream reaches and where the stream channel is more confined.

Table 3-7: Surficial Material Classes

Letter Code	Surficial Material	Description
C	Colluvial	Colluvium is gravity eroded material existing along or at the base of slopes. Colluvium may consist of unsorted sediments, broken rock or any combination of material.
Gf	Glaciofluvial	Deposits consisting of boulder, cobbles, sand and silt from active or post glacial melt waters. Usually sorted in layers, sources of aggregates.
Gl	Glaciolacustrine	Glacial Lacustrine landforms are composed of sediments that were deposited in post-glacial standing water environments, generally post-glacial lakes. Glacial lacustrine sediments are typically fine-sandy and/or silty in texture. This parent material is likely under the deep organic layers found in the valley bottom.
F	Fluvial	Used to indicate creek deposits in channel, flood plain and terraces along active or recently active river or stream systems.
I	Ice	Ice includes any surface exposed, multi-annual ice body that is relatively persistent from year-to-year. Ice parent materials are generally considered to be glaciers.
L	Lacustrine	Lacustrine landforms are composed of lake sediments deposited following the post-glacial period (differentiated from Glacial Lacustrine). Some lakes may drain rapidly exposing lake bottom sediments. Other situations would include slow processes of eutrophication converting an aquatic environment to a terrestrial landform.
M	Morainal till	Glacial (Morainal) Till landforms are composed of unsorted sediment, gravel and rocks that were transported and deposited by glaciers. Sediment texture, stoniness and drainage are highly variable. Till is the dominant parent material for most Upland Landscape Types in Central Yukon.
O	Organic	Organic landforms are composed of poorly decomposed organic materials greater than 40 cm in thickness. Organic landforms generally occur in low-lying, poorly drained depression sites. Organic materials originate primarily from slowly decomposing plant material.
R	Rock	Bedrock landforms may occur throughout the landscape and are defined anywhere bedrock is exposed at the surface. Shallow, weakly developed soils are commonly associated with bedrock, <10% vegetation.
W	Water	Open water such as wetlands, lakes and creeks.

4 TEM SCOPE

The Terrestrial Ecosystem Map (TEM) scope focused on building upon and refining the previous ecosystem map that was completed in 1995 by Norecol, Dames and Moore Ltd. as part of the Initial Environmental Evaluation (IEE). The scope focused on checking and refining the existing polygons along with extending the mapped area to the east and west of the Project site to model similar ecosystems as control sites. The activities that were conducted included:

- Gathering updated remote imagery for the LSA;
- Developing a preliminary ecosystem map from the new imagery and 1995 vegetation map;
- Ground-truthing the draft map through ecosystem plots, ground inspection and visual checks;
- Establishing permanent/control ecological plots for monitoring; and
- Analyzing the field data to create the TEM map and report.

A considerable amount of the scoped work scheduled for 2015 was dependent on receiving updated georeferenced aerial imagery that covered the extent of the LSA. However, imagery was not available until June 2016. Once the new aerial imagery was received the TEM was expanded and refined for the whole LSA and subsequent field work was undertaken in 2016 to validate the desktop interpretation.

4.1 PROJECT AREA

The Project LSA boundary extends roughly in a three-kilometre buffer around the proposed Mine site infrastructure and has an area of 78 km^2. A portion of this LSA was previously mapped by Norecol, Dames and Moore Ltd. in 1995. The objective for 2015 and 2016 was to check, refine, and expand the TEM to include the entire LSA.

4.2 TOTE ROAD

The Tote Road LSA boundary extends in a 1.5 kilometre buffer around the current alignment of the Tote Road and has an area of 46 km^2. This extent was previously mapped by Norecol, Dames and Moore Ltd. in 1995. The 2015 and 2016 TEM first used the aerial imagery captured by Geographic Air Survey Ltd. in June 1992 that was georeferenced in-house in 2015 to refine the 1995 vegetation polygons. The 2016 georeferenced aerial imagery was then used to further refine polygon boundaries and vegetation interpretations.

5 TEM METHODS

The British Columbia Terrestrial Ecosystem Mapping inventory standard for 1:20,000 scale mapping was used to develop a sampling methodology for describing and mapping the Project's ecosystem units (Resource Inventory Committee, 1998). Ideally, this provides a uniform technique that permits both air photo interpretation and field data collection to contribute to describing vegetation, soil and terrain characteristics. The methodology for TEM mapping can be broken down into the following phases:

- Aerial photography interpretation;
- Ground-truthing and ecosystem plot establishment;
- Integration of field data into site unit codes for ecosystem polygons; and
- Development of a TEM.

The Kudz Ze Kayah Project TEM is provided in Appendix A.

5.1 AERIAL PHOTOGRAPHY INTERPRETATION

Data Available

Initial aerial imagery for the Project was acquired in 1995 by Lamerton & Associates Professional Surveyors Ltd. The photos were captured at a scale of 1:10,000 and were georeferenced using photogrammetry by Lamerton & Associates Ltd. in 2015. In June of 2016, full colour aerial imagery was acquired from Eagle Mapping. Imagery captured at a resolution of 30 cm at a scale of 1:15,000 and was then used to update and delineate polygons for the remaining portion of the LSA, check interpretations, and guide 2016 ground-truthing field work.

The preliminary vegetation classification delineation was done digitally using ArcGIS Desktop 10.3 and PurVIEW a digital stereoscope program for viewing and interpreting aerial imagery in ArcGIS. With the digital capabilities of ArcGIS many additional datasets were used to construct the preliminary ecosystem units. Datasets vary in precision and accuracy and are listed below for the Tote Road and the Project site (Table 5-1).

The elements considered for polygon delineation included: species composition, crown closure, stand structure, aspect, elevation, slope, and tree/shrub heights. Once the entire study area was delineated, a draft map was created. This map displayed the traced vegetation cover boundaries (polygons) on top of a colour mosaic of the aerial imagery and was used to guide the subsequent ground-truthing field work.

Table 5-1: Supplementary Data for Ecosystem Polygon Delineation

Tote Road Data	Project Site Data
Elevation - 2016 1 m DEM from aerial imagery	**Elevation -** 2016 1 m DEM from aerial imagery, 2015 Lidar 1 m digital elevation model, 1 m LiDAR derived contours
Surficial Geology - Jackson 1986 Terrain inventory, Finlayson Lake, Yukon Territory. Geological Survey of Canada, 1:125,000 scale	**Surficial Geology -** Jackson 1986 Terrain inventory, Finlayson Lake, Yukon Territory. Geological Survey of Canada, 1:125,000 scale.
Base data - Canvec 1:50,000 base watercourses and waterbodies	**Base data** - 2015 LiDAR derived watercourses and waterbodies**,** 1995 photogrammetrically derived watercourses and waterbodies, Canvec 1:50,000 base watercourses and waterbodies.
Ecological Data – 2014 Bioclimatic zones of Yukon, Yukon government Ecological and Landscape Classification. 2004 Ecoregions of the Yukon, 2006 Vegetation Inventory Mapping 1:50,000 Yukon Government Department of Forestry, Yukon Biophysical Inventory System*, 1995 Vegetation mapping, Norecol, Dames and Moore Ltd.	**Ecological Data –** 2014 Bioclimatic zones of Yukon, Yukon government Ecological and Landscape Classification. 2004 Ecoregions of the Yukon, 2006 Vegetation Inventory Mapping 1:50,000 Yukon Government Department of Forestry, Yukon Biophysical Inventory System*, 1995 Vegetation mapping, Norecol, Dames and Moore Ltd.

**Yukon Biophysical Inventory System online database was checked and no existing plots were located in a 25 km proximity of the local study area*

Polygon boundaries, as presented in the ecosystem map show vegetative changes as discrete boundaries, whereas in situ vegetative changes on the landscape can occur gradually with no sudden demarcation. Canopy cover and species composition can differ throughout a polygon depending on microtopography and small scale disruptions. At best, polygons drawn from aerial photographs are based on average floristic characteristics of the tree and shrub layers. Understory vegetation, such as forbs, graminoids, and mosses cannot be discerned from aerial photographs at the provided scale and require field checks.

5.2 GROUND-TRUTHING AND ECOSYSTEM PLOTS

Prior to commencing field surveys, polygons created from aerial photography interpretation were reviewed and a number of polygons were selected to be visited. These polygons were representative of prominent types of ecosystem units including unique ecological areas such as rock outcrops and wetland complexes, high wildlife value, and areas difficult to define from aerial photography. Some polygons that were difficult to access were viewed from a vantage point or from the air, parameters were estimated from a distance such as the tree/shrub species, aspect, slope, and growing conditions.

The ground surveys were conducted during two field programs in 2015 and one in 2016. The first field program occurred from 22 June to 27 June 2015 focusing primarily on the Tote Road corridor while the second program occurred from 29 July to 2 August 2 2015 focusing on the Project area and control locations outside of the expected zone of influence. In 2016 the new aerial imagery provided better resolution and covered the whole of the LSA including the Tote Road corridor. Additional ground plots were established and characterized from July 30 to August 4 2016 to fill information gaps on vegetation associations, to develop edatopic grids and toposequences for ecosite units, and to increase the overall accuracy of the TEM.

Field data collection was based on the B.C. Terrestrial Ecosystem Mapping inventory standard and included brief reconnaissance surveys (flown in helicopter), full plots, ground inspections, and visual checks. The full plot required use of an ecosystem field form which allowed for comprehensive ecological data collection for a site used to assist in the creation of ecosystem unit descriptions and summary statistics. The methodology for establishing an ecosystem plot is described as follows.

Once a location representative of a distinct vegetation community and landscape form was selected, the plot centre was marked by flagging tape. A circular plot with a radius of 11.29 m (400 m^2) was measured from the plot centre and marked with flagging tape. These plots were referenced with a Garmin GPS map 60Cx unit, designed to be easily relocated for future monitoring.

At each plot, the following attributes were measured and recorded:

- Geographic position;
- Plant species and percent cover;
- Site features;
- Surface shape;
- Macro and meso-slope position;
- Aspect;
- Elevation;
- Slope;

- Drainage;
- Microtopography;
- Soil moisture/nutrient regimes;
- Types of disturbances;
- Wildlife sign;
- Diagram of plot;
- Overview and soil pit photographs; and
- Soil and vegetation samples taken for metal content analysis.

Ground inspections did not require a plot layout. Information collected was basic ecological data and some characterization information; this data was recorded on abbreviated forms. The ground inspections were done at the timber estimate sites and were intended to confirm the identities of ecosystem units of the forested areas in the LSA. Visual checks were the least detailed data collection and were completed to verify the precision of the 2015 TEM and desktop interpretation of the 2016 aerial imagery. Visual checks were done at vantage points where ecosystems were viewed from a distance and photographs and notes were taken.

The number of vegetation/ecosystem plots and ground inspections surveyed per bioclimate zone are listed in Table 5-2.

Table 5-2: Ecosystem Survey Effort

2015 / 2016 Ecosystem Survey Efforts			
Bioclimate Zone	**Full Ecosystem Plot**	**Ground Inspection Plot**	**Visual Polygon Check**
Alpine	11	0	15
Subalpine	24	1	27
Boreal High	2	20	3
Total	**37**	**21**	**45**

The data collected for each of the Project ecosystem plots will be made available to the Yukon Biological Information Inventory System (YBIS). This database contains ecosystem information collected throughout the territory over a thirty-year time span. It is an excellent resource as information from ecological studies in the same ecoregion can be viewed, thus augmenting knowledge of local ecosystems and aiding in classification. Access into YBIS is controlled by ELC program managers and is limited to known researchers.

Summary sheets of the ecosystem plots can be found in Appendix C. This appendix includes all the summaries from the 2015 and 2016 field seasons. The most pertinent information was gleaned from field data sheets and presented with plot photographs. The summaries can be used when viewing the ecosystem map to better understand polygon characteristics. The summaries can be taken into the field when ecosystem plots are revisited to aid in navigation and orientation.

5.3 INTEGRATION OF FIELD DATA INTO ECOSYSTEM MAP

The product of the aerial interpretation and the field ecosystem investigative program is the TEM which presents the spatial relationship of the local ecosystems within the LSA. Each polygon conveys information regarding vegetation association(s), structural stage, nutrient and moisture regimes, and surficial material. The different colour hues on the TEM are used to indicate the different leading species within the associated polygons.

Orthorectified imagery was received after execution of the field program in 2015; therefore, the integration of the field data was coupled with a re-interpretation of the 2016 imagery. Polygon boundaries were revised and classifications were refined and improved based on information gathered in the 2016 field program. A revised TEM map was produced.

6 TEM RESULTS

The following section summarizes the final information and products resulting from the TEM inventory efforts.

6.1 TERRESTRIAL ECOSYSTEM MAP

In total 329 polygons were delineated, interpreted and assigned an ecosystem(s) unit. The polygons were labelled 1 to 329 and paired with the corresponding ecosites as presented in Figure 6-1. The final TEM map for the Project study area is presented in Appendix A. The total area mapped was 124 km^2 which included 46 km^2 in the Project area, and 78 km^2 along the Tote Road mapped at a scale of 1:23,000. Of the 124 km^2, the Boreal High bioclimate zone represents 40 percent (49.7 km^2), the Boreal Subalpine zone represents 40.0 percent (49.6 km^2), and the Alpine zone represents 20.0 percent (25.0 km^2). Survey effort for 2015 and 2016 combined included 37 full ecosystem plots, 21 ground inspection plots, and 45 visual checks. The field survey effort aligned with a level two survey intensity established by Environment Yukon's Ecological and Landscape Classification Guidelines, which requires 4-8 full plots, 19-48 ground inspection plots and 41-104 visual checks of polygons (Environment Yukon, 2016, Table 6-1). The Yukon level two survey intensity is in-between a level three and level four survey level intensity as defined by the British Columbia Resource Inventory Committee standards for TEM and is the industry standard for wildlife land-use planning, environmental assessment and forestry planning (Environment Yukon, 2016). Table 6-1 shows the Yukon survey level intensity compared to B.C. standards.

Table 6-1: TEM Field Survey Intensity

Survey intensity levels for ecosystem mapping (Environment Yukon, 2016., RIC, 1998)					
Survey Intensity Level	**Percentage of Polygon Inspections**	**Ratio of Full Plots: ground Insp.: Visual Checks**	**Suggested Scales (K=1000)**	**Area Covered by 0.5 cm2**	**Range of Study Area (ha)**
2 (Yukon)	20-50%	5:30:65	1:20 K to 1:50 K	2 - 12.5 ha	5,000 – 50,000
3 (B.C.)	26-50%	5:20:75	1:10 K to 1:50 K	0.5 - 12.5 ha	5,000 – 50,000
4 (B.C.)	15-25%	5:20:75	1:20 K to 1:50 K	2 - 12.5 ha	10,000 - 500,000

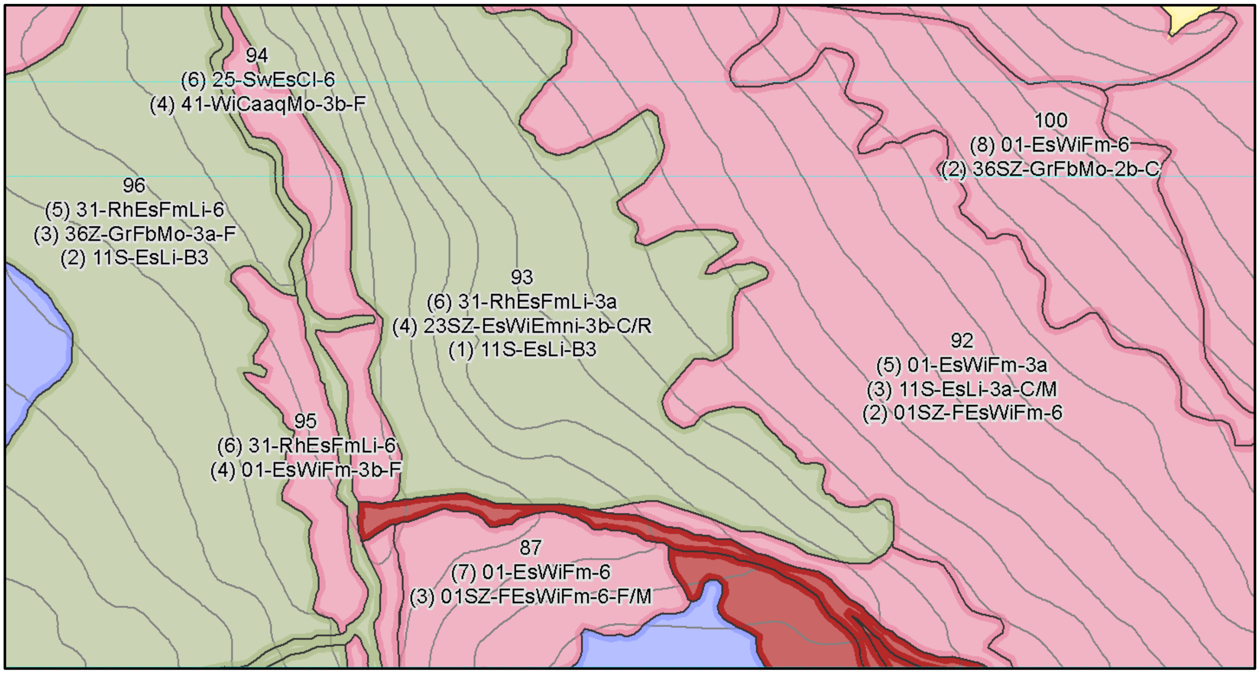


Figure 6-1: Clip of KZK Ecosystem Map with Polygons, Identifier Code and Ecosystem Unit Labels

The vegetation associations were refined to ecosite units, as the improved aerial imagery and more ecosystem plots surveyed in 2016 aided in the development of edatopic grids and defined toposequences.

6.2 ECOSITES AND VEGETATION ASSOCIATIONS

There were 27 core vegetation communities (7 alpine, 9 boreal subalpine, 11 boreal high) that were derived from 126 vegetation associations gleaned from aerial photographs and fieldwork in 2015. Table 6-2 presents the vegetation associations that were identified within the Project LSA. The plant species codes are general descriptions and the order that the plant codes are placed is not always reflective of greatest percent plant cover, but present the most common plants that were encountered at sites with particular correlations between soil nutrients and moisture., The ecosite unit number is shown with the vegetation association and code, the soil moisture and nutrient regime correlation, and a description of that ecosystem type. The reference ecosites and vegetation associations have been identified for each of the bioclimate zones (as subzones have not been yet determined) that exist in the Project LSA are as follows:

- BOH: White Spruce-Willow-Forb-Feathermoss;
- BOS: Scrub birch-Willow-Feathermoss (Subalpine Fir may be present usually <10% cover); and
- ALP: Scrub birch-Willow-Dwarf shrubs-Lupine (Scrub birch is low to ground <40 cm, Willows are prostrate species (e.g., *S. reticulate, polaris, arctica*).

Ecoplot identity numbers are provided in Appendix C - Field Plot Summaries. A plant list for the LSA was developed and is contained in Appendix E.

Table 6-2: Vegetation Associations by Bioclimate Zones for Project LSA

Ecosite Unit Code	Vegetation Association	Vegetation Association Code	Moisture/Nutrient Regime	Description of Ecosystem Ecoplot Summaries references
ALPINE Tundra (>1,550 m)				
01	Willow-Dwarf shrub-Lupine	WiDsLu	4/C	Gentle to moderate middle slopes on morainal or colluvial, neutral aspects. Hummocky ground. Low height (<2 m) willows with scrub birch (varies in cover %). Dwarf shrubs present are crowberry, prostrate willows and bog blueberry. Common forbs are: lupine, sagewort, tall bluebells and coltsfoot. Altaica fescue, woodrushes and carex sp. present in low cover. Some mosses common. Cryosol soils. Ecoplot: PA09, PA02
13	Scrub birch-Grasses-Lichens	EsDsGr	2/B	Coarse grained soils and/or shallow soils on upper slopes and hill crests with warm aspects. Gravel and rocks often exposed. Low Scrub birch (height <50 cm), dwarf shrubs present include lingonberry and bog blueberry. Extensive coverage of lichens, predominantly *Cladina, Cladonia and Stereocaulon*. Scattered grasses include altaica fescue, polar grass and woodrushes. Regosols and Brunisol soils. Ecoplot: PA01, PA40
1w	Scrub birch-Dwarf shrubs-Graminoids-lichens	EsDsGrLi	3/B	Warm upper to middle slopes, well drain on colluvial and glaciofluvial terraces. Low scrub birch (<40 cm) with prostrate willows, mountain avens. Graminoids include *Carex podocarpa* and *Fescue altaica*. Cladina sp. most common lichen. More species diversity than ecosite unit 13. Brunisol soil. Ecoplots: PA08, PA11
21k	Heather-Carex-Lichen	HeCxLi	3/B	Cool upper to middle slopes well drain on colluvial and glaciofluvial. Along northern aspects with late spring snow retention Hummocky ground due to active permafrost host low growing ericaceous shrubs including: *arctic white heather* and *bog blueberry* with upland sedges. Cladina and Cladonia are the most prominent lichen. Low cover of forbs and grasses. Cryosol soil. Ecoplots: PA07, PA35w
31	Net-veined willow-Carex-Mosses	SireCxMo	5/B	Gentle middle slopes on colluvial veneer over morainal or morainal. Alpine prostrate willows such as, net-veined and arctic are common with patches of low growing scrub birch. (height <40 cm). Upland sedges and forbs such as anemones, lupines, sageworts, coltsfood, present in low % cover. Moss coverage around 15%. Ecoplots: PA04

Ecosite Unit Code	Vegetation Association	Vegetation Association Code	Moisture/Nutrient Regime	Description of Ecosystem Ecoplot Summaries references
33	Willow-Forbs Graminoids	WiFbGr	4/D	Gentle middle to low slope positions on morainal or colluvial veneer on morainal. Willows such as Barclay's are small (<50 cm). Dwarf shrubs crowberry, lingonberry and bog blueberry are present. Altai fescue common with upland sedges. Forbs include anemones, lupines, sageworts, coltsfood, Jacob's ladder and bluebells. Lower cover of feathermosses and lichens. Cryosol soils. Ecoplots:PA05, PA34w
45	Cotton grass-Forbs-Moss	ErFbMo	7/D	Depressions where water collects usually organic over morainal or fluvial. Permafrost is near surface. Cottongrass (*Eriophorum sp.)* in wet sites with few hydrophilic sedges and mosses. Forbs include Alpine bistort, anemones forbs and a few dwarf shrubs on hummocks. High plant diversity. This ecosystem was only found in small patches. Gleyed Cryosol soils with well-developed humus No plot set in this ecosystem, visual check
SUB-ALPINE (1,300 m – 1,550 m)				
01	Fir-Scrub birch-Willow-Feathermoss, or Scrub birch-Willow-Feathermoss	FEsWiFm EsWifm	4/C	Gentle to moderate middle slopes on colluvial over morainal or glaciofluvial. Well-developed shrub understorey where scrub birch cover is near double that of willow, Labrador tea occurs under taller shrubs. Dwarf shrubs crowberry, lingonberry and bog blueberry are often present. Forbs are usually less than 15% cover and consist of Lupine, tall bluebells, and bunchberry. Main ground cover is Feathermoss with small reindeer lichen patches. Veteran white spruce occurs with Subalpine fir on lower slopes along Geona valley. ESWiFm continues to higher elevation with no tree cover. Brunisol and Cryosol soils. Ecoplots: PA12, PA16, PA52
11	Shrub Birch-Lichen	EsLi	2/B	Sandy soils on domed glaciofluvial deposits. Low Scrub birch (height<2m) with extensive coverage of lichens, predominantly *Cladina, Cladonia and Stereocaulon*. Low cover of Lingonberry, bog blueberry and altaica fescue. Brunisol soils. Ecoplots: PA53, PA57
22	Scrub birch-Feathermoss- Cladina	EsFmCl	3/B	Moderate upper slopes, colluvial veneer over morainal or glaciofluvial surficial material. Low scrub birch (height <2m), Low cover of willows (<15%). Extensive feathermoss with Reindeer lichen, few forbs: sagewort and tall bluebells usually <5% cover. Altaica fescue may be present. Brunisol and Cryosol soils. Ecoplot:PA03, PA57

Ecosite Unit Code	Vegetation Association	Vegetation Association Code	Moisture/Nutrient Regime	Description of Ecosystem Ecoplot Summaries references
23	Scrub birch-Willow-crowberry	EsWiEmni	4/B	Upper slopes on colluvial over morainal near treeline. Variable aspects, solifluction lobes may be present; ground hummocky Tall to low shrub matrix composed of scrub birch and willow, shrubs are usually below 2m. Dwarf shrubs well represented includes high cover of crowberry with prostrate alpine willows, lingonberry, bog blueberry and occasional arctic white heather. Altaica grass and upland sedges common. Forbs are limited. Cryosol soils. Ecoplot: PA45, PA52
31	Labrador tea-scrub birch-Feathermoss-Lichen	RhEsFmLi	5/B	Gentle mid to low slopes on morainal and glaciofluvial, fine grained to sandy loams. High cover of Labrador tea under scrub birch, willow present at variable % cover. Feather moss carpet with Cladina and Peltigera sp. lichens. Forbs include lupine, anemones, and coltsfoot. Brunisolic Cryosols soils. Ecoplots:, PA54, PA51, PA59
35	Willow- -Horsetail-Forbs-Grass	WiEqFbGr	5/C	Found along small drainages in lower alpine through subalpine zones. Rich soils with high diversity of plants: forbs include: anemones, lupines, sageworts, delphinium, coltsfood, willow herb, Jacob's ladder and bluebells. Willows are mainly tall (height >2m). Small patches of hydrophilic glow and woolly mosses. Regosol soils. Ecoplot: PA41, PA42, PA56, PA58, PA20
36	Graminoids-Forbs-Mosses	GrFbMo	5-6/D	Morainal on gentle to level ground along lower slopes and valleys. Organics over mineral soils on level ground in high valleys and passes. Wet nutrient rich meadows, humus and Ah well developed. Some tall or low willows on raised hummocks scattered through site. Forbs include horsetail, delphinium, anemones, and rose sedum. These are site is associated with solifluction and Turbic Cryosols. Ecoplots: PA05, PA14
42	Water sedge-sphagnum	CaaqSp	6/B	Upland bogs in upper valleys at the toes of slopes and in depressions. Organics over mineral soils. Dwarf shrubs and forbs on heights of sphagnum hummocks. Labrador tea and scrub birch may also be present on hummocks. Cryosol soils. Ecoplots: PA13
48	Carex-Grasses-Forbs-Moss	CxGrFbMo	6-7/D	Water collecting plains or depressions often along mineralized drainages. Rich wet sites with a variety sedges and grasses such as Calamagrostis canadensis and Glyceria sp. High diversity of forbs and hydrophilic mosses glow moss, and woolly moss. Willows on higher ground. Organic layer over fine textured gleyed soils. Cryosols soils. Ecoplots: PA15
HIGH BOREAL (900 m - 1,300 m)				
01	White Spruce Willow-forbs-Feathermoss	SwWiFbfm	4/C	Open canopy coniferous forest found on well drained sites along upper slopes to middle slopes. Often scrub birch is present but at less cover than willow. Other plant species include: lingonberry, kinnickinnick, Lupine, tall bluebells and Reindeer lichen. Brunisol soils. Ecoplots: TE21, KZK2, TE30

Ecosite Unit Code	Vegetation Association	Vegetation Association Code	Moisture/Nutrient Regime	Description of Ecosystem Ecoplot Summaries references
11	Trembling aspen-Kinnickinnick-Grasses	AKnGr	2/B	Open to close aspen stands on colluvial material or steep south facing slopes. These aspen stands are a successional stage where recent disturbance has occurred e.g. spot fires, erosion or mass wasting. Very uncommon in the LSA. Dystric Brunisol soils. Ecoplot: TE31
15	White spruce-Scrub birch-Cladina	SwESCl	2/B	Open to sparse forest occurring on glaciofluvial deposits with sandy soils where drainage is rapid. Other plants may include bog blueberry, lingonberry, kinnickinnick and grasses. Drier sites may not have trees at all and there is more Stereocaulon lichen presence. Dystric Brunisol soil. Ecoplots: TE26, TE16A
25	White spruce-Scrub birch-Dwarf shrubs-Feathermoss-Cladina	SwEsDsFmCl	3/B-C	Open forest, well developed understorey on variety of surficial material. Along upper through middle slopes. Other plants include: willows, grasses (*Calamagrostis purpurascens* and *Festuca altaica*), Lupine, tall bluebells, bastard toadflax. Dystric Brunisol soil. Ecoplots: TE21, TE23, TE30, PA59, PA60
28	White spruce-Balsam popular-horsetail-Feathermoss	SwBEqFm	3-4/D	Open to close mixed forest on upper fluvial terrace on sandy soils over fluvial cobles and gravel. High productivity site for tree growth. Low shrub cover except in canopy gaps includes willows, soapberry and rose. Diversity of forb species. Regosol soils with multiple buried humus horizons. Ecoplots: TE24
35	Black spruce-White spruce Labrador Tea-Feathermoss	SbSwRhFm	5/B	Commonly found on gentle mid to lower slopes overlying permafrost. Tend to be large polygons. Black spruce is the dominant tree species and white spruce is restricted to high drier sites. Thick humus, acidic soil, poor nutrient. Brunisol and Cryosol soil. Ecoplots: KZK1, PA59, TE6, TE22
40	Black spruce-Labrador tea-Feathermoss-Cladina	SbRhFmCl	6/B	Sparse to open Sb, with minor component of Sw, forests on gentle slopes to flat sites with pockets of open water, lichens on hummocks. Often associated with permafrost. Organics over mineral soil, nutrient poor bog, B6 Variants: SbRhFmLi. Ecoplots: TE20, , KZK4, KZK5, TE7A
41	Willow-Carex aquatilis-Moss	WiCaaqMo	6/C	Along sides of mineral fens with neutral pH. High cover of water sedge and occasionally Russet sedge. A variety of forbs present: anemones, wintergreens, arctic raspberry and Galium sp.. Dwarf shrubs on hummocks. Shallow organic over glaciofluvial. Gleyed Cryosol soils. Ecoplots: TE21
46	Balsam poplar-Willow-Forb	BWiFb	6/D	Along riparian corridor, subject to frequent flooding. Often young stands of Balsam popular due to regular disturbance. Willow most common shrub, but a variety of shrub and forb species present. Horsetails and sedges can occur in side channels or on deposited sediment inside channel bends. Substrate of sand, gravel and cobbles. Regosolic soils. Ecoplots: KZK6

Ecosite Unit Code	Vegetation Association	Vegetation Association Code	Moisture/Nutrient Regime	Description of Ecosystem Ecoplot Summaries references
52	Scrub birch-Water Sedge-Sphagnum	ESCaaqSp	7/B	Bogs with open water Accumulation of organics 20 to 40 cm deep over fine grained mineral soils on morainal and glaciofluvial surficial material. Situated on poorly drained plains and depressions. Acidic substrate with Water sedge in water, dwarf shrubs and few forbs: Cloudberry, Arctic raspberry on moss hummocks Ecoplots: KZK3, TE25, KZK3
56	Sedge-Forb-Glow moss	CxFbAuco	7/C-D	Edges of rich fens and ponds. Water sedge most common, forbs include Horsetails, Anemones, Coltsfoot and Sagewort. Ecoplots: TE25
NON VEGETATED				
	Wetland	Wetland		Open water ponds
	Riparian	Riparian		Open water and channel
	Rock	Rock		Bedrock, talus

6.3 PLOT INFORMATION SUMMARIES

During the ground-truthing phase of the ecosystem mapping project, 37 full ecoplots were established. Information regarding plant species, structural stage, soil features, and site attributes were recorded on the Ecosystem Site Description forms. An example of this data collection form is in Appendix B. As not all this information could be effectively contained in a polygon ecosystem unit label, the pertinent data was condensed onto a plot summary sheet for each plot. Each plot summary sheet contains photographs representative of each plot and soil pit where available. The summary plot sheets can be viewed in Appendix C.

6.4 ECOSYSTEM CONTROL PLOTS

Table 6-3 presents a summary of nine ecosystem plots that were surveyed and are proposed control plots for longer term monitoring. These are plots deemed to be outside the zone of influence of the Project. The control plots can be revisted to compare any local changes in plant communities and possible effects from the construction through to closure of the Project.

Table 6-3: 2015 Summary of Ecosystem Control Plots

Plot Number/ General Location	Reasons	Bioclimatic Zone/ Aspect/ Slope	GPS UTM Coordinates
TE6	Boreal High site at 1,229 masl elevation. Mature mixed forest with black spruce, white spruce, shrub birch and willow. Permafrost under gently undulating landscape. Soil is Gleysolic Turbic Cryosol.	BOH 22°/8%	417807.5E, 6822454N
PA9	Alpine Dwarf shrub dominant ecosystem at 1,586 masl elevation. Moderately sloped alpine tundra dominated by dwarf shrubs and lupine. Soil is Turbic Cryosol with a pH of 5.56. Plot is located in the reference valley to the east of the Project site.	ALP 78°/30%	418033.6E, 6817351N
PA10	Subalpine site dominated by willow, heather, dwarf shrubs and lupine. Soils are coarse textured and well-draining. Soil is Turbic Cryosol with a pH of 6.06. Plot is located down slope of PA09 in reference valley to the east of the Project site.	BOS 65°/22%	418456.8E, 6817538N
PA12	Subalpine parkland at 1,477 masl elevation, west aspect. Willow/birch, black tipped groundsel/bluebell, moss. Soil is coarse textured District Turbic Cryosol with no ice layer encountered. Located on east side of reference valley to the east of the Project site. Subalpine fir age 100 years.	BOS 235°/26%	420478.1E, 6816095N
PA13	Wet Subalpine meadow dominated by water sedge, willow, and sphagnum. Soil is Humic Organic Cryosol. Located in gully in reference valley to the east of the Project site.	BOS 112°/5%	418021.3E, 6816020N
PA19	Subalpine 1,448 masl elevation located in reference valley to the west of the Project site. Shrub birch/ willow, dwarf shrub, feathermoss dominated. Soil is Dystric Turbic Cryosol. Same elevation and exposure of east side of proposed mine site	BOS 222°/24%	409805.6E, 6815768N
PA20	Subalpine site located south-west of Project site. Plant community is sedge, herb, and sphagnum with some willow on drier sites. Soil is Geysolic Turbic Cryosol. Same elevation and exposure as South Lakes south of proposed mine site.	BOS 148°/5%	412348.3E, 6812158N
PA35	Alpine site, 1,728 masl, gentle middle slope approximately 1.5 km west of mine pit edge. Plant community is Heather-Carex-Lichen, with good cover of dwarf shrubs. Colluvial material with shallow Static Cryosol soils.	ALP $34^0/12$	413326E, 6814698N
PA42	Subalpine site 1,481 masl in Project LSA, approximately 1.3 km west of Class A Storage Facility. Plant community is Willow-Horsetail-Forb-Grass. This an open meadow with scattered tall willows. There is a high component of Altaica fescue with a diverse number of Forb species. Soil is a fine grained Turbic Cryosol.	BOS $002^0/15$	412976E, 6817591N

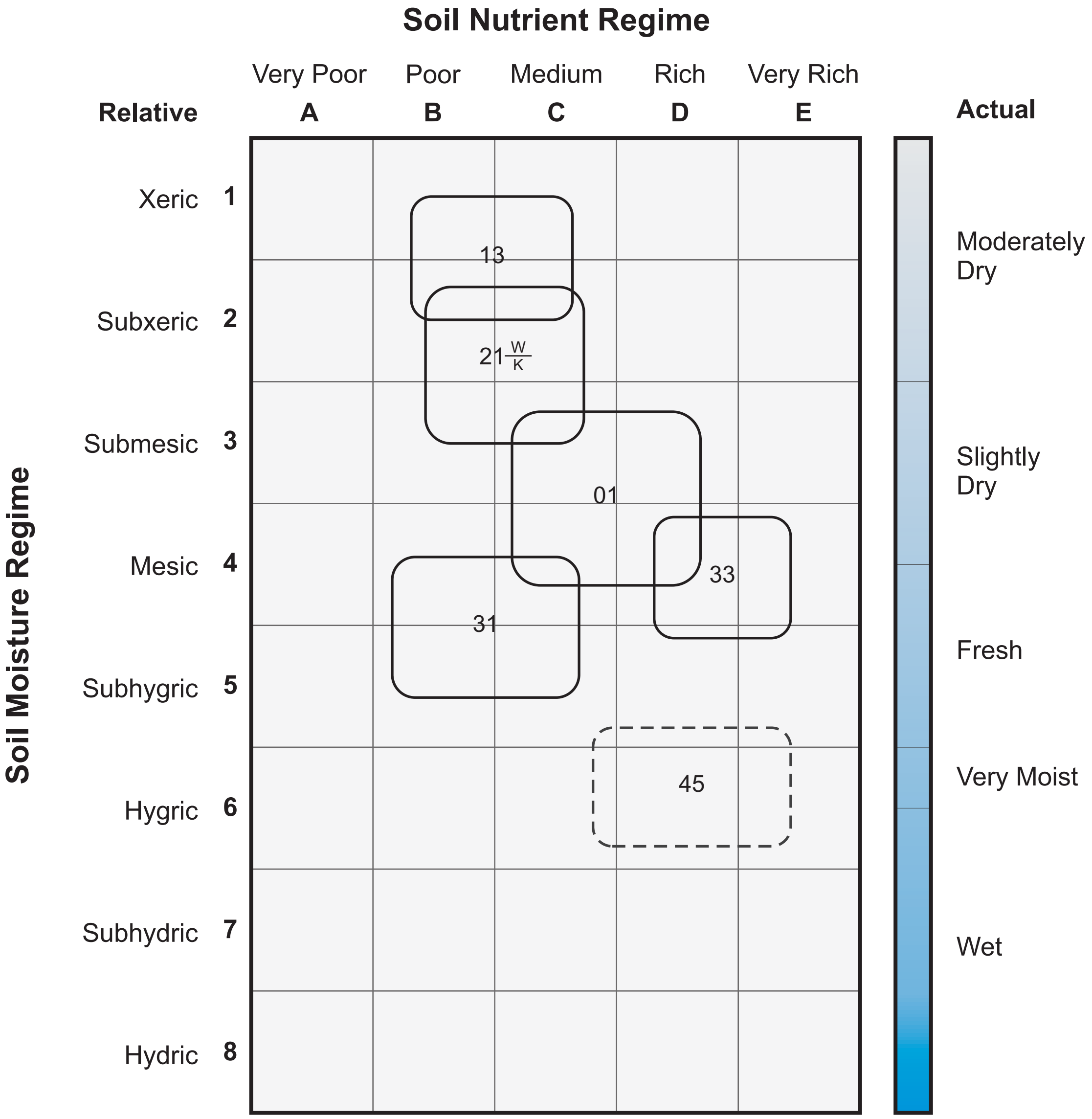
6.5 EDATOPIC GRIDS AND TOPOSEQUENCES

Edatopic grids are visual representations of the relationship between nutrients and moisture within a particular ecosite of a bioclimate zone. The grids capture the nutrients and moisture classes as described in Table 3-6 and Table 3-5 and help illustrate a predictable variability within the ecosite. The toposequence then describes the relationship of ecosites along a topographic profile (Environment Yukon, 2016).

The Boreal Low edatopic grids in the Yukon have already been developed; however, they have not been developed for the bioclimate zones of the Boreal High, Boreal Subalpine, and Alpine zones found at the Project area. Based on the vegetation work done to date, edatopic grids and toposequences were developed for the Project related bioclimate zones and are presented in Figure 6-2 to Figure 6-7.

FIGURE 6-2 ALPINE EDATOPIC GRID FOR PROJECT LOCAL STUDY AREA

Elevation: ≥1550 m



Site Unit	Plant Associations	Code
01	Scrub Birch-Willow-Dwarf shrubs-Lupine	EsWiDSLu
13	Scrub birch-Grass-Lichen	EsGrLi
21	Scrub birch-Dwarf shrubs-Graminoids(w) Heather-Carex-Lichen(k)	EsDsGr(w) HeCxLi(k)
31	Net-veined Willow/Scrub birch-Carex-Moss	SireCxMo
33	Willow-Forbs-Carex	WiFbCx
45	Cotton grass-Forbs-Moss (Not Visible on the Map)	ErFbMo

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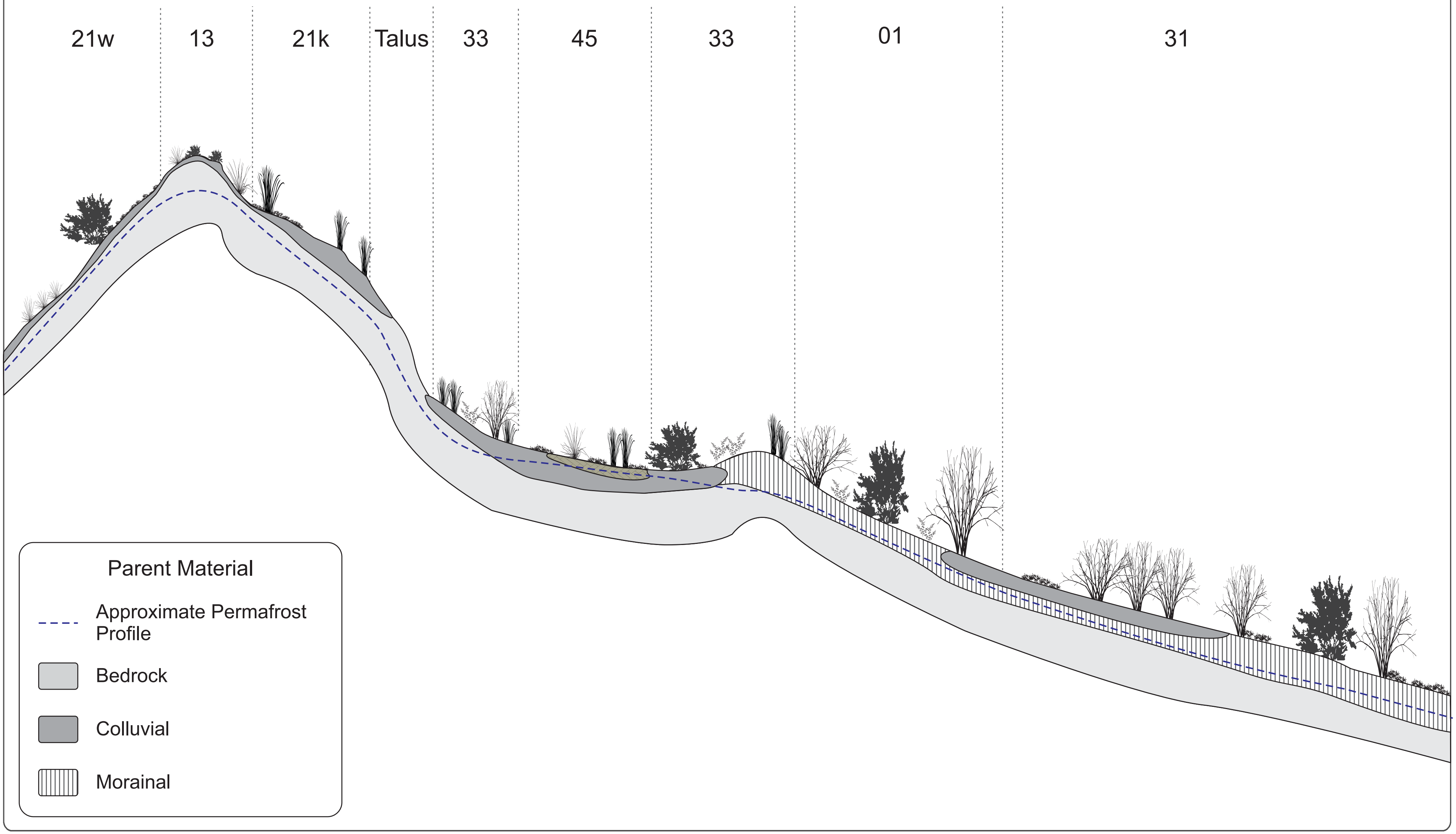
KUDZ ZE KAYAH LANDSCAPE PROFILE

Alpine Bioclimate Zone

Elevation: ≥1550m



Scrub Birch

Willow

Grasses

Sedge

Feathermoss
Lichen
Dwarf shrubs

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ALEXCO ENVIRONMENTAL GROUP

KUDZ ZE KAYAH PROJECT

FIGURE 6-3

ALPINE TOPOSEQUENCE

OCTOBER 2016

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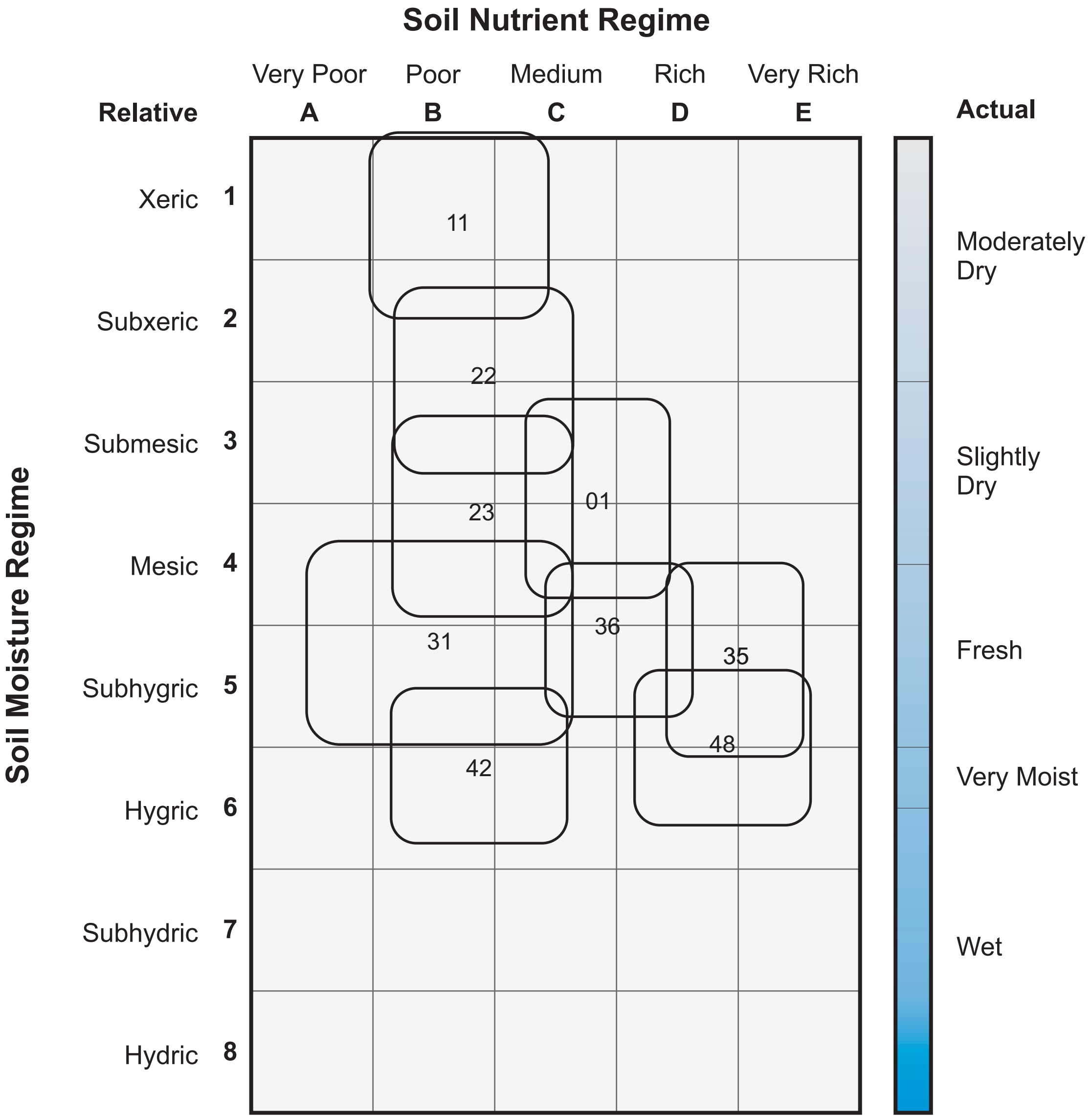
Figure 6-4 Boreal Subalpine Edatopic Grid for Project Local Study Area

Elevation: 1300 - 1550 m



Site Unit	**Plant Associations**	**Code**
01	Scrub Birch-Willow-Feathermoss (non-treed)	EsWiFm
	Fir-Scrub birch-Willlow-Feathermoss	FEsWiFm
11	Scrub birch-Lichen	EsLi
22	Scrub birch-Feathermoss-Lichen	EsFmLi
23	Scrub birch-Willow-Crowberry	EsWiEmni
31	Labrador tea-Scrub birch-Feathermoss-Lichen (non-treed)	RhEsFmLi
	Fir-White spruce Labrador tea-Scrub birch-Feathermoss-Lichen	FSwRhEsFmLi
35	Willow-Horsetail-Forbs-Grass	WiEqFbGr
36	Grass-Forbs-Moss	GrFbMo
42	Water sedge-Sphagnum	Caaqsp
48	Carex-Grass-Forbs-Moss	CxGrFbMo

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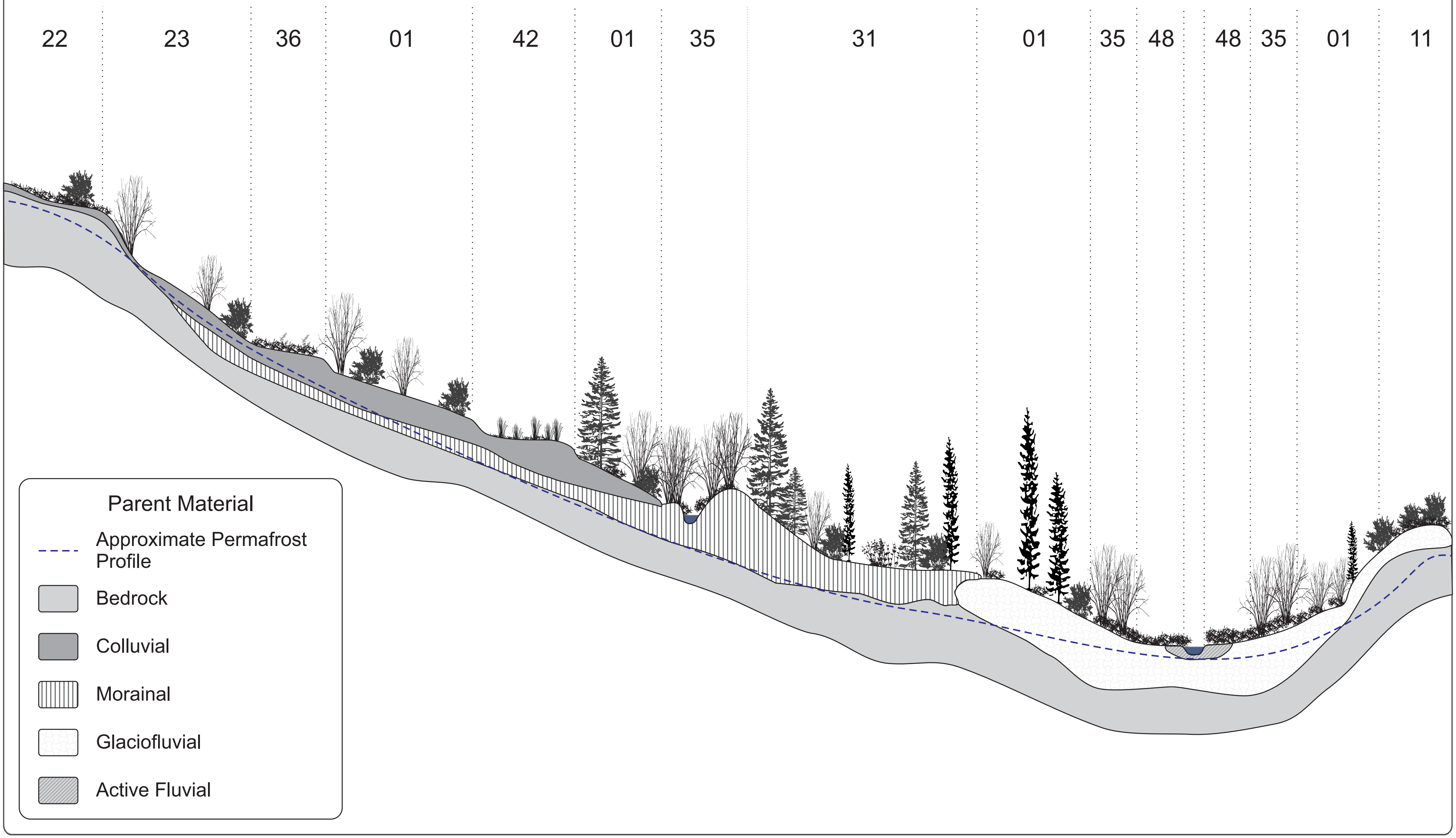
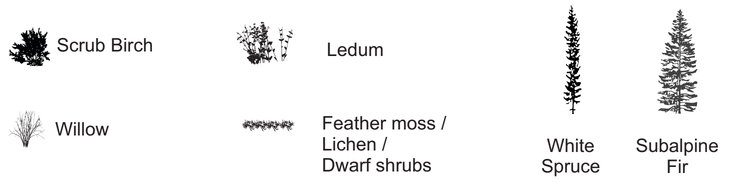
KUDZ ZE KAYAH LANDSCAPE PROFILE

Boreal Subalpine Bioclimate Zone

Elevation: 1300 - 1550m





BMC MINERALS

ALEXCO ENVIRONMENTAL GROUP

KUDZ ZE KAYAH BASELINE VEGETATION REPORT

FIGURE 6-5

BOREAL SUBALPINE TOPOSEQUENCE

OCTOBER 2016

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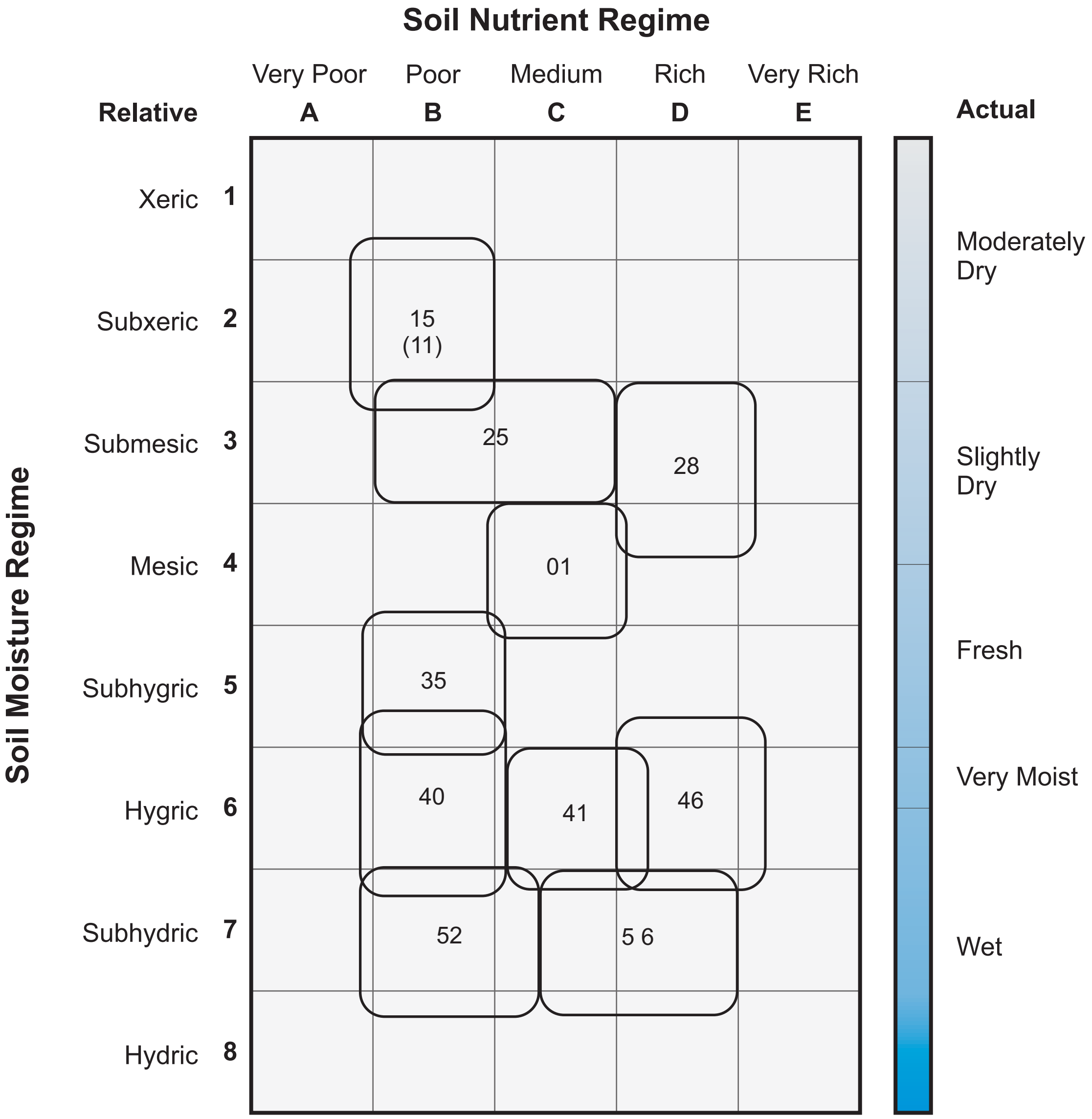
FIGURE 6-6 BOREAL HIGH EDATOPIC GRID FOR PROJECT LOCAL STUDY AREA

Elevation: < 1300 m



Site Unit	Plant Associations	Code
01	White spruce-Willow-Forbs-Feathermoss	SwWiFbFm
11	Trembling aspen-Kinnikinnick-Grass (SuccessionalStage)	AKnGr
15	White spruce-Scrub birch-Cladina	SwEsCl
25	White spruce-Scrub birch-Dwarf shrub-Feathermoss-Cladina	SwEsDsFmCl
28	White spruce-Balsam popular-Horsetail-Feathermoss	SwBEqFm
35	Black spruce-White spruce Labrador Tea-Feathermoss	SbSwRhFm
40	Black spruce-Labrador tea-Feathermoss-Cladina	SbRhFmCl
41	Willow-Carex aquatilis-Moss	WiCaaqMo
46	Balsam popular-Willow-Forbs	BWiFb
52	Scrub birch-Water Sedge-Sphagnum	EsCaaqSp
56	Sedge-Forb-Glow moss	CxFbAuco

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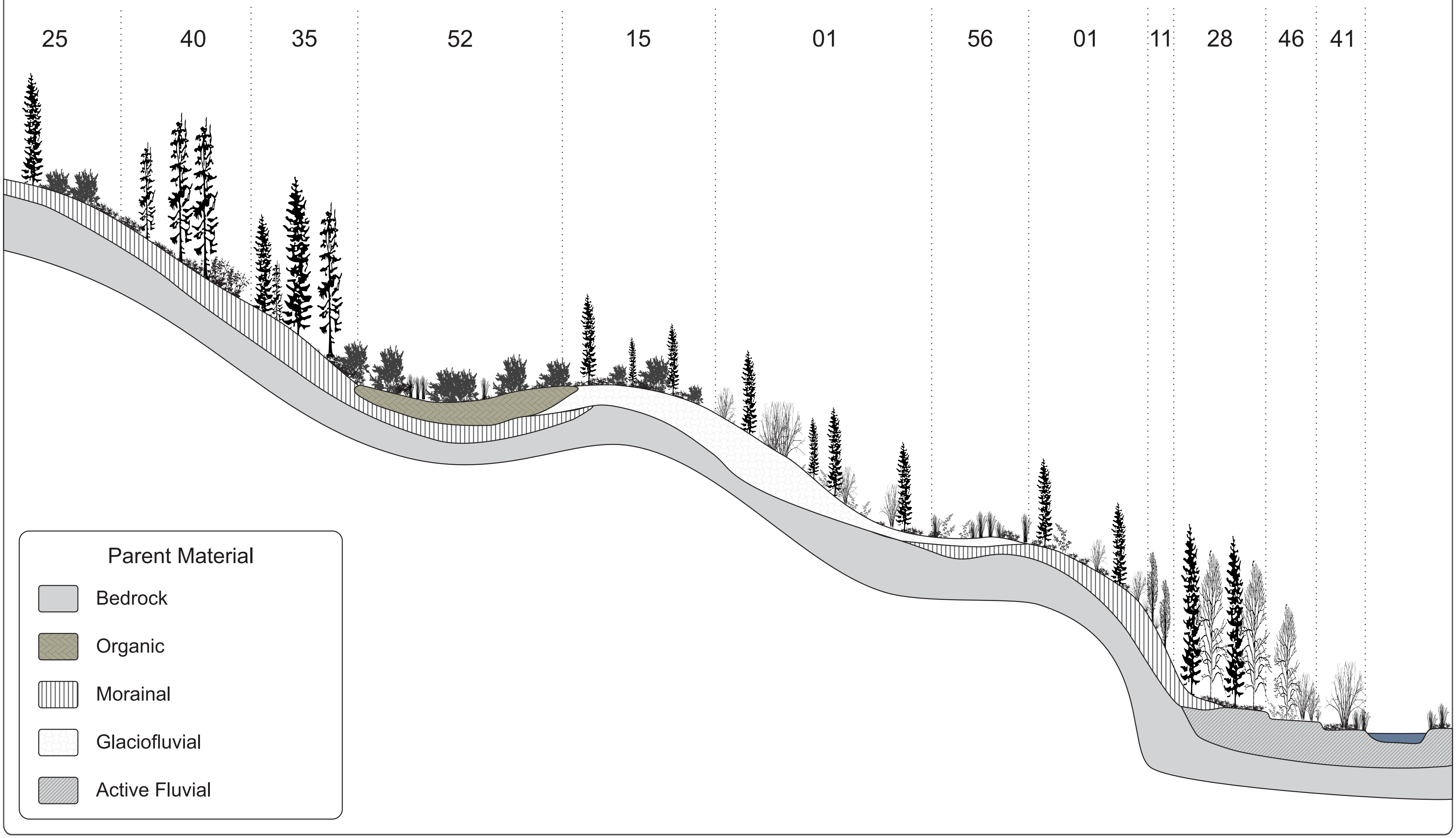
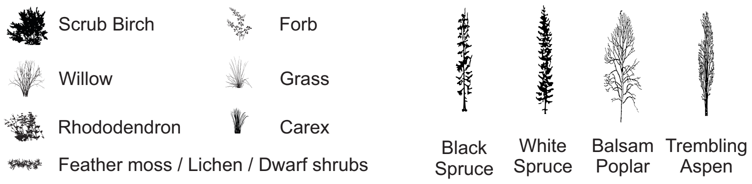
KUDZ ZE KAYAH LANDSCAPE PROFILE

Boreal High Bioclimate Zone

Elevation: 850 - 1300 m





BMC MINERALS

ALEXCO ENVIRONMENTAL GROUP

KUDZ ZE KAYAH BASELINE VEGETATION REPORT

FIGURE 6-7

BOREAL HIGH TOPOSEQUENCE

OCTOBER 2016

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7 WETLAND CLASSIFICATION

Current Yukon regulatory environmental review places emphasis on investigating riparian vegetation and wetland vegetation that may be affected by developments. For example, YESAB's *Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submissions* suggests that notable natural resource features within, or directly adjacent to, the proposed Project area," such as large wetland complexes, be classified and identified. There were ten wetlands identified to be directly affected by the Project development design. This section of the report provides information on each of the ten wetlands including their classification, size, pH, substrate material, and the dominant vegetation both shoreline and aquatic.

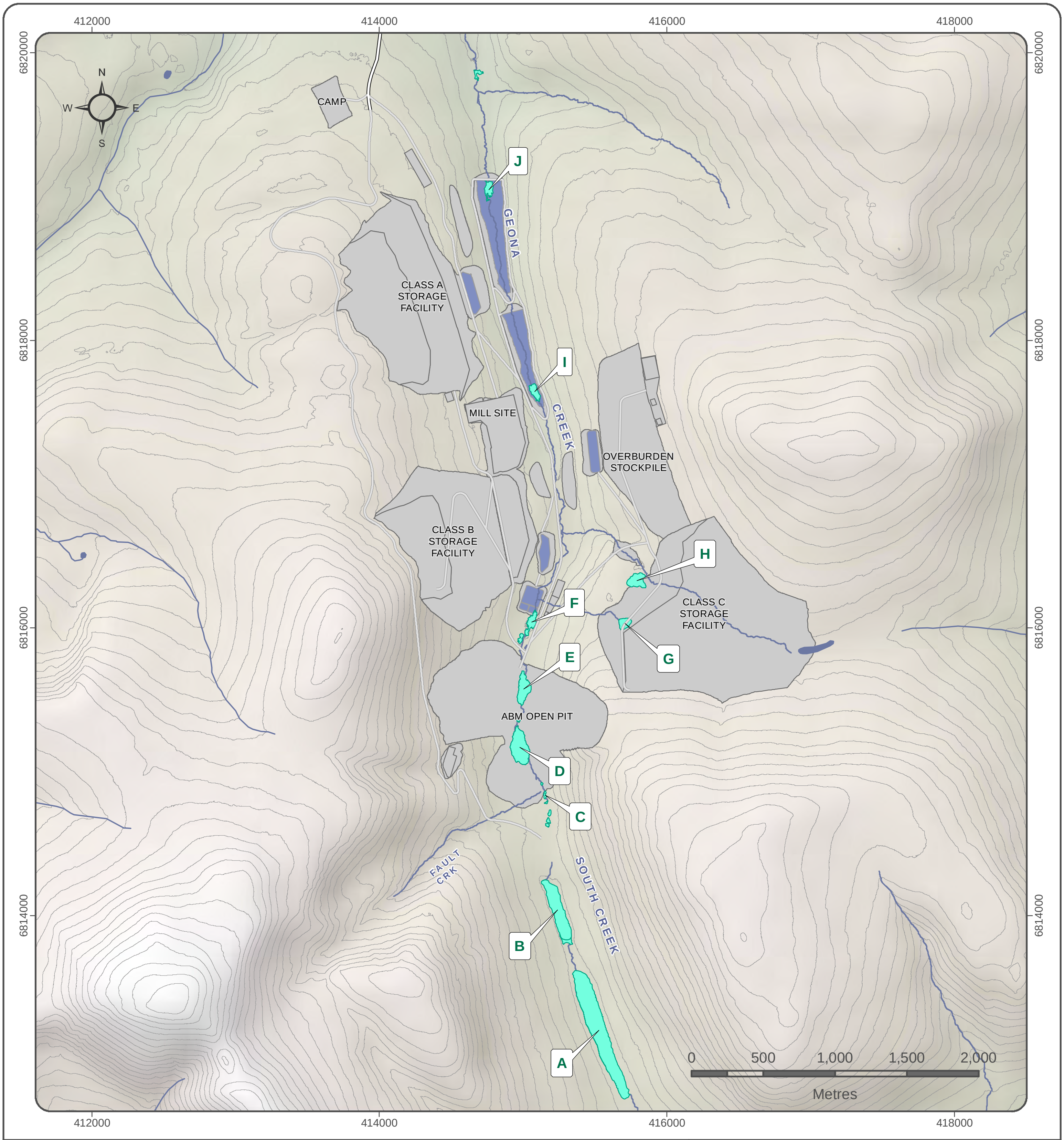
In Yukon, wetlands are typically identified using the Canadian Wetland Classification System (CWCS). Doing so creates a consistent framework for the characterization and description of wetlands within Yukon. The CWCS has five classes of wetlands: bog, fen, marsh, swamp, and shallow open water (Table 7-1). These classes are determined by soil, vegetation, water pH, and other ecological characteristics of the wetland in question (National Wetlands Working Group, 1997). The Yukon ELC system also includes wetland classes as site units based on pH and hydrodynamic regime differences. The ten wetlands surveyed in the Project site are classified according to the CWCS in this section of the report and their corresponding locations are shown on the ecosystem map.

The CWCS is hierarchical and ecologically-based. The three levels of classification proceed from broader to more specialized definitions in the following order: class, form, and type. The five classes are recognized on the basis of the overall origin of wetland ecosystems (Table 7-1). Forms are differentiated on the basis of surface morphology, surface pattern, water type, and morphology of underlying mineral soil. Types are classified according to vegetation physiognomy.

Table 7-1: Five Classes of Wetland in the Canadian Wetland Classification System

Class	Characteristics*			
	Moisture and Water Table	Nutrients	Vegetation	Soil/ Other
Bog	moisture from rain, snow, fog; water table at or near surface.	poor	low diversity of species: sphagnum moss, lichens, stunted black spruce, shrubs.	organic material, acidic; deep peat layer with living surface and dead subsurface layers.
Fen	moisture influenced by surface and groundwater flows; water table at or near surface.	richer than bogs	greater than bogs: sedges, mosses, shrubs and trees.	organic material; peat layer >40 cm.
Marsh	permanently or seasonally flooded; moisture from precipitation, groundwater, stream inflow.	very high nutrient levels	abundance of submerged and emergent aquatic vegetation adapted to shifting water level.	shallow organic layer, low acidity; transition between open water and shorelines.
Swamp	slow-moving or stagnant water; fluctuating water levels; found adjacent to rivers, lakes and ponds.	saturated soils, rich in nutrients & woody debris	tall trees and shrubs dominate (due to high nutrients), vegetation densities >60%.	mineral/organic soil with hummocks of organic material; transition between upland forest and other wetlands.
Shallow Open Water	water <2 m deep; permanently flooded.	high nutrient levels	submerged vegetation and floating plants.	mineral soil; transition between marshes and deeper open water.

Adapted from Yukon Wetlands Fact Sheet (Ducks Unlimited Canada, n.d.)



🟩 Wetland Polygon

⬜ Location of Proposed Mine Infrastructure

🟦 Waterbody

— Watercourse

═ Tote Road/Proposed Access Road

═ Proposed Mine Road

— Contours (10 m)

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 9N

AEG

BMC MINERALS

KUDZ ZE KAYAH PROJECT

FIGURE 7-1
WETLAND LOCATIONS

DECEMBER 2016

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7.1 METHODS

There were two work phases involved to classify wetlands for the Project. The first component consisted of determining the number and locations of wetlands that fell within or adjacent to the Project footprint. As the proposed Mine site is situated in the Geona Creek valley, the wetlands that occupied the upper Geona Creek valley and an eastern side valley (Figure 7-1) were identified as being directly affected by the proposed Mine development. Each one of the wetlands was surveyed to determine their area and was assigned a letter identity code (e.g. Wetland A, B, C).

The second phase was the fieldwork. Each identified wetland was visited and assessed for water depth, pH, substrate composition, dominate shoreline and aquatic vegetation, as well as general landscape morphology. The assessment procedure consisted of a complete navigation of the shoreline to determine water sources, water flow, connectivity, mesoslope position, main plant species (rare plants were also searched for), substrate material (organic vs. mineral), nutrient regime, wildlife usage, and disturbance.

To facilitate collection of aquatic plant samples and to determine water depth, a crew member in waders entered the wetland. The pH was determined with Hach pH test strips at three different locations in each wetland, care was taken so sediment was not disturbed at pH testing sites. Depth was estimated at the deepest part. Plants were searched for and a sample of each different plant species found was collected by hand. Photographs of each wetland were taken.

A summary of wetland observations, characteristics, and classification was compiled and is presented in the results section below.

7.2 WETLAND CLASSIFICATION RESULTS

The wetlands as identified in Figure 7-1 were surveyed and classified. The results, presented in Appendix D, give the wetland class, form and type, pH, substrate characteristics, shoreline vegetation, aquatic plants, photograph, and notes. Wetlands were identified as wetland A through J with four parts to the wetland C complex, identified as C1, C2, C3 and C4. Table 7-2 summarizes the characteristics of the ten identified wetlands in the LSA.

Table 7-2: Wetlands Characteristics in Project LSA

Wetland	Form	Size (m^2)	Depth (m)	pH	Substrate	Shoreline Vegetation	Aquatic Plants
A	Shallow water-riparian-meltwater channel	91,853	>2	7.5	silty sand / rock	Graminoid dominated with few forbs and mosses. *Carex aquatilis, C. saxatilis, C. canescens, Juncus castaneus, Luzulu parviflora, Poa palustris, Calamagrostis canadensis*, and *Senecio congestus*	*Potamogeton filiformis, Myriophyllum sibricum*
B	Shallow water-riparian-meltwater channel	35,992	>2	8	silty sand / rock	*Carex aquatilis, C. saxatilis, C. canescens, Juncus castaneus, Luzulu parviflora, Poa palustris, Calamagrostis canadensis, and Senecio congestus*	*Potamogeton filiformis, Myriophyllum sibricum, Hippuris vulgaris*
C	Basin fen	3,390		6.5 - 7			
C1		400	<1		organic	*C. aquatilis, L. parviflora, P. palustris, C. canadensis, Galium trifidium* and *Petasites frigidum*.	Abundant brown moss *Calligeron spp*
C2		2,850	<1		organic	*C. aquatilis* dominant	*Potamogeton alpinus, Sparganium hyperboreum, Ranunculus hyperboreus* and *Myriophyllum. sibricum*
C3		100	<1		organic	Dominated by *Glyceria pulchella* and *C. aquatilis*	
C4		40	<1		organic	Dominated by *Glyceria pulchella* and *C. aquatilis*	*Calligeron spp*
D	Shallow water linked basin	23,673	>2	7	silty sand / rock	*Carex aquatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis* and *Eriophorum angustifolium*	*Calligeron spp.* and *Scouleria aquatilis*
E	Shallow water linked basin	12,619	>2	7		*Carex aquatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis, Aulacomnium palustre* and a few patches of sphagnum mosses	*Sparganium hyperboreum, Hippuris vulgaris, Calligeron spp*
F	Riparian stream	6,484	>2	7	organic	*Carex aquatilis, Carex saxatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis, Aulacomnium palustre* and sphagnum spp. Few willow and shrub birch 2-5 m back from shoreline	*Sparganium hyperboreum, Ranunculus hyperboreus, Calligeron spp*
G	Shallow water - isolated basin	5,290	1.3	6.5	cobble / silty sand	*Carex saxatilis* dominant, willows and white spruce approximately 3 to 5 m from shoreline	*Sparganium hyperboreum*
H	Riparian stream marsh	9,725	<1	8	organic	*Carex aquatilis* dominant, other main species include Luzulu parviflora, and Calamagrostis canadensis, willows and scrub birch on islands	*Sparganium hyperboreum* and *Callerigon spp*
I	Riparian stream marsh	4,717	<2	7	cobbles / boulders / organic	*Carex aquatilis, Juncus castaneus, Luzulu parviflora, Calamagrostis canadensis, Aulacomnium palustre*	*Callerigon spp*
J	Riparian stream marsh	5,211	<2	8	organic	*Carex aquatilis* dominant, plus *Luzulu parviflora, Calamagrostis canadensis, Juncus castaneus*, and *Equisetum arvense*	*Sparganium hyperboreum* and *Callerigon spp*

8 CONCLUSION

Ecosystem maps are valuable for sustainable land use planning and integrated resource management. In most Canadian jurisdictions, ecosystem mapping has provided a common language for multi-agency integrated resource management. Developing a local scale ecological classification system for the Project area will aid in advancing the ELC knowledge of this part of the Yukon Plateau-North ecoregion. This will provide an ecosystem based decision making and guidance for protection of the natural landscape and wildlife habitat.

In total there were 320 polygons delineated, interpreted and assigned an ecosystem(s) units. There are three ecozones with a total of 27 ecosystem types that have been described and assigned to the appropriate polygons as shown on the TEM in Appendix A. Nine control plots have been selected for monitoring, although there is a selection of alternative permanent plots established that can be drawn from depending on the focus of future studies.

The accuracy of the Project TEM project meets both the Yukon and B.C. standards for the mapping scale (1:23,000) for ecosystem inventories and map presentation.

Benefits of the ecosystem map for the Project include:

- Biological and ecological framework for land management;
- Means of integrating abiotic and biotic ecosystem components on one map;
- Basic information on the distribution of ecosystems from which land management decisions can be based;
- Basis for rating values of resources or indicating sensitivities in the landscape;
- Historic record of ecological site conditions that can be used as a framework for monitoring ecosystem response to development, natural disturbances or reclamation; and
- Demonstration tool for portraying ecosystem and landscape diversity (Resources Inventory Committee, 1998).

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APPENDIX A

KUDZ ZE KAYAH PROJECT TERRESTRIAL ECOSYSTEM MAP

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KUDZ ZE KAYAH PROJECT
ECOSYSTEM MAP

BMC MINERALS

MAP LEGEND

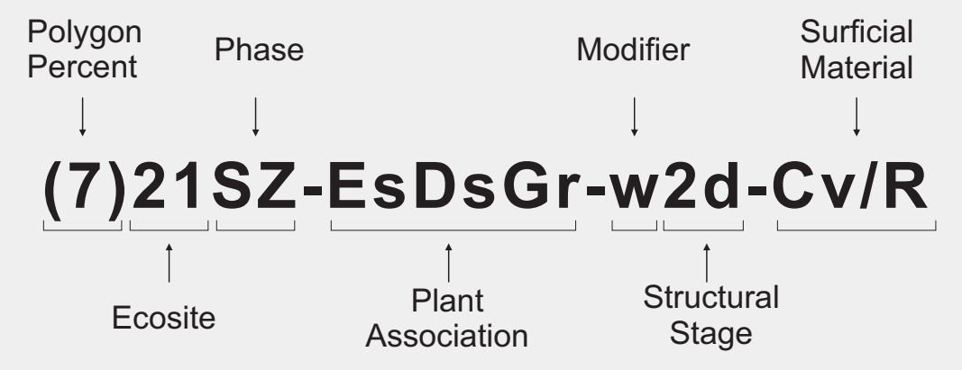
LEADING SPECIES

🟩 Carex species
🟨 Dwarf shrubs
🟥 Scrub Birch
🟩 White Spruce
🟦 Sub Alpine Fir
🟨 Graminoids
🟪 Lichen species
🟥 Willow species
🟦 Riparian
🟦 Black Spruce
🟧 Shrubs
▨ Wetland
🟧 Aspen

OTHER MAP FEATURES

• Ecosystem Plot
— Contours (40 m interval)
☐ Local Study Area
▨ Location of Proposed Mine Infrastructure
☐ BMC Minerals (No.1) Ltd. Mineral Claim Areas

ECOSYSTEM UNIT CODE



MODIFIERS	
M	Moist
X	Dry
W	Warm
K	Cool

ECOSYSTEM PHASE	
SK	Sand and cobble
SZ	Sandy silt
G	Gravel
O	Organic
S	Sand
z	Silt

STRUCTURAL STAGES

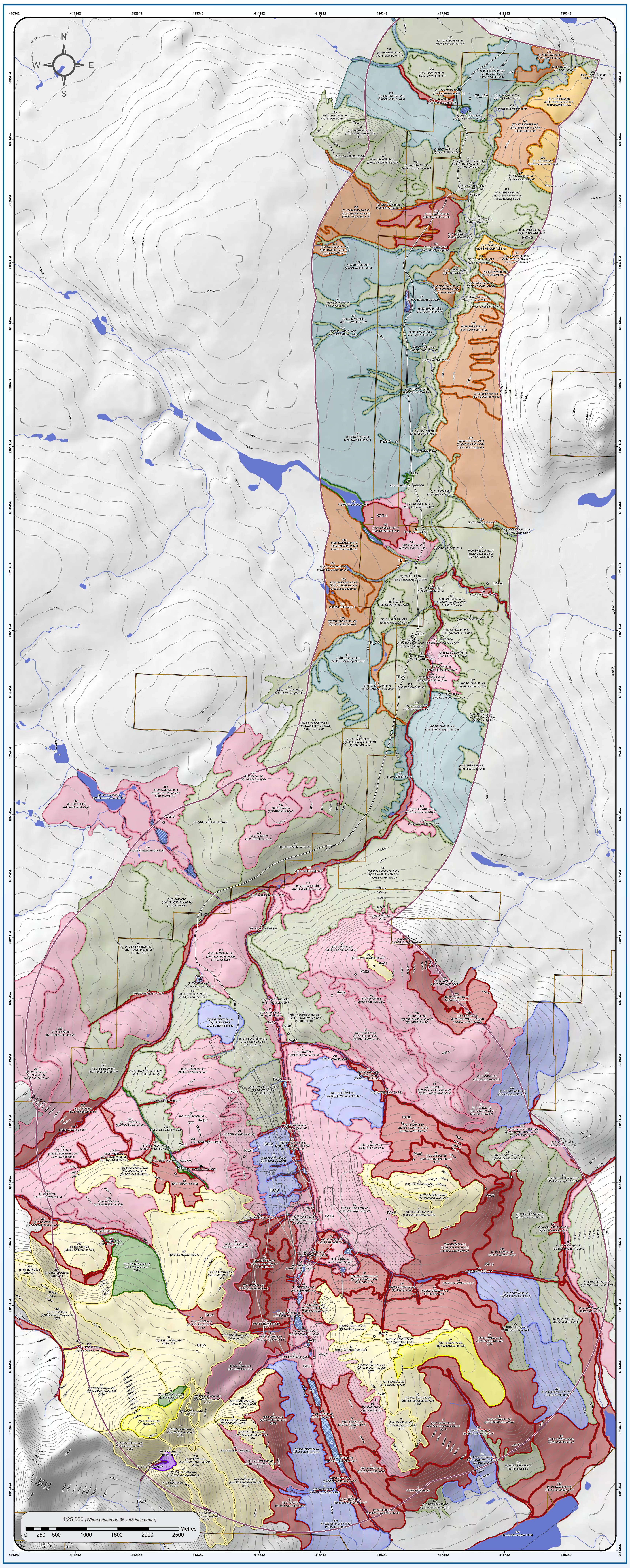
NUMBER CODE	STAGE AND SUB STAGES	DESCRIPTION OF STAGE
1	Sparse/Bryoid	Initial stages of primary and secondary succession; bryophytes and lichens often dominant, can be up to 100%; time since disturbance less than 20 years for normal forest succession, may be prolonged (50–100+ years) where there is little or no soil development (bedrock, boulder fields); total shrub and herb cover less than 20%; total tree layer cover less than 10%.
1a	Sparse	< 10% vegetation cover
1b	Bryoid	>50% Bryophyte and lichen in vegetation cover
2	Herb	Early successional stage or herbaceous communities maintained by environmental conditions or disturbance (e.g., snow fields, avalanche tracks, wetlands, grasslands, flooding; dominated by herbs (forbs, graminoids, ferns); some invading or residual. ; tree layer cover less than 10%, shrub layer cover less than or equal to 20%, Herb cover >20%.
2a	Forbs	Forb-dominated communities (greater than 1/2 of the total herb cover) by non-graminoid herbs.
2b	Graminoids	Graminoid dominated herbaceous communities dominated (greater than 1/2 of the total herb cover) by grasses, sedges, reeds, and rushes.
2c	Aquatic	Aquatic herbaceous communities dominated (greater than 1/2 of the total herb cover) by floating or submerged aquatic plants; does not include sedges.
2d	Dwarf Shrubs	Dwarf shrub communities dominated (greater than 1/2 of the total herb cover) by dwarf woody species such as four-angled mountain heather (*Cassiope tetragona*), bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea),* Crowberry (*Empetrum nigrum*), bearberry (*Arctostaphylos rubra*) and prostrate growing willows e.g. *Salix reticulata,* (See list of dwarf shrubs assigned to the herb layer in the *Field Manual for Describing Terrestrial Ecosystems)*.
3	Shrub/Forb	Early successional stage or shrub communities maintained by environmental conditions or disturbance (e.g., snow fields, avalanche tracks, wetlands, grasslands, flooding, intensive grazing, intense fire damage); dominated by shrubby vegetation; seedlings and advance regeneration may be abundant; tree layer cover less than 10%, shrub layer cover greater than 20% or greater than or equal to 1/3 of total cover.
3a	Low Shrub	Low shrub Communities: dominated by shrub layer vegetation less than 2 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; seedlings and advance regeneration may be abundant; time since disturbance less than 20 years for normal forest succession.
3b	High Shrub	Tall shrub Communities: dominated by shrub layer vegetation that are 2–10 m tall; may be perpetuated indefinitely by environmental conditions or repeated disturbance; seedlings and advance regeneration may be abundant; time since disturbance less than 40 years for normal forest succession.
4	Pole Sapling	Dense growth, have overtopped shrub and herb layers; younger stands are vigorous (usually greater than 15 years old); self-thinning and vertical structure not yet evident in the canopy –this often occurs by age 30 in vigorous broadleaf stands, which are generally younger than coniferous stands at the same structural stage; time since disturbance is usually less than 40 years.
5	Young Forest	Self-thinning has become evident and the forest canopy has begun differentiation into distinct layers (dominant, main canopy, and overtopped);vigorous growth and a more open stand than in the pole/sapling stage; time since disturbance is generally 40–60 years
6	Mature Forests	Trees established after the last disturbance have matured; a second cycle of shade tolerant trees may have become established; understories become well developed as the canopy opens up; time since disturbance is generally 80–120 years.
7	Old Forests	Old, structurally complex stands composed mainly of shade-tolerant and regenerating tree species, although older seral and long-lived trees from a disturbance such as fire may still dominate the upper canopy; snags and coarse woody debris in all stages of decomposition typical, as are patchy understories; time since disturbance generally greater than 120 years

SURFICIAL MATERIAL

CODE	SURFICIAL MATERIAL	DESCRIPTION
C	Colluvial	Colluvium is gravity eroded material existing along or at the base of slopes. Colluvium may consist of unsorted sediments, broken rock or any combination of material.
D	Disturbance	Any human-disturbed or transported materials such as gravel pits, roads, tailings, landfills, waste piles, transect lines etc.
Gf	Glaciofluvial	Deposits consisting of boulder, cobbles, sand and silt along glacial melt water channels. Usually sorted in layers, sources of aggregates.
Gl	Glaciolacustrine	Glacial Lacustrine landforms are composed of sediments that were deposited in post-glacial standing water environments, generally post-glacial lakes. Glacial lacustrine sediments are typically fine-sandy and/or silt like in texture. This parent material is likely under the deep organic layers found in the valley bottom.
F	Fluvial	Used to indicate creek deposits in upper (steeper) reaches. More gravel, cobbles and gravel present, than in alluvial systems. Common in flashier riparian systems.
I	Ice	Ice includes any surface exposed, multi-annual ice body that is relatively persistent from year-to-year. Ice parent materials are generally considered to be glaciers.
L	Lacustrine	Lacustrine landforms are composed of lake sediments deposited following the post-glacial period (differentiated from Glacial Lacustrine). Some lakes may drain rapidly exposing lake bottom sediments. Other situations would include slow processes of eutrophication converting an aquatic environment to a terrestrial landform.
M	Morainal till	Glacial (Morainal) Till landforms are composed of unsorted sediment, gravel and rocks that were transported and deposited by glaciers. Sediment texture, stoniness and drainage are highly variable.
O	Organic	Organic landforms are composed of poorly decomposed organic materials greater than 40 cm in thickness. Organic landforms generally occur in low-lying, poorly drained depressional sites. Organic materials originate primarily from slowly decomposing plant material.
R	Rock	Bedrock landforms may occur throughout the landscape and are defined anywhere bedrock is exposed at the surface. Shallow, weakly developed soils are commonly associated with bedrock, <10% vegetation.
W	Water	Open water such as wetlands, lakes and creeks.

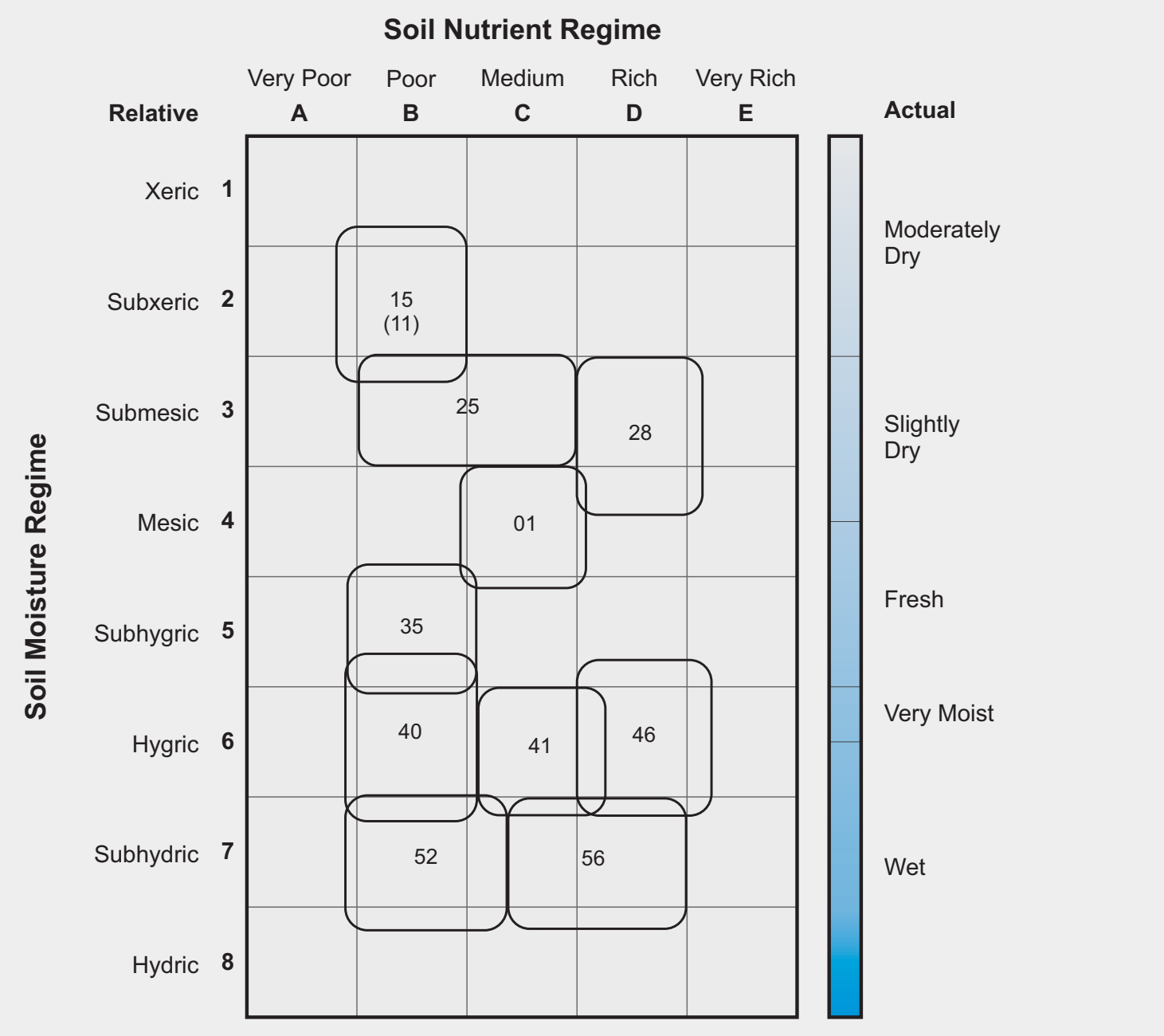
VEGETATION CODES

Vegetation Codes		
A	*Populus tremuloides*	Trembling aspen
Auco	*Aulacomnium palustre*	Glow Moss
B	*Populus balsamifera*	Balsam poplar
Caaq	*Carex aquatilis*	Water Sedge
Cx	*Carex sp.*	Sedge species
Ds	*Low growing shrubs commonly found in the Alpine and Sub-alpine includes Vaccinium, Arctostaphylos, Cassiope, Empetrum and prostrate willows*	Dwarf shrubs
Emni	*Empetrum nigrum*	Croberry
Er	*Eriophorum sp.*	Cottongrass
Es	*Betula glandulosa*	Scrub birch
Eq	*Equisetum sp.*	Horsetails
F	*Abies lasiocarpa*	Sub-alpine fir
Fb	*Herbaceous plants*	Forb species
Fm	*Pleurozium schreberi, Hylocomnium splendens*	Feathermoss
Gr	*Grasses, Carex, Juncus, Luzula*	Graminoids
He	*Cassiope tetragona*	Four-angled mountain-heather
Kn	*Arctostaphylos uva-ursi*	Kinnikinnick
Li	*Mainly refers to Cladina and Cladonia sp.*	Lichen species
Lu	*Lupinus arcticus*	Arctic lupin
Mo	*Dicranium, Aulacomnium, Polytrichum, Calliergon etc.*	Mosses (other than feather moss or sphagnum)
Rh	*Rhododendron sp.*	Labrador tea
Sb	*Picea mariana*	Black spruce
Sire	*Salix Reticulata*	Net-leaved willow
Sp	*Sphagnum sp.*	Sphagnum moss
Sw	*Picea glauca*	White spruce
Wi	*Salix sp.*	Willow species
Non-Vegetation Codes		
R		Bedrock
TA		Talus
Wi		Water



BOREAL HIGH EDATOPIC GRID

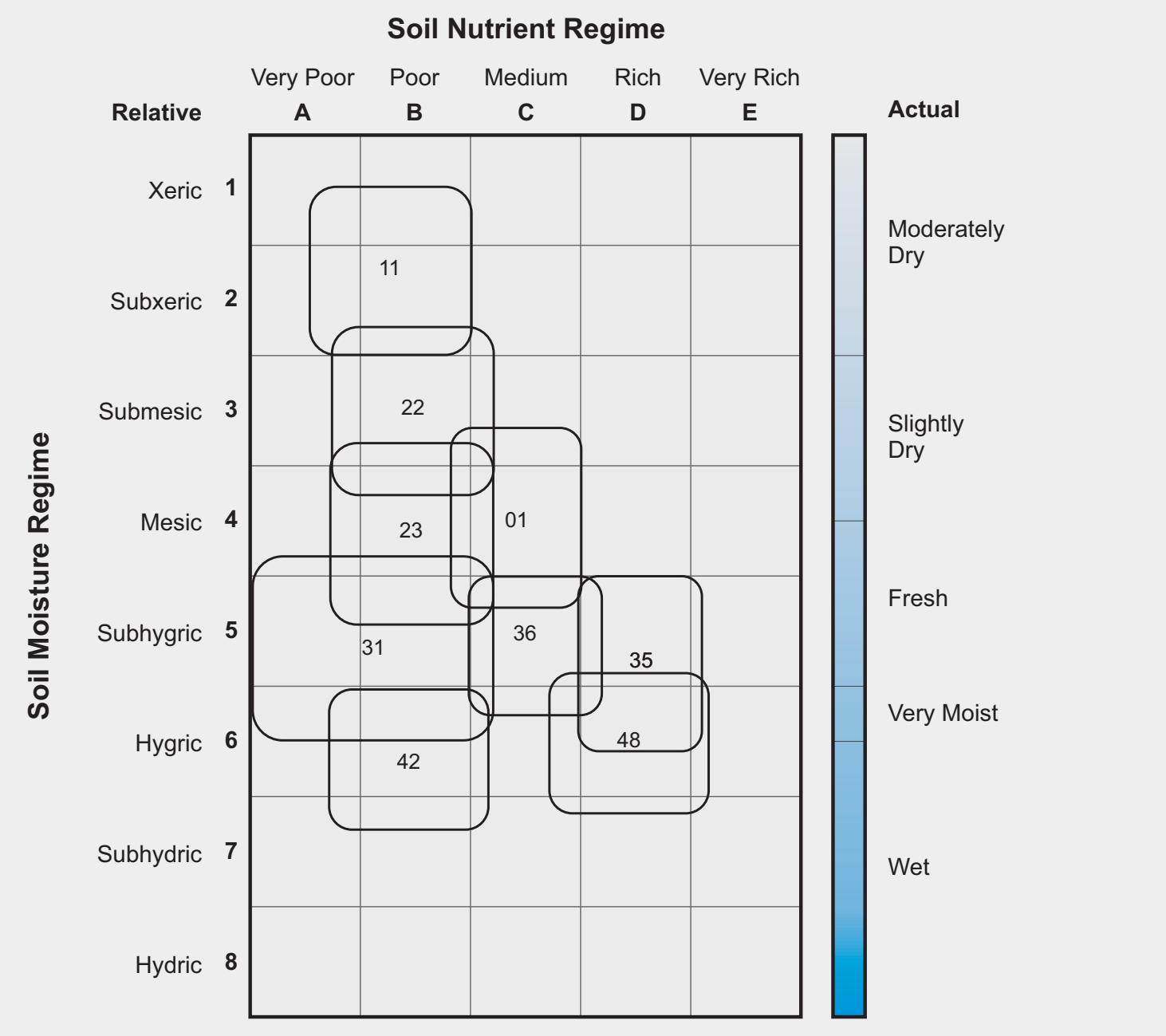
Elevation: < 1300 m



Site Unit	Plant Associations	Code
01	White spruce-Willow-Forbs-Feathermoss	SwWiFbFm
11	Trembling aspen-Kinnikinnick-Grass (SuccessionalStage)	AKnGr
15	White spruce-Scrub birch-Cladina	SwEsCl
25	White spruce-Scrub birch-Dwarf shrub-Feathermoss-Cladina	SwEsDsFmCl
28	White spruce-Balsam popular-Horsetail-Feathermoss	SwBEqFm
35	Black spruce-White spruce Labrador Tea-Feathermoss	SbSwRhFm
40	Black spruce-Labrador tea-Feathermoss-Cladina	SbRhFmCl
41	Willow-Carex aquatilis-Moss	WiCaaqMo
46	Balsam popular-Willow-Forbs	BWiFb
52	Scrub birch-Water Sedge-Sphagnum	EsCaaqSp
56	Sedge-Forb-Glow moss	CxFbAuco

BOREAL SUBALPINE EDATOPIC GRID

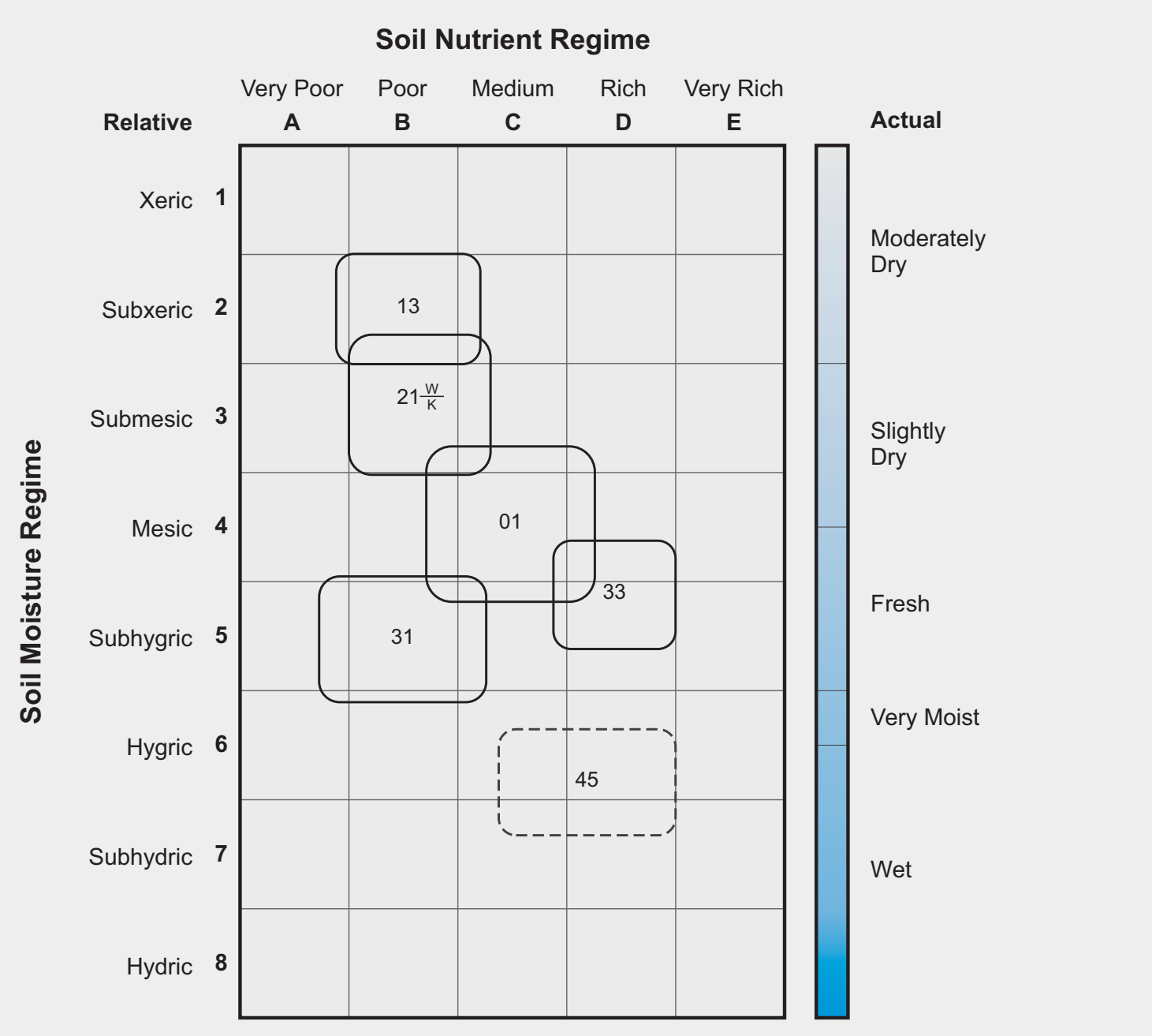
Elevation: 1300 - 1550 m



Site Unit	Plant Associations	Code
01	Scrub Birch-Willow-Feathermoss (non-treed) Fir-Scrub birch-Willlow-Feathermoss	EsWiFm FEsWiFm
11	Scrub birch-Lichen	EsLi
22	Scrub birch-Feathermoss-Lichen	EsFmLi
23	Scrub birch-Willow-Crowberry	EsWiEmni
31	Labrador tea-Scrub birch-Feathermoss-Lichen (non-treed) Fir-White spruce Labrador tea-Scrub birch-Feathermoss-Lichen	RhEsFmLi FSwRhEsFmLi
35	Willow-Horsetail-Forbs-Grass	WiEqFbGr
36	Grass-Forbs-Moss	GrFbMo
42	Water sedge-Sphagnum	Caaqsp
48	Carex-Grass-Forbs-Moss	CxGrFbMo

ALPINE EDATOPIC GRID

Elevation: ≥ 1600 m



Site Unit	Plant Associations	Code
01	Scrub Birch-Willow-Dwarf shrubs-Lupine	EsWiDSLu
13	Scrub birch-Grass-Lichen	EsGrLi
21	Scrub birch-Dwarf shrubs-Graminoids(w) Heather-Carex-Lichen(k)	EsDsGr(w) HeCxLi(k)
31	Net-veined Willow/Scrub birch-Carex-Moss	SireCxMo
33	Willow-Forbs-Carex	WiFbCx
45	Cotton grass-Forbs-Moss (Not Visible on the Map)	ErFbMo

WETLANDS

CODE	pH	SIZE (m^2)	CLASSIFICATION
A	7.5	91853	Shallow Water - Riparian - Meltwater Channel
B	8	35992	Shallow Water - Riparian - Meltwater Channel
C1	6.5	400	Basin Fen
C2	7	2850	Basin Fen
C3	7	100	Basin Fen
C4	7	40	Basin Fen
D	7	23673	Shallow Water Linked Basin
E	7	12619	Shallow Water Linked Basin
F	7	6484	Riparian Stream Fen
G	6.5	5290	Shallow Water - Isolated Basin
H	8	9728	Riparian Stream Marsh
I	7	4718	Riparian Stream Marsh
J	8	5211	Riparian Stream Marsh

ALEXCO ENVIRONMENTAL GROUP

APPENDIX B

EXAMPLE OF ECOSYSTEM DATA FORM

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PAGE	OF

VEGETATION COVER	%
TREE LAYER (A)	0
SHRUB LAYER (B)	90
HERB LAYER (C)	75
MOSS LAYER (D)	30

WILDLIFE SIGN (SCAT, TRACKS, BROWSE, CALL, ENCOUNTER, DEN, ETC.)
willows browsed, moose scat (moderate) Network of trails @ 100m elevation below rip willows

TALLEST DOMINANT CO-DOMINANT **TREE LAYER (A)**

SPECIES	A1 (>10m) %	A2 (2m – 10m) %	A3 SUPPRESSED %	SPECIES	A1 (>10m) %	A2 (2m – 10m) %	A3 SUPPRESSED %
Above	treeline						

SHRUB LAYER (B)

SPECIES	B1 (>2m – 10m) %	B2 (<2m) %	SPECIES	B1 (>2m – 10m) %	B2 (<2m) %
Betu gla	75		Rhodo gro	<1	
Salix	15				
Rosa aci	2				

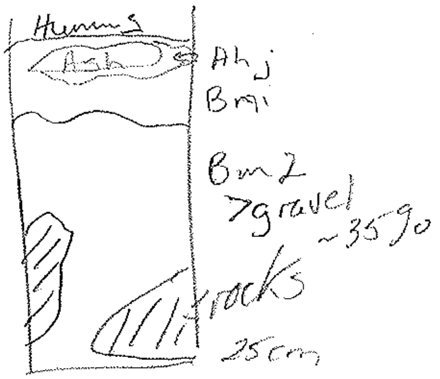
TREE REGENERATION <50cm

SPECIES	%	%	HEIGHT

HERB LAYER (C)						MOSS LAYER		LICHEN LAYER	
SPECIES	%	SPECIES	%	SPECIES	%	SPECIES	%	SPECIES	%
Arte nor	20	Fest alt	5			Polytrichum	6	Peltigera	6
Peta fri	45					Hylo spl	15	Cladina	3
Vacc vit	3					Aula pal	1	Stereocaulon	2
Empe nig	1					Dicranium	1		
Pole cae	<1								
Mert pan	5								
Vacc uli	1								

DOMINANT TREE AGE EST. COUNT	DBH (cm)	HEIGHT (m)	SUCCESSIONAL STAGE	STRUCTURAL STAGE

SITE SKETCH: (1 cm = ________________)



In shrub belt elevation that continues on this eastern side of Genoa Valley mostly above Treeline. A few Subalpine fir ~ 2% of polygon

Salix: barclay, arb, gla

PAGE	OF
1	1

ACCESS
CONSULTING GROUP

PROJECT ID: K2K-01-15 (800)

Scrubbirch-Willow-Coltsfoot C/4
Possible ref plot for Subalpine

WEATHER: Cloudy w Sunny periods
~12°C

PLOT #: PA02	SURVEYORS: LK, KS	DATE: July 29/15	START TIME:	END TIME:
TYPE/ # OF SAMPLES: Soil, willow		PHOTO #'S: 17/6 + 18, 19 KS camera	

GPS ZONE	E See on map N
ASPECT (%)	218
SLOPE (%)	24
ELEVATION	≤1600 approx

SOIL FEATURES			
SURFICIAL MATERIAL (ENTER CODE)		C	M
DEPTH TO (cm)			
WATER TABLE	W	—	
MOTTLES	M	—	
ROOT REST. PAN	R	—	
BEDROCK	B	—	
FROZEN LAYER	F	—	
CARBONATES	C	—	
OTHER Ash		0-4cm	

large cobbles ~20 cm on surface

HUMUS FORM (ENTER X)		
MOR	MO	
MORMODER	MM	✓
MODER	MD	
MULLMODER	MR	
MULL	MU	
SOIL COLOUR (ENTER X)		
DARK	D	
MEDIUM	M	✓
LIGHT	L	
NOT APPLICABLE	N/A	

SOIL DRAINAGE		SNR	
VR	VERY RAPIDLY	A	VERY POOR
R	RAPIDLY	B	POOR
[✓ W]	WELL	[✓ C]	MEDIUM
MW	MODERATELY WEL	D	RICH
I	IMPERFECTLY	E	VERY RICH
P	POORLY	F	SALINE
VP	VERY POORLY	**SMR**	
SEEPAGE		0	VERY XERIC
P	PRESENT	1	XERIX
[✓ A]	ABSENT	2	SUBXERIC
Open Water Present (%)		3	SUBMESIC
Plot 0	Polygon 0	[✓ 4]	MESIC
		5	SUBHYGRIC
ROCKY SUBSTRATES (%)		6	HYGRIC
COBBLES/ STONES	/	7	SUBHYDRIC
BEDROCK	0	8	HYDRIC
GULLIES IN POLYGON		9	AQUATIC

	Y	N
WITHIN MAIN PLOT		✓
BETWEEN PLOTS		✓

SITE CLASSIFICATION				
←UNIFORM TO VARIABLE →				
[✓ 1]	2	3	4	5

SURFACE SHAPE		MICROTOPOGRAPHY		PLOT POSITION MESO	
CV	CONCAVE	SM	SMOOTH	C	CREST
CX	CONVEX	[✓ MO]	MOD. MOUNDED	UP	UPPER SLOPE
[✓ ST]	STRAIGHT	ST	STRONGLY MOUNDED	[✓ MS]	MID SLOPE
UN	UNDULATING	EX	EXTREMELY MOUNDED	LS	LOWER SLOPE

SURFACE COMPOSITION (MUST EQUAL 100%)								
ROCK	COBBLE	GRAVEL	SOIL	VEG	ORG.	WOOD	T	TOE
'	/			88	10	/	D	DEPRESSION
							L	LEVEL

SOIL DESCRIPTION			
HORIZON	DEPTH FROM 0cm	TEXTURE	% TOTAL COARSE FRAGMENTS
L	13	—	-
F	8	—	-
H	3	—	—
ZERO→ Ash j	3		—
Bm_1	9	SiL	25
BM_2	25	SiL	>35
DOP	25	DOP = DEPTH OF PIT (DISTANCE FROM ZERO)	

COMMENTS/ SITE DISTURBANCES/ SAMPLES

Willows taller than avg ht of scrub birch by 30 to 80cm Hit large rocks ~ lithic layer
Ash layer 'White River tephra' 1200 yr ago
Frost heaving Ah + Ash layers mixed

APPENDIX C

FIELD PLOT SUMMARIES

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Project Area Ecosystem Plot Descriptions

Plot PA01 **Location: 09V E 416209.5 N 6820971**

Vegetation cover	60 Festuca/Carex 40 Willow (S.arb/arc)
Age in years (dominant species)	N/A
Polygon Number	106
Site Code	(10) 31SZ-SireCxMo-3b-C/R
Soil moisture and nutrient values (SNR/SMR)	B/2
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (R.dsCv)
Crown cover for polygon in %	N/A
Structural Stage	2b/3a
Aspect (^{0})	237
Elevation (m)	1650
Slope %	12
Meso slope position	Crest
Drainage	W
Samples	Soil, grass , willow

Site description: Gentle rolling alpine tundra, W aspect, Ground cover 90%,

Plant community: Graminoid dominant with groupings of low and dwarf shrubs, 10% Feather moss, 4% lichen in dyer microsites.

Soils: Coarse textured Brunisolic Dystric Turbic Cryosolic (OD.TC) soils, frost heaving present, seepage from melting soils in pit. Large talus fragments in pit bottom.

Plot PA02 **Location**: **09V E 415912 N 6820841**

Vegetation cover	80% Scrub birch (willow); 20%Herbaceous
Age in years (dominant species)	N/A
Polygon Number	105
Site Code	(5) 01-EsWiFm-3b/(5) 23SZ-EsWiEmni-2d-C/r
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock R. dsCv
Crown cover for polygon in %	N/A
Succession Stage	3a
Aspect (^{0})	218
Elevation (m)	1600
Slope %	24
Meso slope position	Mid
Drainage	MW
Samples	Soil and willow

Site description: Uniform moderate slope with SW exposure, sub-alpine.

Plant community: Low shrub (<2m) dominant, herbaceous ground cover 50% (Coltsfoot and Sagewort), 25% bryophytes. Polygon above tree line Sub-alpine fir only 2% cover.

Soils: Shallow (25cm) Coarse textured Brunisolic Dystric Turbic Cryosolic (BRD.TC) soils. Tephra layer present. Large angular coarse fragments in pit bottom

Plot PA03 **Location: 09V E 415525.7 N 6820498**

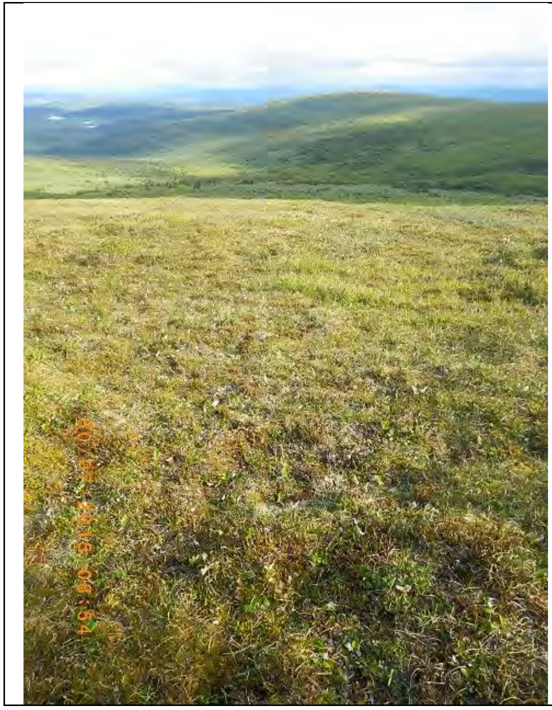
Vegetation cover	70 Scrub birch (willow); 50 Feathermoss; 20 SF
Age in years (dominant species)	> 150 yrs
Polygon Number	92
Site Code	(5) 01-EsWiFm-3a / (3) 11S-EsLi-3a-C/M / (2) 01SZ-FEsWiFm-6
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock R. dsCv
Crown cover for polygon in %	10
Succession Stage	3 (6 in forest patches)
Aspect (^{0})	220
Elevation (m)	1470
Slope %	5
Meso slope position	Mid
Drainage	MW
Samples	Soil and willow

Site description: Gentle sloping sub-alpine parkland, rolling terrain.

Plant community: Mix of high and low shrubs, drier areas have shrub birch and lichen cover, low herbaceous cover <10%, 50% bryophytes.

Soils: Shallow (25cm) Coarse textured Brunisolic Dystric Brunisol (BRD.TC) soils, no signs of mixing. Tephra layer present. Slight sorting of soils, finer grains in B2 horizon.

Plot PA04 **Location: 09V E 417104.6 N 6817402**



Vegetation cover	20 Dwarf shrubs, 30 Graminoid, 25 bryophytes
Age in years (dominant species)	N/A
Polygon Number	73
Site Code	(10) 31SZ-SireCxMo-3b
Soil moisture and nutrient values (SNR/SMR)	C/5
Soil Classification	OD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (R.dsCv)
Crown cover for polygon in %	N/A
Structural Stage	2b/2d
Aspect (^{0})	340
Elevation (m)	1664
Slope %	13
Meso slope position	Upper
Drainage	I
Samples	Soil

Site description: Gentle rolling alpine tundra, N aspect,

Plant community: Graminoid dominant with dwarf shrubs, Net vein willow-sedge-moss

Soils: Coarse textured Brunisolic Eutric Turbic Cryosolic (BRE.TC) soils, pH ($CaCl^2$) = 5.82 Seepage from melting ice in surface soils.

Plot PA05 **Location: 09V E 416853.4 N 6817818**

Vegetation cover	50% low willows, 40 Graminoid, 40 Herb, 20 Dwarf shrubs
Age in years (dominant species)	N/A
Polygon Number	74
Site Code	(8) 33-WiFbCx-3b / (2) 31SZ-SireCxMo-2b-C/R
Soil moisture and nutrient values (SNR/SMR)	D/4
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (R.dsCv)
Crown cover for polygon in %	N/A
Structural Stage	2a/b, 3
Aspect (^{0})	350
Elevation (m)	1576
Slope %	10
Meso slope position	Upper
Drainage	MW
Samples	Soil, grass, willow

Site description: Gentle sloped sub-alpine shrub/meadow mosaic, frost generated hummocks present, N aspect.

Plant community: High diversity of herbs. Willow-Altaic fescue-herb (Sagewort)

Soils: Coarse textured Brunisolic Dystric Turbic Cryosolic (BRD.TC) soils, distinctive dark humus, deeper soils than previously encountered.

Plot PA06 **Location**: **09V E 416673.5 N 6818414**

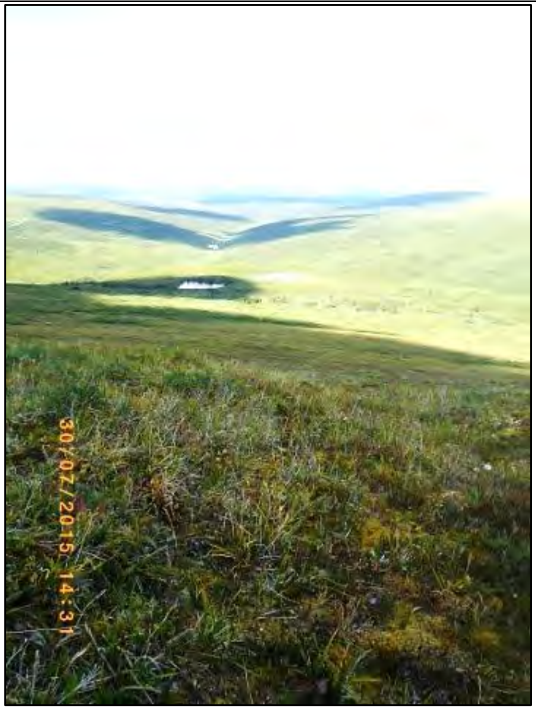
Vegetation cover	15 Fir, 30 shrub birch, 15 willow, 50 moss, 15 lichen
Age in years (dominant species)	Approx. 120 SF
Polygon Number	75
Site Code	(6) 01-EsWiFm-3b / (2) 01SZ-FEsWiFm-6-C/M / (2) 48OZ-CxGrFbMo-2b
Soil moisture and nutrient values (SNR/SMR)	B/3
Soil Classification	OD.SC
Soil Texture	SL
Surficial material	Colluvium veneer over morainal (xCv/dsMb)
Crown cover for polygon in %	15
Structural Stage	3/6
Aspect (^{0})	352
Elevation (m)	1497
Slope %	8
Meso slope position	Mid
Drainage	W
Samples	Soil, grass, willow

Site description: Gentle sloped subalpine parkland, below treeline.

Plant community: Shrub birch and lichen in exposed drier sites. Sub-alpine fir clumps within shrub matrix.

Soils: Coarse textured Brunisolic Dystric Static Cryosolic (BRD.SC) soils (or Orthic Brunisol)

Plot PA07 **Location**: **09V E 416215.7 N 6814940**



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Vegetation cover	30 Graminoid, 35 Dwarf shrub, 15 moss
Age in years (dominant species)	N/A
Polygon Number	50
Site Code	(8) 21SZ-EsDsGr-w-2d / (2) 01-WiEsDsLu-3a-C
Soil moisture and nutrient values (SNR/SMR)	B/5(4)
Soil Classification	BRE.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (gsxCv/R)
Crown cover for polygon in %	N/A
Structural Stage	2b/d
Aspect (^{0})	8
Elevation (m)	1667
Slope %	18
Meso slope position	Upper
Drainage	MW
Samples	Soil, willow

Site description: Gentle sloped alpine tundra, solifluction present

Plant community: Graminoid heath, Sedge-willow-heather

Soils: Coarse textured Brunisolic Eutric Turbic Cryosolic (BRE.TC) soils

Plot PA08 **Location**: **09V E 416249.5 N 6813903**

Vegetation cover	35 Shrub birch, 35 Dwarf shrub, 20 Graminoid
Age in years (dominant species)	N/A
Polygon Number	25
Site Code	(7) 13G-EsGrLi-3a / (3) 33-WiFbCx-3b-C
Soil moisture and nutrient values (SNR/SMR)	B/3
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (gsxCv/R)
Crown cover for polygon in %	N/A
Structural Stage	2d/3a
Aspect (^{0})	242
Elevation (m)	1690
Slope %	28
Meso slope position	Upper
Drainage	I
Samples	Soil, willow

Site description: Moderate sloped alpine tundra, solifluction present, SWW aspect, exposed rock and gravel ~10%. Soil pit located in small drainage hidden by overlying rocks, not representative of plot moisture regime.

Plant community: Scrub birch-blueberry-Graminoid/lichen

Soils: Coarse textured Brunisolic Dystric Turbic Cryosolic (BRD.TC) soils

Plot PA09 **Location**: 09V **E 418033.6 N 6817351**

Vegetation cover	60 Dwarf shrub- 20 herb
Age in years (dominant species)	N/A
Polygon Number	74
Site Code	(8) 33-WiFbCx-3b / (2)31SZ-SireCxMo-2b-C/R
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	BRE.TC
Soil Texture	SL
Surficial material	Colluvium veneer over bedrock (gsxCv/R)
Crown cover for polygon in %	N/A
Structural Stage	2d
Aspect (^{0})	78
Elevation (m)	1586
Slope %	30
Meso slope position	Upper
Drainage	MW
Samples	Soil, grass, willow, blueberries

Site description: Moderate sloped alpine tundra, solifluction present, E aspect.

Plant community: Dwarf shrubs-Lupine, Ref site?

Soils: Coarse textured Brunisolic Eutric Turbic Cryosolic (BRE.TC) soils. pH = 5.56, borderline dystric/eutric. Accumulation of surface organics = 16cm. Buried humus at 17cm

Plot PA10 **Location**: **09V E 418456.8 N 6817538**

Vegetation cover	60 shrub- 20 herb
Age in years (dominant species)	N/A
Polygon Number	243
Site Code	(7) 01-EsWiFm-3b / (3) 01-FSwEsWiFm-F
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	BRE.TC
Soil Texture	SL
Surficial material	Colluvium veneer over Morainal (gsxCv/M)
Crown cover for polygon in %	N/A
Structural Stage	3
Aspect (^{0})	65
Elevation (m)	1440
Slope %	22
Meso slope position	Mid
Drainage	W
Samples	Soil, Willow, Blueberries

Site description: Gentle sloped sub-alpine near treeline, solifluction present, NEE aspect.

Plant community: Willow-heather-Herb Dwarf shrubs-Lupine, polygon has 2% Sw and 5% Sf

Soils: Coarse textured Brunisolic Eutric Turbic Cryosolic (BRE.TC) soils, pH is 6.06. Accumulation of surface organics = 19cm, Ah=10cm. Dark colour soil in lower pit, frozen, some mixing of horizons.

Plot PA11 Visual assessment and sample **Location: 09V E 421395.4 N 6815143**

* Plot parameters not measured as site was used as view point to make notes on nearby polygons

Vegetation cover	
Age in years (dominant species)	
Polygon / Site Code	
Soil moisture and nutrient values (SNR/SMR)	
Soil Classification	
Soil Texture	
Surficial material	
Crown cover for polygon in %	
Structural Stage	
Aspect (^{0})	
Elevation (m)	
Slope %	
Meso slope position	
Drainage	
Samples	

Plot PA12 **Location**: **09V E 420478.1 N 6816095**

Vegetation cover	85 Tall shrub- 90 herb (10 tree)
Age in years (dominant species)	Approximate 100
Polygon / Site Code	*outside mapped area
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	BRD.TC
Soil Texture	SL
Surficial material	Morainal (szMv/R)
Crown cover for polygon in %	10
Structural Stage	3b (Sub-alpine fir=6)
Aspect (^{0})	235
Elevation (m)	1477
Slope %	26
Meso slope position	Upper
Drainage	MW
Samples	Soil (duplicate collected), willow, grass

Site description: West facing moderate sloped sub-alpine parkland. Control plot.

Plant community: Willow/birch- black tipped groundsel/tall blue bell-(moss)

Soils: Coarse textured Brunisolic Dystric Turbic Cryosolic (BRD.TC) soils. Buried humus layers, very few c.f. (10% in bottom horizon). No frozen horizon, relative deep soil.

Plot PA13 **Location: 09V E 418021.3 N 6816020**


31/07/2015 17:14

Vegetation cover	70 Sedge 35 willow 60 moss
Age in years (dominant species)	N/A
Polygon Number	234
Site Code	(7) 01-EsWiFm-3b / (3) 01-FSwEsWiFm-F
Soil moisture and nutrient values (SNR/SMR)	B/7
Soil Classification	HU.MC
Soil Texture	organic
Surficial material	(hObd/F^g)
Crown cover for polygon in %	N/A
Structural Stage	2b/3
Aspect (^{0})	112
Elevation (m)	1421
Slope %	5
Meso slope position	Depression
Drainage	P
Samples	No soil – organics, Horsetail

Site description: Wet meadow dominated by water sedge and low willows. Control plot.

Plant community: Sedge-willow-moss (sphagnum), 3% open water.

Soils: Humic Organic Cryosol (HU.OC)

Plot PA14 **Location: 09V E 415128.5 N 6814772**

Vegetation cover	70 willow/birch 40 Graminoids 30 Herb
Age in years (dominant species)	N/A
Polygon Number	33
Site Code	(10) 01-EsWiFm-3a-C/Gf
Soil moisture and nutrient values (SNR/SMR)	C/6
Soil Classification	GL.EB
Soil Texture	LS
Surficial material	sgmFGf
Crown cover for polygon in %	N/A
Structural Stage	2b,c/3b
Aspect (^{0})	88
Elevation (m)	1377
Slope %	6
Meso slope position	Depression
Drainage	Imperfect
Samples	Soil, grass roots, horsetail, willow

Site description: Moist shrub/meadow mosaic at pass, within mine pit footprint. Alluvial fan from Fault Creek.

Plant community: Graminoid/herb meadow with low willow and shrub birch. Sedge, horsetail prominent.

Soils: Not effected by permafrost. Gleyed Eutric Brunisol (GL.EB) on F^G alluvial fan.

Plot PA15 **Location**: **09V E 413853.3 N 6818827**


01/08/2015 12:54

Vegetation cover	70 willow/birch 40 Graminoids 30 Herb
Age in years (dominant species)	N/A
Polygon Number	80
Site Code	(8) 11S-EsLi-3b/2a-M / (2) TA
Soil moisture and nutrient values (SNR/SMR)	B/4(3)
Soil Classification	O.EB
Soil Texture	LS
Surficial material	dszCv-Mb
Crown cover for polygon in %	N/A
Structural Stage	3b, 2c/d
Aspect (^{0})	54
Elevation (m)	1454
Slope %	20
Meso slope position	Upper
Drainage	Well
Samples	Soil, willow, blueberries, grass roots

Site description: Gentle NEE facing slope at 100m above road.

Plant community: Low shrub-heather-grass.

Soils: Not effected by permafrost. Orthic Eutric Brunisol (O.EB) on colluvium veneer over morainal till, 35% c.f..

Plot PA16 **Location**: **09V E 414515 N 6817223**

Vegetation cover	15 Fir 70 willow/birch 70 Herb
Age in years (dominant species)	N/A
Polygon Number	78
Site Code	(9) 01SZ-FEsWiFm-3a / (1) 11S-EsLi-3a-C/Gf
Soil moisture and nutrient values (SNR/SMR)	B/4(3)
Soil Classification	OE.TC
Soil Texture	SL
Surficial material	dszCv-Mb
Crown cover for polygon in %	15
Structural Stage	6 /3a
Aspect (^{0})	103
Elevation (m)	1442
Slope %	20
Meso slope position	Mid
Drainage	Moderately Well
Samples	Soil, willow, grass

Site description: Gentle E facing slope at 100m below road where mill site is proposed. Strongly mounded, frost boils likely.

Plant community: Mature Sub-alpine fir at site, old growth white spruce at lower elevation ~1400m. Low shrub- birch/willow dominant cover. Rich moist site, high diversity of herbs.

Soils: Orthic Eutric Turbic Cryosol on colluvium veneer over morainal till. Hard pan present at 21cm.

Plot PA17a (Sample Site) **Location: 09V E 415239, 6816633**

Vegetation cover	Low shrub birch-moss-lichen
Age in years (dominant species)	N/A
Polygon Number	68
Site Code	(10) Wi-3b-F/M
Soil moisture and nutrient values (SNR/SMR)	B/3
Soil Classification	O.EB
Soil Texture	SL
Surficial material	szmF^{G}h
Crown cover for polygon in %	N/A
Structural Stage	3a
Aspect (^{0})	100
Elevation (m)	1370
Slope %	20
Meso slope position	Lower
Drainage	Well
Samples	Soil, grass leaves, willow

Site description: Large mound or hummock, drier relative to lower contiguous mountain slope.

Plant community: Low shrub birch-moss-lichen

Soils: Orthic Eutric Brunisol on Glaciofluvial deposit.

Plot PA17 **Location: 09V E 415240.9 N 6816933**

Vegetation cover	Willow(birch)-Water sedge-Sphagnum
Age in years (dominant species)	N/A
Polygon Number	68
Site Code	(10) Wi-3b-F/M
Soil moisture and nutrient values (SNR/SMR)	D/7
Soil Classification	Of
Soil Texture	Organic
Surficial material	sgmF-active
Crown cover for polygon in %	3a
Structural Stage	3B
Aspect (^{0})	N/A
Elevation (m)	1359
Slope %	2
Meso slope position	Depression
Drainage	Poorly
Samples	None

Site description: Along west side of Genoa Creek, strongly mounded. Site of proposed tailings pond.

Plant community: Sedge/horsetail/sphagnum wet meadow and shrub dominate riparian edge.

Soils: Organics over fluvial deposit.

Plot PA18 **Location**: **09V E 415333.9 N 6816964**

Vegetation cover	Shrub birch-feathermoss
Age in years (dominant species)	N/A
Polygon Code	69
Site Code	(6) 23SZ-EsWiEmni-3b / (4) 01SZ-FEsWiFm-6-C/M
Soil moisture and nutrient values (SNR/SMR)	C/5
Soil Classification	BRE.TC
Soil Texture	SL
Surficial material	Glaciofluvial
Crown cover for polygon in %	N/A
Structural Stage	3b
Aspect (^{0})	270
Elevation (m)	1365
Slope %	18
Meso slope position	Lower
Drainage	Imperfectly
Samples	Soil, willow

Site description: West facing slope

Plant community: Shrub birch-Feathermoss with 15% herbs (Sagewort, Horsetail)

Soils: Brunisolic Eutric Turbic Cryosol (E.TC). Colluvium veneer over morainal till. High coarse fragments

Plot PA19 **Location: 09V E 409805.6 N 6815768**

Vegetation cover	Shrub birch/Willow-Dwarf shrub-feathermoss
Age in years (dominant species)	N/A
Polygon / Site Code	Outside Mapped area
Soil moisture and nutrient values (SNR/SMR)	B/4 (3)
Soil Classification	BRD.TC
Soil Texture	L
Surficial material	Glaciofluvial
Crown cover for polygon in %	1
Structural Stage	3a
Aspect (^{0})	222
Elevation (m)	1448
Slope %	24
Meso slope position	Mid
Drainage	Moderately well
Samples	Soil, willow, grass roots

Site description: Control plot, same elevation, exposure as east side of proposed mine pit.

Plant community: Shrub birch/willow-dwarf shrubs-Feathermoss with < 10% herbs. Same veg profile as PA06, edatopic grid placement B/3.

Soils: Brunisolic Dystric Turbic Cryosol (BRD.TC) on colluvium veneer over morainal till.

Plot PA20 **Location**: **09V E 412348.3 N 6812158**

Vegetation cover	Sedge-Herb-Sphagnum
Age in years (dominant species)	N/A
Polygon / Site Code	Outside mapped area
Soil moisture and nutrient values (SNR/SMR)	C /7
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	zdCv/F
Crown cover for polygon in %	N/A
Structural Stage	2b/3
Aspect (^{0})	148
Elevation (m)	1517
Slope %	5
Meso slope position	Lower
Drainage	Poorly
Samples	Soil, willow, grass, horsetail

Site description: Control plot, same elevation and exposure as South Lakes south of proposed mine site.

Plant community: Sedge-Herb-Sphagnum with 15% willow on drier sites. High plant diversity. Similar veg profile as PA13 and 17, edatopic grid placement C/7.

Soils: Gleysolic Turbic Cryosol (GL.TC) on colluvium veneer over fluvial, small streams.

Plot PA34w **Location**: **09V E 413452 N 6815188**

Vegetation cover	Willow (scrub birch)-carex-feather moss
Polygon Number	64
Site Code	(7) 33-WiFbCx-3a / (2) 31SZ-SireCxMo-2b-C / (1) TA
Soil moisture and nutrient values (SNR/SMR)	B (C)/5
Soil Classification	GL.TC
Soil Texture	SL
Terrain/Surficial material	skCv/M
Structural Stage	2b/3a
Aspect (^{0})	---
Elevation (m)	1706
Slope %	Level
Meso slope position	Depression
Drainage	Imperfectly
Samples	none

Site description: Alpine pass, permafrost patterned ground

Plant community: Low willows (S. gla and S. pla) are only 20 to 40 cm high, dominant sedge is C. podocarpa and Pleurozium the common moss.

Soils: Gleysolic Turbic Cryosol (GL.TC) faint mottles below 40 cm. Colluvium veneer over morainal. No soil sample, GIF plot.

Wildlife Habitat: Caribou rut area and willow browsed by moose.

Plot PA35w **Location: 09V E 0413326 N 6814698**


Vegetation cover	Heather-Carex-Lichen
Polygon Number	39
Site Code	(7) 21SZ-HeCxLi-2d / (3) TA- C/R
Soil moisture and nutrient values (SNR/SMR)	B/2
Soil Classification	BRD.TC (young development)
Soil Texture	SiL
Terrain/Surficial material	zskCv/M
Structural Stage	2d/2b
Aspect (^{0})	34
Elevation (m)	1728
Slope %	12
Meso slope position	Mid
Drainage	Rapidly
Samples	None

Site description: Gentle dry alpine slope, diverse moss and lichen species.

Plant community: Heather (*Cassiope tetragona*) is the dwarf shrub with the greatest coverage (40%), indicating that the site retains snow into the summer. *Carex podocarpa* (25%) and lichen species (20%) most common ground cover.

Soils: Brunisolic Dystric Static Cryosol (BRD.SC), soils dry and shallow with high %CF. Colluvium veneer over morainal close to lithic layer. No soil sample, GIF plot.

Wildlife: Caribou rut area, scat, and tracks.

Plot PA40 **Location: 09V E 0413336 N 6818359**

Vegetation cover	Scrub birch-Dwarf shrub-Lichen-Graminoid
Polygon Number	80
Site Code	(8) 11S-EsLi-3b/2a-M / (2) TA
Soil moisture and nutrient values (SNR/SMR)	B/2
Soil Classification	BRD.TC (young development)
Soil Texture	SiL
Terrain/Surficial material	skCv/R
Structural Stage	3a/2b
Aspect (^{0})	34
Elevation (m)	1728
Slope %	12
Meso slope position	Mid
Drainage	Rapidly
Samples	None

Site description: Gentle dry alpine slope, low scrub birch growing in slight depressions.

Plant community: Scrub birch is 60% cover, openings have lingonberry (*Vaccinium vitis-idaea*), lichen (*Stereocaulon*) with 5 to 10% graminoids.

Soils: Brunisolic Dystric Turbic Cryosol (BRD.TC), slight mixing due to frost heave, soils dry high %CF. Colluvium veneer over lithic layer. No soil sample, GIF plot.

Wildlife habitat: Ptarmigan scat in and around site.

Plot PA41 **Location: 09V E 0413030N 6817964**

Vegetation cover	Willow-Horsetail-Forb
Polygon Number	81
Site Code	(10) 48OZ-CxGrFbMo-3a/2a-C/R
Soil moisture and nutrient values (SNR/SMR)	E/5
Soil Classification	GL.HR
Soil Texture	SiL
Terrain/Surficial material	sgkCv/R
Structural Stage	3b/2a
Aspect (^{0})	258
Elevation (m)	1462
Slope %	12
Meso slope position	Depression
Drainage	Moderately well
Samples	Willow, horsetail

Site description: Riparian corridor, ephemeral stream, dry at time of visit, high plant species diversity, rich-moist soils.

Plant community: Scrub birch is 60% cover, openings have lingonberry (*Vaccinium vitis-idaea*), lichen (*Stereocaulon*) with 5 to 10% graminoids.

Soils: Gleyed Humic Regosol, thick H and Ahb with mottling in B horizons (<10 cm), sorting of sands and gravels from repeated flooding. Soil sample not taken, GIF plot.

Wildlife habitat: Moose browsed willows, wildlife trails

Plot PA42 **Location**: **09V E 0412976 N 6817591**

Vegetation cover	Willow-Grass-Forb
Polygon Number	#82
Site Code	(10) 01-EsWiFm-6-F/M
Soil moisture and nutrient values (SNR/SMR)	D/5
Soil Classification	R.TC
Soil Texture	LS
Terrain/Surficial material	zskCv/F
Structural Stage	3a/2
Aspect (^{0})	002
Elevation (m)	1481
Slope %	15
Meso slope position	Mid
Drainage	Moderately well
Samples	Soil, willow, horsetail

Site description: Dry meadow on gentle slope with small streams, a few fir in polygon.

Plant community: 60% grass (Festuca altica) and forbs (30%). Tall willows at 30%, only 5% scrub birch. Lower part of meadow has small stream with higher coverage of willows

Soils: Regosolic Turbic Cryosol thick H and Ahb (>10 cm). Solifluction present on slope.

Wildlife habitat: Moose browsed willows, moose scat, wildlife trails. Mice observed and vole tunnels.

Plot PA45 **Location: 09V E 0416426 N 6816855**

Vegetation cover	Scrub birch-grass, Sub-alpine fir-feathermoss,
Polygon Number	69
Site Code	(6) 23SZ-EsWiEmni-3b/ (4) 01SZ-FEsWiFm-6-C/M
Soil nutrient and moisture values (SNR/SMR)	B/4
Soil Classification	O.DYB
Soil Texture	SL
Terrain/Surficial material	sdCv
Structural Stage	3a
Aspect (^{0})	232
Elevation (m)	1540
Slope %	20
Meso slope position	Mid
Drainage	Well
Samples	willow, lichen

Site description: Gentle to moderate slope, sparse to open sub alpine forest in shrub matrix.

Plant community: 70% scrub birch cover (<10% willow), mainly feathermoss ground cover with crowberry and few forbs. Less than 10% lichens.

Soils: Orthic Dystric Brunisol, poor humus content and high CF% from colluvial deposits. Soil sample not taken

Wildlife habitat: Moose scat and trails.

Plot PA51 **Location**: **09V E 0414095 N 6817872**


Vegetation cover	Scrub birch-willow-dwarf shrub-moss-lichen
Polygon Number	79
Site Code	(10) 23SZ-EsWiEmni-3a-M
Soil nutrient and moisture values (SNR/SMR)	(C) B/4
Soil Classification	O.DYB
Soil Texture	LS
Terrain/Surficial material	sdCv/M
Structural Stage	3a
Aspect (^{0})	77
Elevation (m)	1477
Slope %	12
Meso slope position	Mid
Drainage	Moderately well
Samples	Soil, willow, lichen, blueberries (Vacc uli)

Site description: Gentle to moderate slope, sparse to open sub alpine forest in scrub birch matrix.

Plant community: 65% scrub birch cover (<15% willow), Rhododendron groelandicum has 25% cover. High crowberry (40%) and Vaccinum uliginosum (30%) feathermoss and lichen ground cover.

Soils: Dystric Brunisol, poor humus content and high CF% from colluvial deposits.

Wildlife habitat: Moose scat and trails.

Plot PA52 **Location**: **09V E 0414337 N 6818027**

Vegetation cover	Sub-alpine forest-scrub birch-feathermoss
Polygon Number	78
Site Code	(9) 01SZ-FEsWiFm-3a / (1) 11S-EsLi-3a-C/Gf
Soil nutrient and moisture values (SNR/SMR)	B/4
Soil Classification	O.DYB
Soil Texture	LS
Terrain/Surficial material	sxCv/M
Structural Stage	5 Young forest (F) and 7 Old growth (Sw)
Aspect (^{0})	60
Elevation (m)	1426
Slope %	17
Meso slope position	Mid
Drainage	Well
Samples	Soil, willow, lichen

Site description: Sparse to open forest of young sub-alpine fir intermixed with larger, older white spruce at lower elevations in polygon, forb poor.

Plant community: 65% scrub birch cover (15% willow). High crowberry (30%) and Vaccinum uliginosum (10%) feathermoss (60%) and lichen (30%) ground cover.

Soils: Orthic Dystric Brunisol, poor humus content and high CF% (mica) at 7 cm depth.

Wildlife habitat: Moose and wolf scat and trails.

Plot PA53 **Location**: **09V E 0415054 N 6814570**

Vegetation cover	Scrub birch(Willow)-feathermoss-lichen
Polygon Number	33
Site Code	(10) 01-EsWiFm-3a-C/Gf
Soil nutrient and moisture values (SNR/SMR)	B/3 (2)
Soil Classification	O.DYB
Soil Texture	Sand, gravel
Terrain/Surficial material	rx/Cc rapid mass failure
Structural Stage	3a
Aspect (^{0})	75
Elevation (m)	1392
Slope %	6
Meso slope position	Lower
Drainage	Rapid
Samples	willow, lichen

Site description: Colluvial cone from mass failure along Fault Creek. Unconsolidated angular gravels and cobbles high %CF through soil pit. Disturbance from equipment moving through polygon.

Plant community: 70% scrub birch cover (15% willow), Feathermoss(55%), Cladina sp.(30%) and Festuca altica (15%). Polygon has sparse tree coverer of 10%.

Soils: Orthic Dystric Brunisol, high CF%, Soil sample not taken too high in coarse fragments.

Wildlife habitat: Moose and wolf scat, tracks, numerous wildlife trails.

Plot PA54 **Location**: **09V E 0415231 N 6814600**

Vegetation cover	Scrub birch(Willow)-feathermoss-Forb
Polygon Number	32
Site Code	(10) 01-WiEsDsLu-3b-C/Gf
Soil nutrient and moisture values (SNR/SMR)	D/5
Soil Classification	GL.TC
Soil Texture	SiL
Terrain/Surficial material	Cv
Structural Stage	3a
Aspect (^{0})	265
Elevation (m)	1393
Slope %	16
Meso slope position	Toe
Drainage	Imperfectly
Samples	Soil, willow, horsetail

Site description: Repeated buried humus horizons, angular colluvial CF in B horizons. Gleysolic chromas and signs of soil creep from solifluction. Lower portion of plot is moister with grasses and sedges present.

Plant community: 65% scrub birch cover (15% willow), Feathermoss and glow moss (55%), plus 25% horsetail, a variety of forbs.

Soils: Gleysolic Turbic Cryosol

Wildlife: Several song bird species heard, moose tracks, scat and trails.

Plot PA55 **Location**: **09V E 0414566 N 6819033**

Vegetation cover	White spruce-Sub-alpine fir-Feathermoss-Forbs
Polygon number	86
Site Code	(5) 31-RhEsFmLi-3a / (4) 01-EsWiFm-3b-F / (1) 11S-EsLi-3a
Soil nutrient and moisture values (SNR/SMR)	C/4
Soil Classification	O.DYB
Soil Texture	LS (SiL below 32 cm)
Terrain/Surficial material	F
Structural Stage	3b/7 (Fir is younger <80 yrs)
Aspect (^{0})	NEE
Elevation (m)	1356
Slope %	10
Meso slope position	Lower
Drainage	Well
Samples	Soil, salix, lichen

Site description: Repeated buried humus horizons, sorted sands and gravels. Small ephemeral streams in plot and polygon.

Plant community: High diversity of forb species. 40% willow, (Scrub birch 10%), 65% Feathermoss moss Late snow retention ~ 10% four-angled heather.

Soils: Repeated weakly developed Orthic Dystric Brunisol

Wildlife: moose tracks, scat and trails. Willows moderately browsed.

Plot PA56 **Location**: **09V E 0415067 N 6814124**

Vegetation cover	Willow Forb- Feathermoss-Horsetail
Polygon Number	6
Site Code	(7) 01-EsWiFm-3a / (3) 48OZ-CxGrFbMo-2b-C/F
Soil nutrient and moisture values (SNR/SMR)	D/6
Soil Classification	GL.TC
Soil Texture	L
Terrain/Surficial material	zsF
Structural Stage	3b
Aspect (^{0})	97
Elevation (m)	1370
Slope %	10
Meso slope position	Depression
Drainage	Poor
Samples	Soil, willow, horsetail, lichen

Site description: Site in floodplain on west side of Genoa Creek Buried humus horizons interspersed with sorted mineral horizons slightly mixed. Soil deposition from flooding regime of Genoa Creek.

Plant community: 70% willow, Feathermoss (55%), 30% sedges/grasses plus 12% horsetail, 10% willowherb and a variety of forbs.

Soils: Gleyed chroma with mottles in upper mineral horizons. Water seepage at 25 cm. Mixing of horizon apparent. Gleysolic Turbic Cryosol

Wildlife: moose tracks, scat, trails and willows browsed. Recent beaver trails and willows gnawed near waterway.

Plot PA57 **Location: 09V E 0414463 N 6819957**

Vegetation cover	Scrub birch-Feathermoss-Li
Polygon Number	96
Site Code	(5) 31-RhEsFmLi-6 / (3) 36Z-GrFbMo-3a-F / (2) 11S-EsLi-B3
Soil nutrient and moisture values (SNR/SMR)	B/3 (4)
Soil Classification	O.DYB
Soil Texture	SL
Terrain/Surficial material	Cv/Fg
Structural Stage	3b
Aspect (^{0})	61
Elevation (m)	1321
Slope %	20
Meso slope position	Mid
Drainage	Moderately well
Samples	Soil, willow, lichen

Site description: Convex site on glacio-fluvial deposits of sorted sands.

Plant community: 70% scrub birch, Feathermoss (70%), 30% lichen (Cladina sp.) plus 18% Crowberry and 15% mossberry. Small trace of herbs <1%.

Soils: Poorly developed humus, sorted horizons, buried humus under ash at 29 cm and at 57 cm. Faint mottles in Bm2 horizons and deeper. Orthic Drystic Brunisol.

Wildlife: moose tracks, scat, willows have been browsed.

Plot PA58 **Location: 09V E 0414630 N 6819943**

Vegetation cover	Willow-(scrub birch)-Horsetail-Moss
Polygon Number	114
Site Code	(10) 46SK-BWiFb-6-F
Soil nutrient and moisture values (SNR/SMR)	D/6
Soil Classification	Cu.R
Soil Texture	SL
Terrain/Surficial material	sF
Structural Stage	3b
Aspect (^{0})	67
Elevation (m)	1293
Slope %	5
Meso slope position	Toe
Drainage	Poorly
Samples	Soil, willow, horsetail

Site description: West side of Genoa Creek, subjected to high flood events. Strongly mounded site, small wetlands to east, drier microsites host scrub birch. Old regenerating road to south, adjacent to plot.

Plant community: 65% willow, 25% scrub birch, 20% horsetail, 80% mosses (Mostly Feathermoss, sphagnum, glow moss), 15% graminoids.

Soils: Sorted mineral horizons interspersed with buried humus layers, slight mixing. Very few CF. Cumulic Regosol. Soil and vegetation samples taken about 15m uphill, to many organics in plot's soil.

Wildlife: moose tracks, scat, browsed willows and wildlife trails. Beaver trails and recently gnawed twigs placed in breached dams.

Plot PA59 **Location**: **09V E 0414818 N 6819874**

Vegetation cover	Scrub birch- willow Feathermoss-Lichen/ White spruce-Fir-Feathermoss
Polygon Number	93
Site Code	(6) 31-RhEsFmLi-3a / (4) 23SZ-EsWiEmni-3b-C/R / (1) 11S-EsLi-B3
Soil nutrient and moisture values (SNR/SMR)	C/3 (4)
Soil Classification	O.DYB
Soil Texture	LS
Terrain/Surficial material	sdCv/R
Structural Stage	3b/7
Aspect (^{0})	260
Elevation (m)	1313
Slope %	6
Meso slope position	Mid
Drainage	Moderately well
Samples	Soil, willow, horsetail, blueberries (Vacc mem)

Site description: On bench, exposed rock just south of plot. Old growth spruce (>200yrs.) open forest within shrub matrix, a few younger Fir in polygon. Large boulders in plot.

Plant community: 40% scrub birch, 35% willow, 55% Labrador tea. 20% horsetail, 80% mosses (Mostly Feathermoss, sphagnum, glow moss), 15% graminoids. Plus 70% feathermoss and 35% lichen

Soils: Shallow soils, high % CF at 30 cm lithic fragments. Relative thick humus and buried humus at 13 cm.

Wildlife: moose tracks, scat, browsed willows and wildlife trails.

Plot PA60 **Location: 09V E 0413285 N 6820712**

Vegetation cover	Scrub birch-willow-Rhodo-Feathermoss-Lichen/ White spruce-Fir-Feathermoss
Polygon Number	98
Site Coce	(5) 31-RhEsFmLi-6 / (5) 23SZ-EsWiEmni-3a-F
Soil nutrient and moisture values (SNR/SMR)	C/3 (4)
Soil Classification	GL.TC
Soil Texture	L
Terrain/Surficial material	zsCv/Fg
Structural Stage	3a/7
Aspect (^{0})	56
Elevation (m)	1292
Slope %	7
Meso slope position	Toe
Drainage	Imperfect
Samples	Soil, willow, lichen, blueberries (Vacc mem)

Site description: Plot approximately 50 m west of wetland, at bottom of short slope. Strongly mounded On bench, exposed rock just south of plot. Old growth white spruce (>150yrs.) open forest with many snags.

Plant community: 45% scrub birch, 20 % willow, 60% Labrador tea., 80% mosses (mostly Feathermoss), and 30% lichen. Diverse forb species and dwarf shrubs.

Soils: Sorted horizons, high % CF at top of soil pit Cv. Gleyed and mottled soils apparent. Relative thick humus and buried humus under ash at 5 to 24 cm.

Wildlife: moose tracks, scat, browsed willows and wildlife trails. Woodpeckers on snags heard.

Access Road Plot Summaries

Plot KZK1 **Location**: **09V E 418060 N 6827210**

Vegetation cover	Sw-blueberry-lichen
Age in years (dominant species)	Sw >200
Polygon Number	148
Site Code	(5) 25-SwEsDsFm-3 / (3) 52O-EsCaaqSp-2b / (2) 35-SwRhFm-3a
Soil moisture and nutrient values (SNR/SMR)	B/6(7)
Soil Classification	BRD.TC
Soil Texture	SiL
Surficial material	M
Crown cover for polygon in %	20
Structural Stage	6/7(veteran Sw)
Aspect $(^0)$	200
Elevation (m)	1122
Slope %	16
Meso slope position	Lower
Drainage	Imperfectly

Site description: Boreal High. Gentle slope on warm aspect above East Creek.

Plant community: Open mature Sw with bog blueberry and Cladina as dominant ground cover.

Soils: Brunisol Dystric Turbic Cryosol (BRD.TC). Aeolian silt deposit on morainal. Ground frozen at 8cm.

Timber: Average Sw DBH =20cm, height = 11.1m. Veterans DBH 25-30 cm, height >14m. Some decay.

Plot KZK2 **Location: 09V E418625 N 683275**

Vegetation cover	Sw-birch/willow -Feathermoss
Age in years (dominant species)	Sw >200
Polygon Number	199
Site Code	(8) 25-SwEsDsFm-5 / (2) 35SZ--SbSwRhFm-3
Soil moisture and nutrient values (SNR/SMR)	C/4 (reference site?)
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	zdCv/Mb
Crown cover for polygon in %	30-40
Structural Stage	7
Aspect (^{0})	190
Elevation (m)	1097
Slope %	18
Meso slope position	Mid
Drainage	Moderately Well

Site description: Boreal High. Old growth open Sw forest on gentle southern exposure.

Plant community: Sw-shrub birch/willow-feathermoss; Bastard toadflax 20% and 24% lichen

Soils: Gleysolic. Turbic Cryosol (GL.TC) on colluvium veneer over morainal. Frozen at 21cm.

Timber: Average Sw DBH = 21cm, height = 14m

Plot KZK3 **Location**: **09V E412782 N 6823317**


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Vegetation cover	Sedge-Glow moss
Age in years (dominant species)	N/A
Polygon Number	119
Site Code	(10) 25-SwEsDsFmCl-6-O/M
Soil moisture and nutrient values (SNR/SMR)	B/7
Soil Classification	Organic Cryosol
Soil Texture	Of, Om
Surficial material	O/Mb
Crown cover for polygon in %	N/A
Structural Stage	2b
Aspect (^{0})	210
Elevation (m)	1267
Slope %	4
Meso slope position	Depression
Drainage	Poorly

Site description: Wetland complex

Plant community: Sedges mainly water sedge and grasses, few low shrubs: Myrtle leaf willow, trappers tea with willow/shrub birch along wetland perimeter.

Soils: Deep organics over glaciofluvial

KZK3a **Location: 09V E412781 N 6823317**

Vegetation cover	(Sw)-birch/willow –Altai Fescue- Lichen
Age in years (dominant species)	Sw > 100
Polygon Number	119
Site Code	(10) 25-SwEsDsFmCl-6-O/M
Soil moisture and nutrient values (SNR/SMR)	C/4
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	zdCv/Mb
Crown cover for polygon in %	30-35
Structural Stage	6
Aspect (^{0})	190
Elevation (m)	1270
Slope %	4
Meso slope position	Low
Drainage	Imperfectly

Site description: Boreal High. Old growth Sw (Sb minor component) sparse cover, in low shrub matrix. Polygon is a shallow hill.

Plant community: (Sw)-shrub birch/willow- Altai fescue; with Bastard toadflax 20% and 24% lichen

Soils: Gleysolic. Turbic Cryosol (GL.TC) on colluvium veneer over morainal. Frozen at 10cm.

KZK4 **Location: 09V E 416176 N 6828272**

Vegetation cover	SwSb-willow(Rhodo)-Feathermoss
Age in years (dominant species)	Sw > 100
Polygon Number	151
Site Code	(7) 25-EsDsFmCl-3 / (3) 35-SbSwRhFm-6-M
Soil moisture and nutrient values (SNR/SMR)	B/6 (5)
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	Mb
Crown cover for polygon in %	25
Structural Stage	6
Aspect (^{0})	236
Elevation (m)	1270
Slope %	12
Meso slope position	Upper
Drainage	Imperfectly

Site description: Boreal High, mature white /black (7%) spruce open forest, in low shrub matrix.

Plant community: SwSb-willow-Feathermoss; with 40% Labrador tea and 20% lichen

Soils: Gleysolic. Turbic Cryosol (GL.TC) on morainal. Frozen at 60cm.

Timber: Average Sw DBH = 19.8, height = 11m

KZK5 **Location: 09V E 416575 N 6829518**

Vegetation cover	Sb(Sw)-Labrador tea-Lichen
Age in years (dominant species)	Spruce > 100
Polygon Number	157
Site Code	(8) 40-SbRhFmCl-6 / (2) 01-SwWiFbFm-6-M
Soil moisture and nutrient values (SNR/SMR)	B/6
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	Mv
Crown cover for polygon in %	15-20
Structural Stage	6
Aspect (^{0})	N/A
Elevation (m)	1148
Slope %	2
Meso slope position	Level
Drainage	Imperfectly

Site description: Boreal High, Sb sparse to open forest, on gentle to level areas, hummocky.

Plant community: Sb(Sw)-Labrador tea-lichen, willows at 10% cover. Sw is 30% of cover for polygon.

Soils: Gleysolic. Turbic Cryosol (GL.TC) on morainal. Frozen at 21cm. Seepage at 14cm.

Timber: Average Sb DBH = 10.5cm height = 6.9m

KZK6 **Location: 09V E 417776 N 6833474**

Vegetation cover	SwAcb-willow-sedge
Age in years (dominant species)	Sw > 100
Polygon Number	278
Site Code	(10) 28SK-SwBEqFm-F
Soil moisture and nutrient values (SNR/SMR)	D/6
Soil Classification	CU.HR
Soil Texture	LS
Surficial material	sgkFd
Crown cover for polygon in %	30-35
Structural Stage	5 (7 for timber plot)
Aspect (^{0})	N
Elevation (m)	1060
Slope %	3
Meso slope position	Depression
Drainage	Imperfectly

Site Description: Lower Finlayson Creek floodplain on west side.

Plant Community: SwAcb-willow-sedge. Young mixed forest along riparian corridor.

Soils: Cumulic Humic Regosol with high % of gravel, cobbles and boulders. Fluvial active. Soil pit within 20cm of water table.

Timber: Old growth Sw along upper bench of riparian corridor approximately 30m NW of ecoplot. Older trees > 230 years. Broken tops and stem rot present. Avg: DBH = 30cm, height = 20m

TE7A **Location 09V E 416114 N 6826152**

Vegetation cover	Sb(Sw)-Labrador Tea-Lichen
Age in years (dominant species)	Sb > 150
Polygon Number	132
Site Code	(7) 40-SbRhFmCl-6 / (3) 52O-EsCaaqSp-2b-O/Gf
Soil moisture and nutrient values (SNR/SMR)	B/5(6)
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	Mb
Crown cover for polygon in %	10-20%
Structural Stage	6-7
Aspect (^{0})	21
Elevation (m)	1177
Slope %	5
Meso slope position	Lower
Drainage	poorly

Site Description: Boreal High. Permafrost action cause hummocks, mosaic of wet and dry microsites.

Plant Community: Sb dominant, Sw scattered through polygon growing on high sites.

Soils: Frozen at 31cm, organic layer 12cm. Gleysolic Turbic Cryosol (GL.TC)

Timber: Mature forest with veteran trees and snags. Sinuous stems Avg: DBH = 11cm, height = 6.3m

TE6 **Location 09V E 417807.5 N 6822454**

Vegetation cover	SbSw-Labrador tea-Lichen
Age in years (dominant species)	Sw > 150
Polygon / Site Code	Outside of mapped area
Soil moisture and nutrient values (SNR/SMR)	B/5
Soil Classification	GL.TC
Soil Texture	SiL
Surficial material	Mb
Crown cover for polygon in %	10-20%
Structural Stage	7
Aspect (^{0})	22
Elevation (m)	1229
Slope %	8
Meso slope position	Mid
Drainage	Imperfectly

Site Description: High Boreal. Permafrost under gently undulating landscape variety of wet to dry regimes.

Plant Community: Mature mix forest with Sb on wet and Sw on drier sites. Shrub birch and willow in understorey.

Soils: Frozen at 4cm, organic layer 30cm. Gleysolic Turbic Cryosol (GL.TC)

Timber: Sw average DBH = 15cm, height = 7.7m; Sb average DBH = 10cm, height = 5-6m

TE9 **Location 09V E 416602.7 N 6827489**

Vegetation cover	Willow-Sedge/Sw(Sb)-Shrub birch-feathermoss
Age in years (dominant species)	> 150 years
Polygon Number	152
Site Code	(4) 25-SwEsDsFmCl-6 / (4) 35-SbSwRhFm-6-M / (2) 52O-EsCaaqSp-2b
Soil moisture and nutrient values (SNR/SMR)	C/8
Soil Classification	HY.F
Soil Texture	N/A
Surficial material	Organic/Fluvial
Crown cover for polygon in %	10-20
Structural Stage	6/3a
Aspect (^{0})	N/A
Elevation (m)	1133
Slope %	0
Meso slope position	Depression
Drainage	Very poorly

Site Description: Relatively flat area with fens and

Plant Community: 75% of plot is a fen that is dominated by willows and sedges. 25% is on higher ground which is an open Sw forest with more shrub birch and moss.

Soils: Organic Hydric Fibrisol over braided fluvial channel.

Timber: Sw average DBH = 28cm, height = 13.3m

TE16A **Location 09V E 417777.2 N 6835115**

Vegetation cover	Sw-shrub birch-Lichen
Age in years (dominant species)	90 years
Polygon Number	211
Site Code	(6) 35-SbSwRhFm-3a / (4) 15S-SwEsCl-7-F
Soil moisture and nutrient values (SNR/SMR)	A(B)/2
Soil Classification	O.DYB
Soil Texture	N/A
Surficial material	Glaciofluvial
Crown cover for polygon in %	10-20
Structural Stage	5-6
Aspect (^{0})	N/A
Elevation (m)	1023
Slope %	0
Meso slope position	Level
Drainage	Rapidly

Site Description: High Boreal, raised area with sorted sandy soils greater than 1m depth. Signs of old burn.

Plant Community: Open Sw forest in glacial washout area, kettle lake to east of plot.

Soils: Orthic Dystric Brunisol, no signs of permafrost

Timber: Sw average DBH = 8cm, height = 4.2m

Plot TE20 **Location: 09V E 0417916 N 6835682**

Vegetation cover	Black Spruce-Rhododendron-Feathermoss, White spruce-Feathermoss-Lichen, Sedge-Sphagnum
Polygon Number	211
Site Code	(6) 35-SbSwRhFm-3a / (4) 15S-SwEsCl-7-F
Soil nutrient and moisture values (SNR/SMR)	B/6 (7)
Soil Classification	GL.TC
Soil Texture	Organic mesic
Terrain/Surficial material	O/M
Structural Stage	3a/7
Aspect (^{0})	---
Elevation (m)	1036
Slope %	<2
Meso slope position	Level
Drainage	Poor

Site description: Mix Sb and Sw forest. Thick organic layer > 40 cm, strongly mounded. Three ecosystems depending on variations in moisture regime. Depressions have sedges and sphagnum with open water, higher ground is Sw, feathermoss and lichen, Mid level is Sb, rhododendron and feather moss with 60% cloud berry BOH Old growth black and white spruce (125yrs.). Kettle/esker topography.

Soils: Gleyed Turbic Cryosol under organic layer.

Wildlife: moose tracks, scat, browsed willows and trails.

Plot TE21 **Location**: **09V E 0417518 N 6834333**

Vegetation cover	White spruce-willow-Feathermoss-Lichen/ Black spruce-Rhododendron-Feathermoss
Polygon Number	196
Site Code	(8) 01-SwWiFbFm-3 / (2)35-SbSwRhFm-7-M
Soil nutrient and moisture values (SNR/SMR)	B/4, B/5
Soil Classification	O.DYB
Soil Texture	SL
Terrain/Surficial material	dCv/szFg
Structural Stage	6/3a
Aspect (^{0})	73
Elevation (m)	1042
Slope %	8
Meso slope position	Mid
Drainage	Well

Site description: Sw (Sb) forest, 20-15% cover. Sb in lower wetter microsites. Mature to old growth (Sw 120yrs). Rh 70%, Wi 20% and Scrub birch 10% as minor component of shrub layer.

Soils: Orthic Dystric Brunisols. No contact with ice, no sins of mixing in soil pit. Glacio-fluvial outwash area, lower horizons sorted sands. Few coarse fragments near surface.

Wildlife: moose tracks, scat, browsed willows and trails. Squirrel midden.

Plot TE22 **Location: 09V E 0416996 N 6831755**

Vegetation cover	White spruce-willow- Lichen-Feathermoss/ Black spruce-Rhododendron-Feathermoss
Polygon Number	170
Site Code	(8)40-SbRhFmCl-6 / (2)01-SwWiFbFm-6-M
Soil nutrient and moisture values (SNR/SMR)	B/7
Soil Classification	GL.TC
Soil Texture	SiL
Terrain/Surficial material	dCv/M
Structural Stage	7/3a
Aspect (^{0})	82
Elevation (m)	1092
Slope %	15
Meso slope position	Mid
Drainage	Poor

Site description: Sb forest, 20-25% cover. Mature to old growth (Sb 135yrs). Rh 50%, Wi 25% and Scrub birch 10% as minor component of shrub layer. FM 30%, Lichen (Cladina) 50% with 3% horsetail. Vac uli and vit 30%.

Soils: Gleyed Turbic Cryosol, frozen layer contacted at 20 cm, some mixing of horizons, water at 8 cm. “Drunken trees” appearance. Few coarse fragments (20%) near surface.

Wildlife: Wildlife trails through polygon, old caribou and moose scat.

Plot TE23 **Location**: **09V E 0416970 N 6830639**

Vegetation cover	White spruce-Rhododendron-Willow-Lichen-Feathermoss/ Black spruce-Rhododendron-Feathermoss
Polygon Number	168
Site Code	(7)01-SwWiFbFm-3 / (3)35-SbSwRhFm-6-F
Soil nutrient and moisture values (SNR/SMR)	C/6
Soil Classification	GL.TC
Soil Texture	SiL
Terrain/Surficial material	dCv/M
Structural Stage	7/3a
Aspect (^{0})	90
Elevation (m)	1062
Slope %	26
Meso slope position	Mid
Drainage	Poor

Site description: Sw forest, 20% (Sb 5%) cover. Old growth (Sw 168 yrs). Rh 65%, Wi 35% (Scrub birch is in polygon 10%, not plot). FM (with glowmoss) 70%, Lichen (Cladina) 35%, Vac uli 25%.

Soils: Gleyed Turbic Cryosol, frozen layer contacted at 39 cm, some mixing of horizons, water at 36 cm. "Drunken trees" appearance and solifluction, moderately mounded.

Wildlife: Wildlife trails through polygon, moose scat, light browse.

Plot TE24 **Location**: **09V E 0417146 N 6830575**

Vegetation cover	White spruce-Balsam popular-Equisetum-Feathermoss
Polygon Number	278
Site Code	(10) 28SK-SwBEqFm-F
Soil nutrient and moisture values (SNR/SMR)	D/4 (5)
Soil Classification	O.R
Soil Texture	FSL
Terrain/Surficial material	skFg
Structural Stage	7/2c
Aspect (^{0})	---
Elevation (m)	1050
Slope %	none
Meso slope position	Level
Drainage	Moderately well

Site description: Sw and Balsam popular forest, 45% cover. Upper terrace of Finlayson Cr floodplain. Sw over 20 m high. Old growth (Sw 140 yrs). Eq 35%, FM 70%. High diversity of forbs; willows, rose and soapberry in gaps.

Soils: Orthic Regosol; well developed humus of 10 cm. CF only at bottom of pit (37 cm), river gravel/cobbles.

Wildlife: Wildlife trails through polygon, moose scat.

Plot TE25 **Location: 09V E 0417146 N 6830575**

Vegetation cover	Sedge(*C. aquatilis*)-Sphagnum (Fen)
Polygon Number	114
Site Code	(10) 46SK-BWiFb-6-F
Soil nutrient and moisture values (SNR/SMR)	B/8
Soil Classification	O
Soil Texture	Om
Terrain/Surficial material	uO/F
Structural Stage	2b
Aspect (^{0})	---
Elevation (m)	1118
Slope %	none
Meso slope position	Level
Drainage	Very poor

Site description: Stream fen, part of a slow moving stream draining boggy uplands. Hummocks formed from sphagnum and sedge accumulations. Signs of recently raised water table likely due to road obstruction altering original drainage pattern. Downstream of road waterway becomes more riparian due increase in slope.

Soils: Sedge and moss community with low shrubs (*B. glandulosa, D. fruticosa*), dwarf shrubs (*V. uliginosum, S. reticulata*) and few forbs. Peat greater than 40 cm, but complete depth not known.

Wildlife: Woodpecker cavities on dead trees

Plot TE26 **Location: 09V E 0417028 N 6827271**

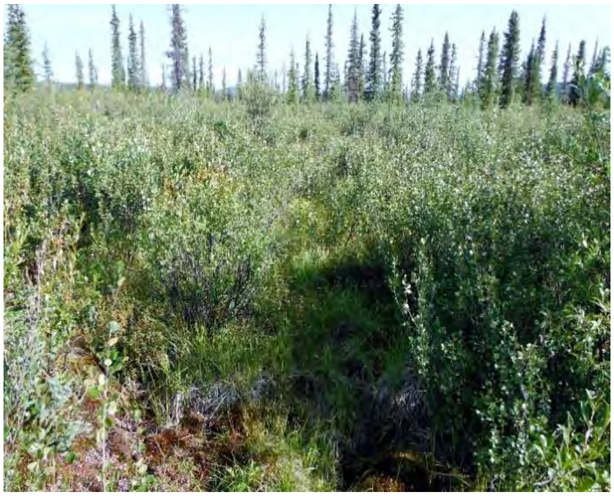
Vegetation cover	White spruce-Scrub birch-Lichen/ Sedge-Scrub birch-Mosses
Polygon Number	139
Site Code	(7)15S-SwEsCl-3b / (3)52O-EsCaaqSp-2b-O/Gf
Soil nutrient and moisture values (SNR/SMR)	B/2, B/7
Soil Classification	O.DYB
Soil Texture	FSL
Terrain/Surficial material	szE/skFg
Structural Stage	6/1b
Aspect (^{0})	---
Elevation (m)	1129
Slope %	none
Meso slope position	Level
Drainage	Rapid

Site description: Sparse to open Sw forest with C. stellaris and Stereocaulon spp. main lichen types. Raised ground and small basin wetlands typical topography for polygon. Glacio-fluvial genesis of landform, eolian deposits recent.

Soils: Fine sandy loam (FSL), poor nutrients. Oxidized reddish hues to 15 cm, then grey hues no mottles. Rounded coarse fragments in lower horizons. Orthic Dystric Brunisol.

Wildlife: Trails through polygon, old moose and caribou scat.

Plot TE27 **Location: 09V E 0416832 N 6826376**



Vegetation cover	White spruce(Black Spruce)-Rhododendron-Feathermoss-Lichen/ White spruce-Scrub birch-Lichen/ Sedge-Scrub birch-Mosses
Polygon Number	135
Site Code	(6) 15S-SwEsCl-3 / (2) 35-SbSwRhFm-6-F / (2) 52O-EsCaaqSp-2b
Soil nutrient and moisture values (SNR/SMR)	B/4, B/2, B/6 (7)
Soil Classification	---
Soil Texture	SL
Terrain/Surficial material	szdM/F
Structural Stage	6/2b
Aspect (^{0})	275
Elevation (m)	1160
Slope %	5
Meso slope position	Mid, undulating topography
Drainage	Well

Site description: Sparse to open Sw forest (Sb < 5%). Main shrub is labrador tea, then scrub birch and willow.

Soils: N/A

Wildlife: Trails through polygon, moose scat and browse.

Plot TE28 **Location: 09V E 0416572 N 6825591**

No photos

Vegetation cover	White spruce Rhododendron-Scrub birch-Feathermoss-Lichen/
Polygon / Site Code	#134/SwRhEsFmLi (Wi lower on slope)
Soil nutrient and moisture values (SNR/SMR)	B/5
Soil Classification	---
Soil Texture	
Terrain/Surficial material	szdM
Structural Stage	6/3a
Aspect (^{0})	75
Elevation (m)	1160
Slope %	15
Meso slope position	Upper
Drainage	Rapid

Site description: Sparse to open Sw forest. Main shrub is labrador tea, then scrub birch and willow at only 10% increasing cover downslope.

Soils: Visual check only, correct polygon label. Road cut used for texture.

Wildlife: Trails through polygon, moose scat and browse.

Plot TE29 **Location**: **09V E 0414543 N 6823428**

Vegetation cover	White spruce-Sub-alpine fir-Scrub birch-Feathermoss
Polygon Number	121
Site Code	(9)22-EsFmCl-6 / (1)31-RhEsFmLi-6-M
Soil nutrient and moisture values (SNR/SMR)	B/4
Soil Classification	O.DYB
Soil Texture	SiL
Terrain/Surficial material	szxM/F
Structural Stage	5(6)/3b
Aspect (^{0})	---
Elevation (m)	1376
Slope %	2%
Meso slope position	Upper, mountain top plateau
Drainage	Well

Site description: Sparse young sub-alpine fir and white spruce crown cover <10%. Mostly a mix of matrix of tall scrub birch and willows, scrub birch 65%, willow 15% and Labrador tea is 40%.

Soils: Thin soils, 10-15 cm deep then hit fragmenting lithic layer. Young Orthic Dystric Brunisol

Wildlife: Trails through polygon, old road used quite extensively by wildlife. Moose, bear and wolf sign.

Plot TE30 **Location: 09V E 0415367 N 6823209**

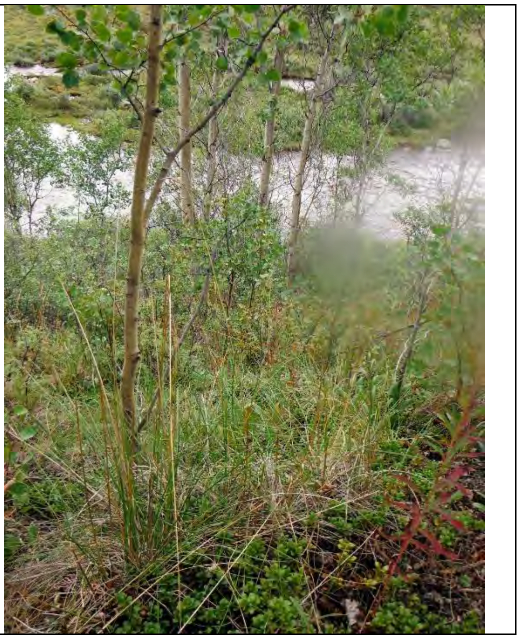
Vegetation cover	White spruce-Labrador tea-Willow-Scrub birch-Feathermoss
Polygon Number	116
Site Code	(10)01-SwWiFbFm-3a-M/F
Soil nutrient and moisture values (SNR/SMR)	C/4 (5)
Soil Classification	BRD.TC
Soil Texture	SiL
Terrain/Surficial material	szxcv/Fg
Structural Stage	7/3a
Aspect (^{0})	140
Elevation (m)	1305
Slope %	13%
Meso slope position	Mid
Drainage	Moderately well

Site description: White spruce crown cover 15%. Mix of low shrubs Labrador tea 70%, willows 35%, scrub birch 20%. Some forbs present, 9 species 30% cover and lichen (Cladina spp.) 25%. Solifluction evident; sinuous tree growth, linear hummocks and ice in soil pit.

Soils: Relative deep humus and Ah, some mixing of horizons. Coarse fragments 25% in B horizons, ice encountered at 12 cm. Brunisolic Dystric Turbic Cryosol**.**

Wildlife: Trails through polygon, old road used quite extensively by wildlife. Moose, bear and wolf sign.

Plot TE31 **Location: 09V E 0413330 N 6821681**



Vegetation cover	White spruce-Scrub birch- -Feathermoss-Lichen/ Aspen-Kinnickinnick-Grass
Polygon Number	102
Site Code	(5)15S-SwEsCl-3 / (4)01-SwWiFbFm-3-F/M / (1)11Z-AKnGr-5
Soil nutrient and moisture values (SNR/SMR)	B/3, B/2
Soil Classification	O.DYB
Soil Texture	LS
Terrain/Surficial material	szCv/F
Structural Stage	6/5
Aspect (^{0})	172 (For Aspen ecotype)
Elevation (m)	1268
Slope %	5% (Aspen 40%)
Meso slope position	Level/Steep upper slope
Drainage	Well/ Rapid

Site description: White spruce crown cover 10-25%. Mix of low shrubs willows 35%, scrub birch 20%. Some forbs present, 9 species 30% cover and lichen (Cladina spp.) 25%. Solifluction evident; sinuous tree growth, linear hummocks and ice in soil pit.

Soils: Relative deep humus and Ah, some mixing of horizons. Coarse fragments 25% in B horizons, ice encountered at 12 cm. Brunisolic Dystric Turbic Cryosol**.**

Wildlife: Trails through polygon, old road used quite extensively by wildlife. Moose, bear and wolf sign.

APPENDIX D

WETLAND SUMMARIES

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Wetland A

Shallow Water-Riparian-Meltwater Channel, pH 7.5

Size: 91,853 m^2

Both wetlands A and B are similar and occupy the same glaciofluvial meltwater channel that Geona Creek does. Wetland A and B are part of the North Lake watershed and flow south, the Geona Creek is part of the Finlayson Creek watershed and flows north. At one point these wetlands may have been connected with the Geona Creek system, but a slope failure along Fault Creek resulted in a colluvial deposit that is a barrier to water flow linkage between the two watershed systems.

Water flow is intermittent between Wetland A and B, during seasonal higher water levels Wetland B flows into Wetland A. Wetland A is approximately three times the size of Wetland B and deeper. The depth at centre is over 2 m deep. The water is clear with silty sand and rocks as the main substrate along the shoreline and pond bottom.

Vegetation around Wetland A's shoreline is graminoid dominated with a few forbs and mosses. The main plant species encountered: *Carex aquatilis, C. saxatilis, C. canescens, Juncus castaneus, Luzulu parviflora, Poa palustris, Calamagrostis canadensis, and Senecio congestus*.

Aquatic plants: *Potamogeton filiformis, Myriophyllum sibricum,* only a small number of each species present.

Wetland A view to the south

Wetland B

Shallow Water-Riparian-Meltwater Channel, pH 8

Size: 35,992 m^2

Both Wetlands A and B are outside of the proposed mine footprint and should not be directly affected by development. However, these are fish bearing wetlands and are easily accessible by foot or ATV from the mine site. There are well used wildlife trails on both the east and west sides of these wetlands with evidence of moose, caribou, wolves and grizzly bear usage. Bird surveys indicate that the area is rich in birdlife providing habitat for passerines, shorebirds and waterfowl. These two wetlands may need monitoring to ensure disturbances are minimal and controlled.

Characteristics and shoreline vegetation species are the same as wetland A, with a higher % cover of *C. aquatilis.*

Aquatics: *Potamogeton filiformis, Myriophyllum sibricum*, *Hippuris vulgaris.* More plant cover than in wetland A, but less than 10%, most common is *H. vulgaris.*

Wetland B view to the south

Wetland C

Basin Fen, pH 6.5 to 7

Size: 3,390 m^2 collectively = [400 m^2 (C1) + 2850 m^2 (C2) + 100 m^2 (C3) + 40 m^2 (C4)]

Wetland C is actually a collection of 4 small wetlands that occupy a basin located at the head of Geona Valley. Although these wetlands are in close proximity to each other they are not connected by surface flow, except during high water events. Most of the water originates from groundwater with contributions from precipitation and surface runoff. There is prolific vegetation growth around these wetlands due to the high moisture availability and nutrients. Wetlands C1, C2, C3 and C4 border the southern edge of the proposed mine pit and will be directly affected by development.

These wetlands are small and less than a meter deep. Connective flow only during high water events. Graminoids are the dominate vegetation. Each of the four wetlands are described below.

Wetland C1 vegetation around shoreline: *C. aquatilis, L. parviflora, P. palustris, C. canadensis, Galium trifidium and Petasites frigidum.* The one aquatic found, in abundance, is the brown moss *Calligeron spp.*

Wetland C1

Wetland C2 is the largest of wetland of the group. The dominant shore plant is C. aquatilis, other plants as observed at C1, plus *Glyceria pulchella*. Aquatic plants include: *Potamogeton alpinus, Sparganium hyperboreum, Ranunculus hyperboreus and Myriophyllum. sibricum.*

Wetland C2

Wetland C3 shoreline is dominated by *Glyceria pulchella* and *C. aquatilis* shore vegetation similar to C1

Wetland C3

Wetland C4 is the smallest of the group with an area of approximately 40 m^2 of open water, shoreline vegetation same as C3. *Calligeron spp*. is the only aquatic plant present. There is no photograph of Wetland C4.

Wetland D

Shallow Water Linked Basin, pH 7

Size: 23,673 m^2

Proceeding further along the Geona Valley Wetland D is the next wetland and the headwater of Geona Creek. Water sources are from groundwater discharge, surface runoff, and precipitation. The water is clear with silty sand and rocks as main substrate. Shoreline has a shallow (<40 cm) accumulation of organics. This wetland is within the proposed mine pit footprint.
Tote Road and drill site on east side within 30 m of shoreline, about 30 m^2 of vegetation removed.

Shoreline vegetation: *Carex aquatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis* and *Eriophorum angustifolium.*

Aquatics: *Calligeron* spp. and *Scouleria aquatilis,* both are mosses.

Wetland D view to the south

Wetland E

Shallow Water Linked Basin, pH 7

Size: 12,619 m^2

Connected to wetland D by culverts under access road. In proposed mine pit footprint.
Same characteristics as Wetland D. Tote Road is approximately 15 m from west shoreline. This wetland is within the proposed mine pit footprint.

Shoreline vegetation: *Carex aquatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis*, *Aulacomnium palustre* and a few patches of *sphagnum spp.*

Aquatic plants: *Sparganium hyperboreum, Hippuris vulgaris, Calligeron* spp.

Wildlife: Skull and pelt remains of two beaver found on east side. Moose sign tracks, scat and browsed willows.

Wetland E

Wetland F

Riparian Stream Fen, pH 7

Size: 6,484 m^2

Pond formed at widening of Geona Creek channel. Old beaver dam at outlet currently breached. Slow water movement, shores and pond bottom consist of peat originating mainly from decomposed sedges and grasses. Two small pocket wetlands on either side of the inflow. Substrate on pond bottom and shoreline is organic. A couple of small islands have developed from organic accumulations.

This wetland is between the proposed mine pit and Pit Rim Pond and will be directly affected by mine development.

Shoreline vegetation: *Carex aquatilis, Carex saxatilis, Juncus castaneus, Glyceria pulchella, Luzulu parviflora, Poa palustris, Calamagrostis canadensis*, *Aulacomnium palustre* and *sphagnum spp.* Few scattered willows and scrub birch, 2 to 5 m back from shoreline.

Aquatic plants: *Sparganium hyperboreum, Ranunculus hyperboreus, Calligeron* spp.

Wildlife: Several wildlife trails, recent moose and wolf sign. Two mallards and one Yellow legs.

Wetland F view to the northwest

Wetland G

Shallow water-Isolated basin, pH 6.5

Size: 5,290 m^2

No inflow nor outflow, water depth 1.3 m. Water has been recently drawn down for drilling. Water received from ground water and precipitation. Shore margin of angular and sub angular cobbles and silty sand.
This wetland is in the footprint of the proposed Class C Storage Facility.

Shoreline vegetation: *Carex saxatilis* is dominate shore cover, willows and white spruce approximately 3 to 5 m from shoreline.

Aquatic plants: *Sparganium hyperboreum,* only a few plants, 10% cover.

Wildlife: Moose tracks and scat. Many shorebird tracks. Old wolf and caribou scat.

Wetland G

Wetland H

Riparian stream marsh, pH 8.

Beaver created wetland. Outflow and inflow dams breached. No water movement as water level is below outflow sill. Water depth <1 m exposed muddy substrate around islands and shoreline.

This wetland is in the footprint of the proposed Class C Storage Facility.

Shoreline vegetation: *Carex aquatilis* is dominate shore cover*,* other main species include *Luzulu parviflora,* and *Calamagrostis canadensis*, willows and scrub birch on islands.

Aquatic plants: *Sparganium hyperboreum* and *Callerigon spp.*

Wildlife: Area has many signs of moose usage: trails, tracks, scat and willow browse. Several warbler species in shrubs near wetland. Old beaver sign, no sign of recent beaver activity.

Wetland H

Wetland I

Riparian Stream Marsh, pH 7

Pond formed at widening of Geona Creek channel. Old beaver dam at outlet, water movement out of wetland slow and steady. Narrow shore margins as more confined by lower valley slopes. Substrate composed of cobbles and boulders of fluvial and colluvial in origin. Edges have shallow organic accumulation. Dead shrubs in water indicative of water level changes due to beaver dam.

This wetland is within the Upper Water Management Pond design footprint.
Shoreline vegetation: *Carex aquatilis, Juncus castaneus, Luzulu parviflora, Calamagrostis canadensis*, *Aulacomnium palustre.*

Aquatic plants: *Calligeron* spp.

Wildlife: Many trails, moose tracks (cow and calf), scat and willow browse. Old beaver sign evident, no signs of recent activity.

Wetland I beaver created (old lodge upper left)

Inflow to Wetland I, note rocky channel substrate

Wetland J

Riparian stream marsh, pH 8.

Beaver created wetland causing flooding of area. Meandering stream links series of small ponds. Substrate is organic and over 40 cm deep. Three old beaver dams breached and grown over by willows and scrub birch. Water movement very slow. Water level is low (<1 m) exposed muddy substrate along edges on small islands.

This wetland is in the proposed Lower Water Management Pond.

Shoreline vegetation: *Carex aquatilis* is the dominate shore cover*,* other plants include *Luzulu parviflora, Calamagrostis canadensis*, *Juncus castaneus*, and *Equisetum arvense*.

Aquatic plants: *Sparganium hyperboreum* and *Callerigon spp.*

Wetland J view to the south

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APPENDIX E

PROJECT PLANT LIST

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KZK Area Plant List

Botanical Name	Code	Common Name
TREES		
Abies lasiocarpa	ABIELASI	Sub-alpine fir
Picea glauca	PICEGLA	White spruce
Picea mariana	PICEMAR	Black spruce
Pinus contorta latifolia	PINULAT	Lodgepole pine
Populus balsamifera	POPUBAL	Cottonwood
Populus tremuloides	POPUTRE	Trembling Aspen
SHRUBS		
Alnus incana	ALNUINCA	Grey Alder
Alnus crispa	ALNUCRIS	Green Alder
Betula glandulosa	BETUGLAN	Shrub Birch
Rhododendron groenlandicum	RHODGRO	Labrador Tea
Rhododendron decumbens	RHODDECU	Marsh Labrador Tea
Shepherdia canadensis	SHEPCANA	Soapberry
Dasiphora fruticosa	DASIFRU	Shrubby cinquefoil
Ribes hudsonianum	RIBEHUDS	Black Currant
Rosa acicularis	ROSAACIC	Prickly Rose
Rubus idaeus	RUBUIDAE	Raspberry
Spiraea beauverdiana	SPIRBEAU	Beauverd's Spiraea
Salix reticulata	SALIPULC	Diamond leaved Willow
salix arcticus	SALIARC	Arctic willow
Salix alaxensis	SALIALAX	Felt leaf Willow
Salix arbusculoides	SALIARBU	Small tree Willow
Salix barclayi	SALIBAR	Barclays Mountain Willow
Salix bebbiana	SALIBEBB	Long Beaked Willow
Salix glauca	SALIGLAU	Blue-Green Willow
Salix myrtillifolia	SALIMYRT	Myrtle leaf Willow
Salix polaris	SALIPOL	Polar willow
Salix planifolia	SALIPLAN	Plane-leafed Willow
DWARF SHRUBS		
Arctostaphylos rubra	ARCTRUBR	Red Bearberry
Chamaedaphne calyculata	CHAMCALY	Leatherleaf/Cassandra
Cassiope tetragona	CASSTET	White spruce
Empetrum nigrum	EMPENIGR	Crowberry
Linnaea borealis	LINNBOR	Twinflower
Kalmia polifolia	KALMPOLI	Bog-laurel
Oxycoccus microcarpus	OCCYCMICR	Bog Cranberry
Vaccinium caespitosum	VACCCAES	Dwarf Blueberry
Vaccinium uliginosum	VACCULIG	Alpine Blueberry
Vaccinium vitis-idaea	VACCVITI	Lowbush Cranberry
FORBS		
Achillea millefolium	ACHILMILL	Common Yarrow
Achillea sibirica	ACHISIBI	Siberian Yarrow
Aconitum delphinifolium	ACONDELP	Northern Monkshood
Andromeda polifolia	ANDRPOLI	Bog Rosemary
Anemone multifida	ANEMMULT	Cut Leaf Anemone
Anemone narcissiflora	ANEMNARC	Narcissus Windflower
Anemone parviflora	ANEMPARV	Northern Anemone
Anemone richardsonii	ANEMRICH	Yellow Anemone
Arctagrostis latifolia	ARCTLATI	Polar Grass
Arctostaphylos uva-ursi	ARCTUVAU	Kinnikinnick
Artemisia norvegica (arctica)	ARTENORV	Alpine Sagewort
Artemisia tilesii	ARTETILE	Tilesius' Wormwood
Aster sibiricus	ASTESIBI	Siberian Aster
Astragulus alpinus	ASTRALPI	Alpine Milk vetch
Aulacomnium palustre	AULAPALU	
Bistorta alpinum	BISTALP	Alpine Bistort
Chamerion angustifolia	CHAMANG	Fireweed
Chamerion latifolium	CHAMLAT	Dwarf Fireweed
Cornus canadensis	CORNCANA	Bunchberry
Crepis tectorum	CREPTECT	Narrow leaf Hawks-beard
Delphinium glaucum	DELPHGLAU	Tall Delphinium
Dryas drummondii	DRYADRUM	Yellow Avens
Dryas octopetala	DRYAOCTO	Mountain Avens

Botanical Name	**Code**	**Common Name**
Erigeron sp.	ERIGSP	Fleabane
Erigeron humilis	ERIGHUMI	Arctic alpine fleabane
Galium boreale	GALIBORE	Northern Bedstraw
Gentiana glauca	GENTGLAU	Pale Gentian
Gentianella propinqua	GENTPROP	Inky gentian
Geocaulon lividum	GEOCLIVI	Northern Commandra
Hedysarum alpinum	HEDYALPI	Alpine hedysarum
Hedysarum boreale	HEDYBORE	Liquorice-root
Hieracium gracile	HIERGRAC	Slender Hawkweed
Linnaea borealis	LINNBORE	Twin Flower
Lupinus arcticus	LUPIARCT	Arctic Lupine
Mertensia paniculata	MERTPANI	Bluebells
Moneses uniflora	MONEUNIF	One Flowered Pyrola
Orthilia secunda	ORTHSECU	One-sided Wintergreen
Oxyria digyna	OXYRDIG	Mountain Sorrel
Oxytropis campestris	OXYTCAMP	Yellow locoweed
Oxytropis splendens	OXYTSPLE	Showy Locoweed
Papaver lapponicum	PAPALAPP	Arctic Poppy
Parnassia fimbrata	PARNFIMB	Fringed Grass of Parnassus
Parnassia palustris	PARNPALU	Bog Star
Parrya nudicaulis	PARRNUDI	Naked stem Wallflower
Pedicularis labradorica	PEDILABR	Labrador Lousewort
Petasites frigidus figidus	PETAFRIG	Arctic Sweet Coltsfoot
Petasites frigidus nivalis	PETAFRIG	Sweet Coltsfoot
Platanthera hyperborea	PLANHYPE	Nrth green orchid
Platanthera obtusata	PLATOBTU	Northern Bog Orchid
Polemonium acutiflorum	POLEACU	Tall Jacob's Ladder
Polygonum alaskanum	POLYALAS	Wild Rubarb
Polygonum bistorta	POLYBIST	Alpine Bistort
Potentilla norvegica	POTENORV	Norwegian Cinquefoil
Potentilla palustris	POTEPALU	Swamp Cinquefoil
Pyrola asarifolia	PYROASAR	Large Wintergreen
Pyrola chlorantha	PYROCHLO	Gr Flwr Wintergreen
Pyrola grandiflora	PYROGRAN	Arctic Wintergreen
Ranunculus flammula	RANUFLAM	Buttercup
Ranunculus macounii	RANUMACO	Buttercup
Rubus arcticus	RUBUARCT	Nagoonberry
Saxifraga nivalis	SAXIFRAG	Alpine Saxifrage
Saxifraga tricuspidata	SAXITRIC	Prickly Saxifrage
Sedum integrifolium	SEDUINT	Roseroot
Senecio lugens	SENELUG	Black tip
Senecio triangularis	SENETRI	Arrow-leaf Ragwort
Silene acaulis	SILEACAU	Moss Campion
Solidago multiradiata	SOLIMULT	Alpine Goldenrod
Solidago simplex	SOLISIMP	Goldenrod
Spiranthes romanzoffiana	SPIRROMA	HoodedLadiesTresses
Stellaria sp.	STELLSP	Chickweed
Rubus chamaemorus	RUBUCHAM	Cloudberry
Rumex arcticus	RUMEARCT	Arctic dock
Sanguisorba canadensis	SANGCAN	Canadian Burnet
Valeriana sitchensis	VALESIT	Stika valerian
Veronica wormskjoldii	VEROWORM	Alpine Speedwell
Zygadenus elegans	ZYGAELEG	Mnt Death Camas
GRAMINOIDS		
Agrostis scabra	AGROSCA	Ticklegrass
Calamagrostis canadensis	CALACANA	Bluejoint
Calamagrostis purpura	CALAPURP	Purple Reedgrass
Carex aurea	CAREAUR	Golden Sedge
Carex aquatilis	CAREAQUA	Water Sedge
Carex podocarpa	CAREPOD	Short-stalk Sedge
Carex scirpoidea	CARESCI	Northern Single-spike Sedge
Carex saxatilis	CARESAX	Russet Sedge
Carex utriculata	CAREUTRI	Beaked sedge
Carex species	CARE SP.	Sedge sp.
Deschampsia caespitosa	DESCCAEP	

Botanical Name	Code	Common Name
Eleocharis palustris	ELEOPALU	Spike Rush
Elymus species	ELYMSPEC	Wheatgrass
Elymus trachycaulus	ELYMTRAC	Slender Wheatgrass
Eriophorum brachyan	ERIOBRAC	Cotton Grass
Festuca altaica	FESTALTA	Northern Rough Fescue
Festuca saximontana	FESTSAXI	Fescue
Hierochloe alpina	HIERALP	Alpine sweetgrass
Hordeum jubatum	HORDJUBA	Squirrel-tail barley
Juncus castaneus	JUNCCAST	Chestnut rush
Juncus drummondii	JUNCDRUM	Drummond’s rush
Luzula parviflora	LUZUSPIC	Spiked wood-rush
Poa arctica	POAARC	Arctic Bluegrass
Phleum alpinum	PHLEALPI	Alpine timothy
Trisetum spicatum	TRISSPIC	Trisetum
HORSETAILS and FERNS		
Equisetum arvense	EQUIARVE	Common Horsetail
Equisetum fluviatile	EQUIFLUV	Water Horsetail
Equisetum pratense	EQUIPRAT	Meadow Horsetail
Equisetum scirpoides	EQUISCIR	Dwarf Scouring Rush
Equisetum sylvaticum	EQUISYLV	Wood Horsetail
AQUATICS		
Hippuris vulgaris	HIPPVULG	Mare's Tail
Myriophyllum sibiricum	MYRISIBI	Water-milfoil
Potamogeton filiformis	POTAFILI	Pondweed
Potamogeton gramineus	POTAGRAM	Pondweed
Ranunculus aquatilis	RANUAQUA	Whte Wtr Buttercup
Mosses and Lichens		
Aulacomnium palustre	AULAPAL	Glow moss
Cladonia crispata	CLADCRIS	
Cladonia gracilis	CLADGRAC	
Cladina mitis	CLADMITI	
Cladonia pyxidata	CLADPYXI	
Cladina rangiferina	CLADRANG	
Cladonia species	CLAD SP.	
Cladina stellaris	CLADSTEL	
Dactylina arctica	DACTARC	Arctic Finger Lichen
Dicranum species	DICRSPEC	
Hylocomium splendens	HYLOSPLE	Step Moss
Lycopodium annotinum	LYCOANNO	Bristly Club Moss
Lycopodium clavatum	LYCOCLAV	Running Club Moss
Lycopodium complanatum	LYCOCOMP	Ground Cedar
Nephroma arcticum	NEPHARCT	
Peltigera aphthosa	PELTAPHT	
Peltigera malacea	PELTMALA	
Pleurozium schreberi	PLEUSCHR	
Polytrichum commune	POLYCOMM	
Polytrichum juniperinum	POLYJUNI	
Polytrichum piliferum	POLYPILI	
Polytrichum strictum	POLYSTRI	
Ptilium crista-castrensis	PTILCRIS	
Sphagnum angustifolium	SPHAANGU	
Sphagnum capillifolium	SPHACAPI	
Sphagnum fuscum	SPHAFUSC	
Sphagnum Species	SPHA SP.	
Stereocaulon paschale	STERPASC	
Stereocaulon tomentosum	STERTOME	
Thamnolia vermicularis	THAMVER	Whiteworm Lichen
Tomenthypnum nitens	TOMENITE	

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APPENDIX B:

KUDZ ZE KAYAH INVASIVE PLANT MEMO SEPTEMBER 2015

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Memorandum

To: BMC Minerals (No.1) Ltd. Attn: Kelli Bergh

From: Lisa Knight, Kirsten Scott

CC: Scott Keesey, Kai Woloshyn

Date: August 28, 2015

Re: Kudz Ze Kayah Project: Invasive Plant Survey Baseline Memo

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1 INTRODUCTION

This memorandum describes the methodology and results of an invasive plant (IP) survey conducted by Access Consulting Group (ACG) for BMC Minerals (No.1) Ltd. at their Kudz Ze Kayah (KZK) Property. The field crew consisted of ACG biologists Lisa Knight and Kirsten Scott, plus Environmental Monitor (EM) Keifer Sterriah from Ross River Dena.

The main task of this field session that occurred from July 28th to Aug 2nd, was focused on collecting baseline ecological data at numerous sites within the study area to augment information needed in the development of a ecosystem map. Other investigations conducted by crew during the same period included: timber volume estimates, setup of wildlife monitoring cameras, and collecting incidental wildlife observations in addition to preforming a invasive plant survey.

As a part of the vegetation and soils baseline data collection program agreed upon with BMC, ACG was tasked with undertaking a survey of invasive plants (IP) along roads and camp areas. The objectives of this trip were to:

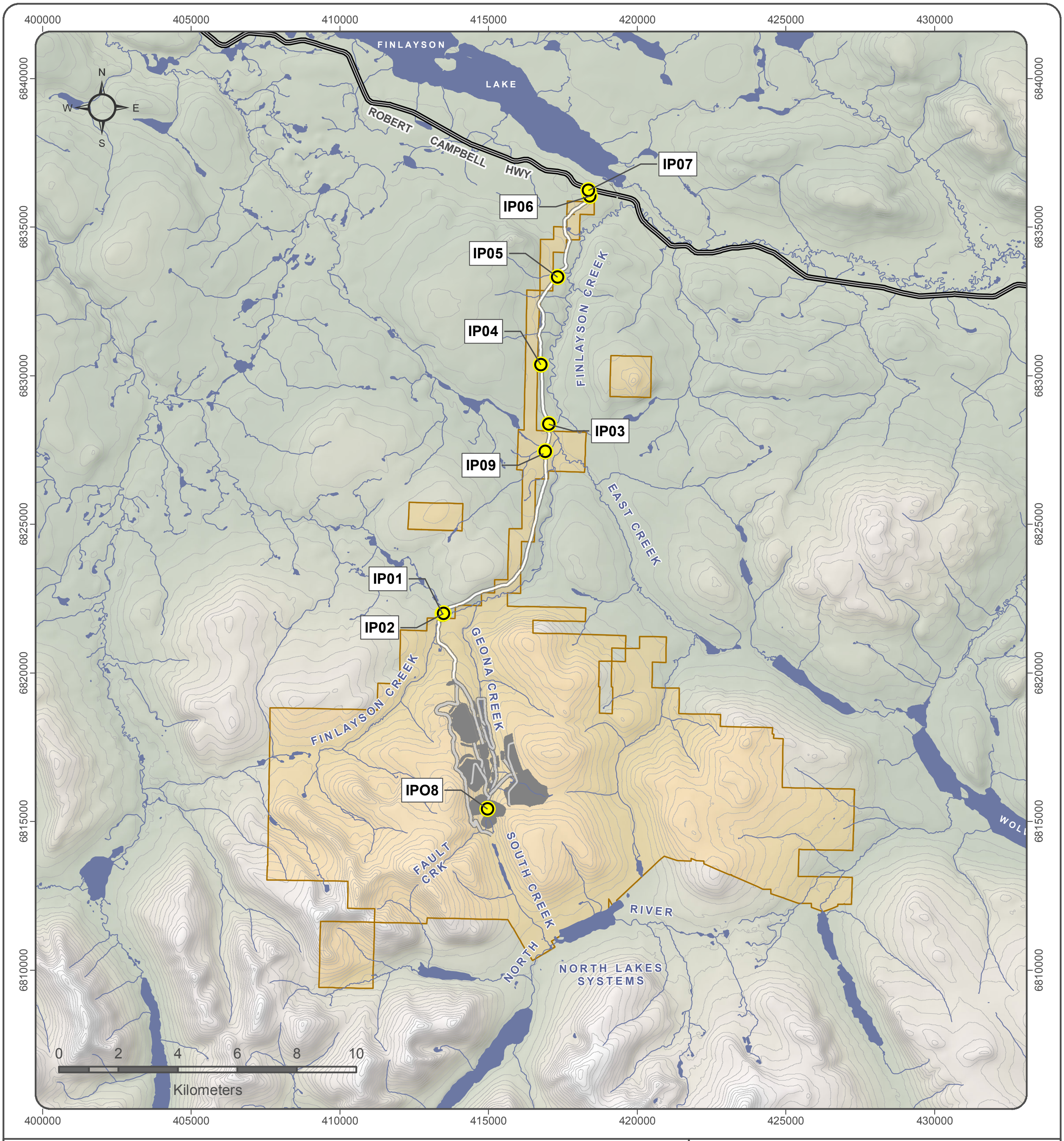
- Concentrate survey efforts along the access road and disturbed areas around the project site;
- Identify to species level any invasive plants found during surveying and mark their location;
- Provide information and recommendations to control invasive plant species encountered in the KZK project area.

2 METHODOLOGY

The local study area (see Figure 1) was surveyed for invasive species during all of the ecosystem mapping work; this included undertaking visual checks while completing ecosystem plots and while travelling between plot locations. Areas known to be disturbed during previous exploration activities were surveyed. This included the old Teck Resources camp, core shack areas and access trails in the upper Genoa valley.

When a invasive plant or colony of plants were found, the location was marked using a Garmin GPSmap 64s. The plant(s) was identified to species level, notes were made on habitat condition and photographs taken.

The mine access road from the camp to the Robert Campbell Highway (including gatehouse and layby area) was surveyed in detail on Aug 2nd . This involved driving the length of the road slowly and visually checking both sides of the roadside, at all borrow sites and other distubed areas. When an IP was found, a careful investigation of the local area was made to assess the extent of the infestation and if other IP were in the vicinity.



● Location of Invasive Plant Sighting

▬ Location of Proposed Mine Infrastructure

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

═ Tote Road

═ Proposed Road

— Contour (40 m interval)

— Watercourse

▬ Waterbody

KUDZ ZE KAYAH PROJECT VEGETATION BASELINE REPORT

FIGURE 1

LOCATION OF OBSERVED INVASIVE PLANT SPECIES

OCTOBER 2016

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 9N

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3 RESULTS

The locations where invasive plants were found are shown in Table 4-1 and Figure 2.

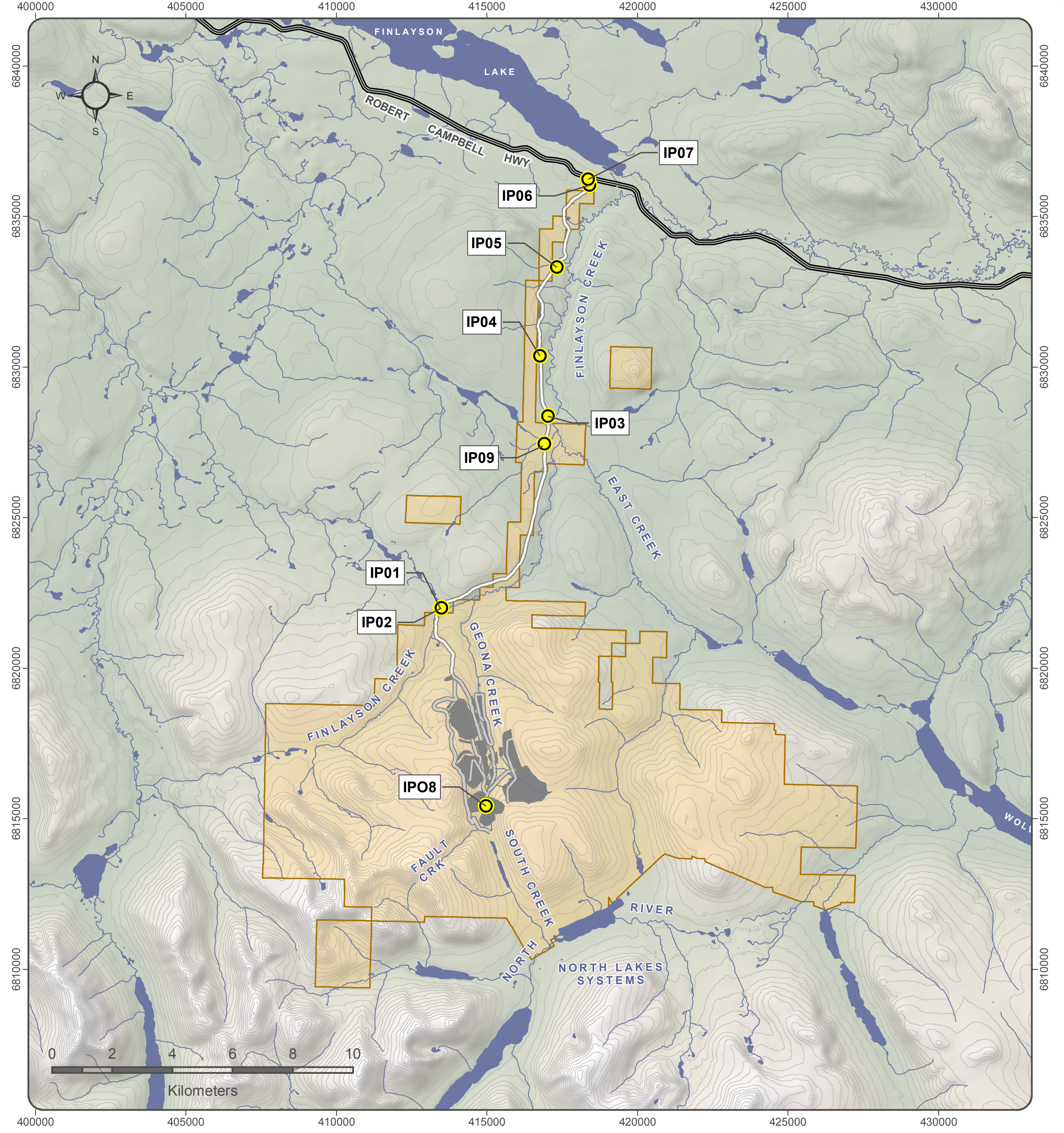
Table 4-1 Results of invasive species survey

Location	UTM Coordinates	Invasive Plants Present	Comments
IP01	E413455.924 N6821986.689	Bitter fleabane (*Erigeron acris*)[1]	Both sides of road
IP02	E413486.0013 N6822001.985	Bitter fleabane (*E. acris*) Foxtail barley (*Hordeum jubatum*)[2] Timothy (*Phelum pratense*)	In borrow on east side of road
IP03	E417037.5129 N6828362.016	Foxtail barley (*H. jubatum*) Bitter fleabane (*E. acris*)	Light infestation
IP04	E416759.2157 N6830363.631	Horned dandelion (*Taraxacum ceratophorum*)[3] Bitter fleabane (*E. acris*)	Around culvert
IP05	E417329.3618 N6833316.255	Foxtail barley (*H. jubatum*) Pineapple weed (*Matricaria discoidea*) Oxeye daisy (*Leucanthemum vulgare*)*	Both sides of road
IP06	E418412.4642 N6836040.93	Narrow-leaf hawksbeard (*Crepis tectorum*)* Foxtail barley (*H. jubatum*) Perennial ryegrass (*Lolium perenne*)	Around gatehouse Variety of invasive species
IP07	E418369.9077 N6836235.724	Narrow-leaf hawksbeard (*C. tectorum*) Foxtail barley (*H. jubatum*) Pineapple weed (*M. discoidea*) Alsike clover (*Trifolium hybridum*)	Large clearing at beginning of access road off the Robert Campbell Highway. High infestation
IP08	E414972.695 N6815411.368	Smooth brome (*Bromus inermis*)*	In project site, was seen at the old bridge at the south end of the proposed tailings pond. Was buried during development of road.

[1] Bitter fleabane (*Erigeron acris*): A native pioneer species that often colonizes disturbed areas such as abandoned fields, vacant lots, roadsides, and waste areas. It competes with highly invasive plant species. It is listed here it is commonly mistaken as an invasive plant.
[2] Foxtail barley (*Hordeum jubatum*): Considered noxious native species as its upward pointing barbs on the bristles can cause injury to grazing animals, particularly their mouth, throat and eyes. Best to manage as it can colonize disturbed areas quickly.
[3] Horned Dandelion (*Taraxacum ceratophorum*): Another native species that pioneers disturbed areas, but does not need to be managed.
* Smooth brome, narrow-leaf hawksbeard and oxeye daisy are considered to be highly invasive plants and need to be managed promptly.

3.1 DESCRIPTIONS OF INVASIVE PLANTS OBSERVED DURING SURVEY

In order to effectively monitor invasive plants (IP), the samples have to be correctly identified. Some native species can be easily mistaken as IP and inadvertently eradicated as part of a control program. Native plants should be left to grow in disturbed areas as they compete with IP slowing the establishment of infestations. In the section below, a description and photographs of IP observed in BMC study area are supplied. Descriptions and photographs of native plants observed pioneering the disturbed areas, often alongside the IP, are also provided.



● Location of Invasive Plant Sighting

▬ Location of Proposed Mine Infrastructure

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

═ Tote Road

═ Proposed Road

— Contour (40 m interval)

— Watercourse

▬ Waterbody

KUDZ ZE KAYAH PROJECT VEGETATION BASELINE REPORT

FIGURE 2

LOCATION OF OBSERVED INVASIVE PLANT SPECIES

OCTOBER 2016

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3.1.1 Smooth Brome (*Bromus inermis*)

Yukon Invasive Species Council invasiveness rank: 1 (may displace or replace native ecosystems) (Bennett 2011).

Smooth brome grass (Figure 3) was introduced to Canada from Eastern Europe and been used extensively in pastures, and hayfields and seeded in roadside ditches in the last hundred years. It is a vigorous plant producing abundant forage and out-competes native species by growing earlier in the spring, growing tall stems that shade native plants, and by spreading via dense mats of rhizomes. Smooth brome is a perennial grass, 20–150 cm tall, and usually appears in loose clumps. It has green to purplish flowers and blooms June to September (Reaume, 2011).

Smooth brome may alter resource conditions and competitive interactions in plant communities where it invades, it may have potential cascading effects. Smooth brome could facilitate invasion by other species, and more importantly, it could enhance their competitive ability under field conditions, creating higher threats to biodiversity (Bennett et al. 2014).

Presently, the only known location where smooth brome was found has been cleared due to road building at the proposed open pit site, and could not be found during the IP survey. This grass may have been introduced through a seed mix used by Teck Cominco to revegetate disturbed areas (Dorothy Dick, per com.).

Control Measures

Controlling smooth brome is a challenge because many native plants grow and are vulnerable to controls at the same time as the brome. Large patches may be very difficult to remove, however control and eradication of small patches may be possible. A combination of control methods works best against smooth brome. These include repeated grazing, cutting while in the boot stage (flowering heads still enclosed within the sheath), prescribed burning in the boot stage, and a ‘wipe’ application of herbicides. Wiping selectively applies concentrated herbicides (33% glyphosate) to smooth brome because it is taller than native species (OGC, n.d.).

Smooth brome (*Bromus inermis*) growing in the field, and an individual sample for identification purposes.

Figure 3 Smooth brome

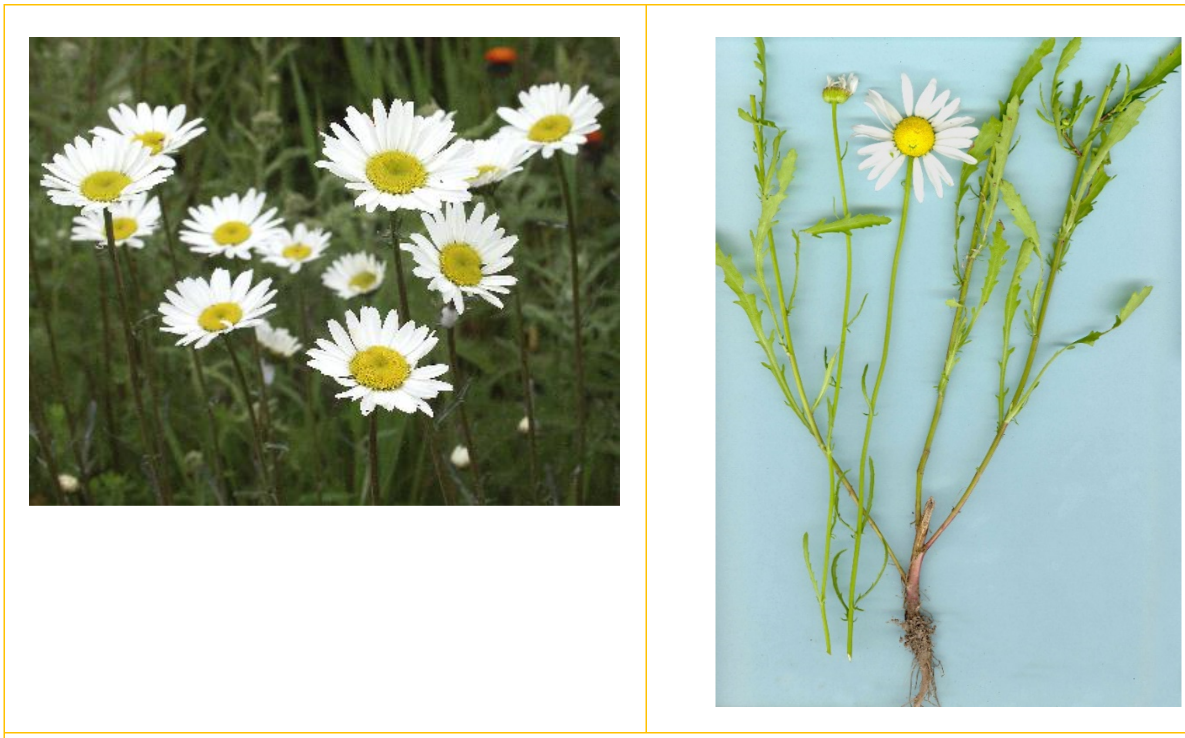
3.1.2 Oxeye Daisy (*Leucanthemum vulgare*)

Yukon Invasive Species Council invasiveness rank: 1 (Bennett 2011)
Often cultivated in gardens as a "wildflower", this non-native is an aggressive invader. Oxeye daisy (Figure 4) is a perennial that spreads primarily by seed, but also by shallow, creeping roots (rhizomes). Individual plants can produce over 500 seeds that are viable in the soil for two to three years or more. The greatest impact of oxeye daisy is on forage production in pastures and meadows. Dense stands of oxeye daisy can decrease plant diversity and increase the amount of bare soil in an area.

Control Measures

Repeated mowing prevents seed production, but also can stimulate re-sprouting of stems. Hand-pulling or digging before seed production is effective, but it is important to remove as much of the fibrous roots and rhizomes as possible. Ground disturbance while digging should be kept to a minimum. Hand removal will have to be continued for several years because seeds may remain viable in the soil for some time. Because of its shallow root system, oxeye daisy is easily killed by intensive cultivation.

The chemical control method is to apply Aminopyralid alone or in a product mix with Metsulfuron-methyl, registered for use on oxeye daisy. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions (AISC, 2014).



Oxeye Daisy (Leucanthemum vulgare) growing in the field, and an individual sample for identification purposes.

Figure 4 Oxeye daisy

3.1.3 Narrowleaf Hawksbeard *(Crepis tectorum)*

Yukon Invasive Species Council invasiveness rank: 1 (Bennett 2011).

Narrowleaf hawksbeard (Figure 5) occurs throughout Yukon along all the major highways (YISC, 2010). Hawksbeard only reproduces by seed, but each plant is capable of producing up to 50,000 seeds. The plant will therefore displace native colonizers and competes with hay crops and, once established, is hard to remove.

The yellow flower heads are numerous with green bracts arranged in two distinctive rows. Stems are single, sometimes branched, rising from a small taproot, growing to 20 – 60 cm or taller. Lower leaves are lanceolate, stem leaves decrease in size and mostly linear on the upper portion of the stem (YISC, 2010).

Control Measures

Small infestations of plants are easily controlled by hand pulling. Further monitoring after eradication is important as this plant is likely to be introduced again because it is a prolific seed producer. Annual plants require prevention of seed production and prevention of dispersal. Caution is necessary when using hay from road ditches or known infested areas. The plants will continue to mature after pulling so all plant parts should be placed in a clear plastic bag, left in the sun to decompose and brought to the landfill where the bag should be buried (YISC, 2010).

Narrowleaf hawksbeard (*Crepis tectorum*) growing in the field, and an individual sample for identification purposes.

Figure 5 Narrowleaf hawksbeard

3.1.4 Perennial ryegrass (*Lolium perenne*)

Yukon Invasive Species Council invasiveness rank: 2 (*aggressive, widespread, persistent, but may not replace native species or change ecosystem function)* (Bennett 2011).

Perennial ryegrass (Figure 6) has been a common forage grass for hundreds of years and has recently become a widely-planted turfgrass in the Pacific Northwest (USDA NRCS, 2002).

It grows erect to about 0.9 m tall. Stems grow singly or in clumps and are rounded to slightly flatten in cross-section. Leaf blades are flat, glossy and generally hairless, leaves are usually folded in the bud. Flowering takes place from May through September. The flower head is 8–30 cm long. It consists of small, spikelets that are spaced apart along the main flowering stem and are alternate to one another. Occasionally spikelets branch off the main axis (USDA NRCS, 2002).

Control Measures
Small patches can be controlled through hand pulling as this grass is has shallow roots. Perennial ryegrass has developed resistance to glyphosate and other herbicides. In humid areas, a certain fungus can infect this ryegrass that can cause intoxication and photosensitivity in livestock. Ryegrass can impact sensitive habitat, particularly vernal pools (Kyser et al. 2013).

Perennial ryegrass (*Lolium perenne*) growing in the field, and an individual sample for identification purposes.

Figure 6 Perennial ryegrass

3.1.5 Alsike clover (*Trifolium hybridum*)

Yukon Invasive Species Council invasiveness rank: 2 (Bennett 2011).

Alsike clover (Figure 7) was introduced from Europe and is used agriculturally as a pasture, hay or silage crop, and is also planted to prevent erosion (NatureServe 2015; USDA NRCS 2008). It grows in wet or acidic conditions, is well adapted to a range of soil types and grows well in northern latitudes at high elevations (NatureServe 2015). The plant spreads by seed and under ideal conditions, seeds last up to six years in the soil (NatureServe 2015).

Alsike clover is not native to the Yukon and as with timothy, it was found at 10% of sites surveyed in a 2007 roadside invasive plant survey (Line et al., 2008). Because of its historical use as a reclamation species in the Yukon, alsike clover is therefore not considered invasive in the territory (YISC, 2008). However, because it is a nitrogen fixing species, the presence of alsike clover will alter the plant community composition, as well as provide early spring forage for herbivorous wildlife (NatureServe 2015; USDA NRCS 2008). It will also form dominant stands and exclude native vegetation (UAA 2011a).

It is a perennial plant growing 15 to 20 cm tall with stems that are ascending to erect. The leaves are typical of clover: trifoliate, smooth and each leaflet is oval or elliptical. Flower heads have 30 to 50 white to pink flowers about 6 to 11 mm long that bend down after pollination and turn brown with maturity (UAA 2011a; USDA NRCS 2008).

Control Measures

Small populations can be controlled by hand-pulling. Given the plant's taproot, digging may be required where the infestation is well established (UAA 2011a.). The herbicides Banvel/Banvell II (dicamba) or Lontrel 360 (clopyralid) can be used in spring or fall against alsike clover (BCMoA n.d.).

Alsike clover (*Trifolium hybridum*) growing in the field, and an individual sample for identification purposes.

Figure 7 Alsike clover

3.1.6 Pineapple-weed (*Matricaria discoidea*)

Yukon Invasive Species Council invasiveness rank: 3 (taxa present in Yukon, not known to be invasive here, but have been found to be invasive in other jurisdictions) (Bennett 2011).

This weed (Figure 8) is native to the Pacific coast and is now widely distributed in North America. Pineapple-weed is a summer or winter annual that reproduces by seed and seeds germinate from early spring to early fall. This species tolerates compact soil and mowing (Berry and Coop, 2000).

The plants are 5 to 40cm tall, bushy with finely divided leaves. Mature plants have elongated branching stems with alternate leaves. Flowers are present from May to September and are yellow-green, rounded or conical shaped. The crushed leaves have a pineapple scent.

Control Measures

Pineapple-weed is hard to control by manual methods and in most cases chemical control is required. The herbicide Gramoxone plus Goal is effective in late fall. Gramoxone is a non-residual herbicide for the control of many grasses and broadleaf weeds (Berry and Coop, 2000).

Pineapple-weed (*Matricaria discoidea*) growing in the field, and an individual sample for identification purposes.

Figure 8 Pineapple-weed

3.1.7 Common timothy (*Phelum pratense*)

Yukon Invasive Species Council invasiveness rank: 4 (has been reported in the territory, has not been shown to be problematic, may not persist) (Bennett 2011).

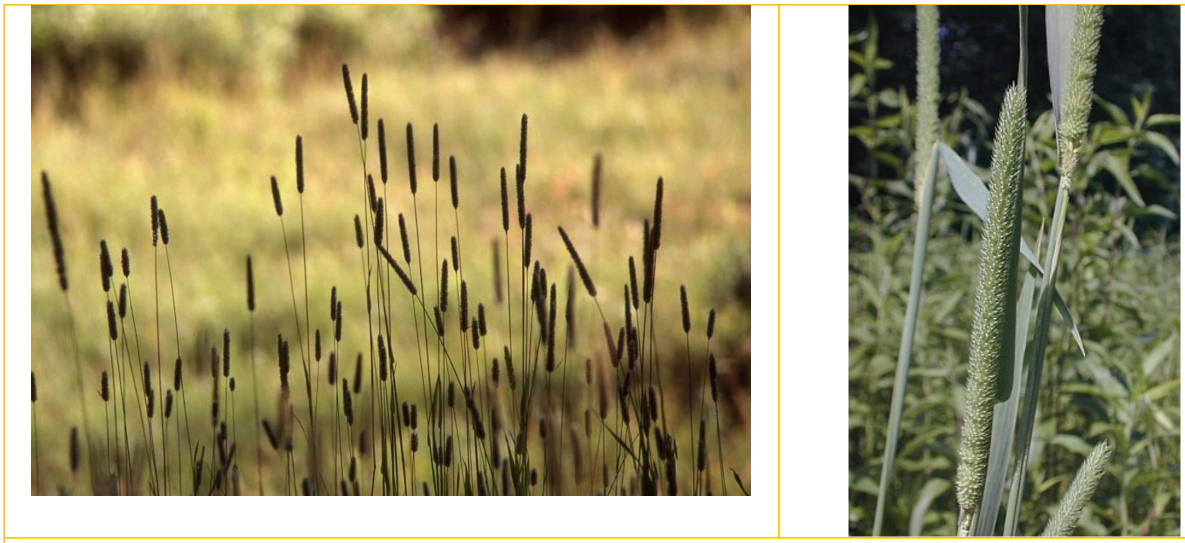
Common timothy (Figure 9) is an agricultural species of perennial bunchgrass introduced from Eurasia and inhabits mesic fields, roadsides, waste areas and disturbed sites (Klinkenberg, 2015b). It is well adapted to cool areas and high elevations (USDA NRCS, 2011). Timothy spreads via seed distribution and seeds can remain viable in the soil for up to five years (USDA NRCS, 2011).

Timothy is considered a non-native, or exotic, plant by YISC and was found at 10% of sites surveyed in a 2007 roadside invasive plant survey (Line et al., 2008). Because timothy was historically used as a reclamation species in the Yukon, it is not considered invasive in the territory. However, it can spread into native vegetation communities under ideal conditions and exist as a monoculture (USDA NRCS, 2011). Seedlings can prevent the establishment of conifer seedlings and increase fire hazards (UAA, 2011c).

Timothy has erect, tufted stems, purple or brown at the base, and growing up to 100cm tall in clumps from fibrous roots (Klinkenberg, 2015b; UAA, 2011c). Leaves are short with smooth sheaths, flat blades 4-8mm wide with rough margins. Flowers are yellow on a slender cylindrical inflorescence 4-11cm long and less than 1cm wide resembling a small cat-tail and giving rise to one of its common names, meadow cat's-tail (UAA, 2011c; USDA NRCS 2011).

Control Measures

Timothy is a shallow-rooted grass so hand-pulling before the grass sets seed (July) can be effective at eliminating small infestations (UAA, 2011c). Cutting or mowing repeatedly, and continuous grazing will also weaken the plant (UAA, 2011c).



Common timothy (*Phelum pratense*) growing in the field, and an individual sample for identification purposes.

Figure 9 Common timothy

3.1.8 Foxtail Barley (*Hordeum jubatum*)

Foxtail barley (Figure 10) is an annual or perennial grass that is considered a native species in Yukon. It is, however, opportunistic and spreading rapidly across Yukon landscape, both along roads and in agricultural situations. The Yukon public has voiced concern about this plant due to its socio-economic impacts: it is harmful to livestock and horses due to its sharp awns, it reduces crop yields and it forms monocultures in once-diverse native ecosystems. Each plant can produce over 150 seeds, which may remain viable in the soil for over a year (UAA, 2011b). A strategy for managing this species is in demand in Yukon and thus it should be part of an invasive species monitoring program (Line et al., 2008).

The plant grows 30 to 60cm tall and has gray-green, rough leaves, 2 to 3mm wide. The spikes are nodding, pale green to purple, and bushy. At maturity, spikes fade to a tawny color and become very brittle. Each seed has 4 to 8 awns and sharp, backward-pointing barbs (UAA, 2011b).

Control Measures

Foxtail barley can be removed by hand-pulling, digging or tillage as it is shallow-rooted (Dunn and Blackshaw, 2007). Care should be taken to do so before the seed heads form in summer. As foxtail barley is also very tolerant of standing water so reducing anthropogenic wet areas during construction or road works can be helpful (UAA, 2011b). In areas where foxtail barley needs to be eradicated and no desirable grass species are present, a clethodim product (Select) or Assure II applied especially before plants mature will be successful. If the areas contain desirable grass species then Plateau is labeled for control. It is important to follow label direction to apply at the proper timing, to use recommended adjuvants, and follow other label information (NDSU, 2015).

Foxtail barley (*Hordeum jubatum*) growing in the field, and an individual sample for identification purposes.

Figure 10 Foxtail barley

3.2 Native Plants with Invasive-like Appearances

3.2.1 Bitter Fleabane (*Erigeron acris*)

Bitter fleabane (Figure 11) is a native pioneer species that often colonizes disturbed areas such as pastures, abandoned fields, vacant lots, roadsides, railways, and waste areas. In these habitats it competes, often successfully, with introduced invasive weeds. This plant was seen at many of the same sites where IP were found during the survey. It does not need to be controlled, where possible should be left alone.

Bitter fleabane is biennial or perennial herb; stems erect, solitary to several, branched above, often spreading stiff and hairy, 20-80 cm tall. The basal leaves are oblanceolate or spoon-shaped, stalked, usually entire, 1-15 cm long, 1-14 mm wide; stem leaves ample or strongly reduced, linear-oblong, becoming unstalked.

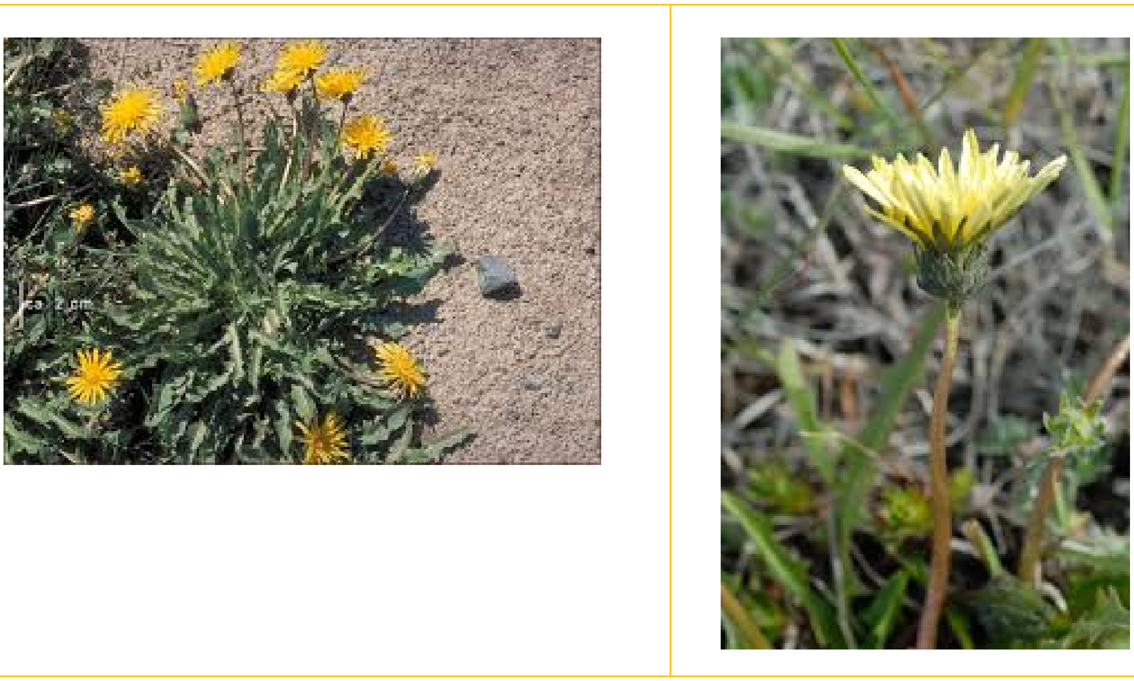
The heads have ray and disk flowers, several to numerous on stalks in a flat or round-topped inflorescence; involucral bracts lanceolate, finely glandular and/or stiff-hairy, green or more or less purplish; ray flowers numerous, although sometimes inconspicuous, in several series, of two types, the outer with a long threadlike tube and narrow pink to purplish or white erect ray flowers, these about 2.5-4.5 mm long, the inner female flowers rayless or nearly so (Klinkenberg, 2015a).

Bitter fleabane (*Erigeron acris*) growing in the field, and an individual sample for identification purposes.

Figure 11 Bitter fleabane

3.2.2 Horned dandelion (*Taraxacum ceratophorum*)

The horned dandelion (Figure 12) is native to North America and often found in alpine environments. It is a perennial herb and grows from a simple or branched stem-base and a thick, often black, taproot; stems ascending to erect, solitary to several, simple, hollow, glabrous or sparsely long-hairy, exuding milky juice when broken, 3-60 cm tall. Basal leaves lanceolate to oblanceolate, 1-35 cm long, 0.3-6 cm wide, tapering basally to a more or less winged stalk, nearly entire to toothed or more often pinnately lobed to pinnately cut, the terminal lobe often wider than the others, Heads with yellow strap-shaped flowers, solitary; involucres 7-22 mm tall; involucral bracts in 2 series, the outer ones egg-shaped to lanceolate, appressed to ascending, glabrous or long-hairy, the inner ones lance-oblong, long-pointed, usually horned at the tips, rarely only slightly so; ray flowers yellow, sometimes purple-veined; disk flowers lacking (Klinkenberg, 2015c).



Horned dandelion (*Taraxacum ceratophorum*) growing in the field, and an individual sample for identification purposes.

Figure 12 Horned dandelion

4 DISCUSSION

During the field session, between July 28th and August 2nd, an active mineral exploration program was underway so some areas could not be accessed for the IP survey. Also, machinery had excavated or graded areas around the project site where older disturbed sites had been. That meant that vegetation was cleared and/or buried, so the field crew was unable to assess if IP had existed at these sites. These site will need to be assessed next growing season as IP are tenacious and could still be present.

According to the report Results of the 2007 Invasive Plants Roadside Inventory in Yukon (Line et al. 2008) there are several know species of aggressive weeds that have infested certain sites along the Robert Campbell Highway. Primarily at rest areas and points of interest. As this is the only land-based transport route to the KZK access road it would be prudent to ensure that drivers travelling to KZK check their vehicles and trailers for plant material prior to entering the KZK access road.

5 RECOMMENDATIONS

The following recommendations are brief, more detailed information can be found in the KZK Invasive Plant Management Plan (IPMP).

- Develop a Management Plan to control Invasive Plant species specific to the KZK area;
- Educate and train Environmental Monitors (EM) and other personnel to identify and properly remove IP;
- Set up a routine to check vehicles at the entrance to the KZK access road with signage and disposal material;
- Revegetate disturbed areas as soon as possible with native grasses and plants; and
- Monitor, on a seasonal basis, areas that have been treated for IP and areas with high potential to host IP.

6 CONCLUSION

As a part of the vegetation and soils baseline data collection program a field program occuring on July 28th to Aug 2nd ACG undertook a survey of invasive plants (IP) along roads and camp areas. This work concentrated survey efforts along the access road and disturbed areas around the project site; and identified to species level any invasive plants found during surveying and marked their location.

The majority of the IP found were along the mine access road from the camp to the Robert Campbell Highway (including gatehouse and layby area). Eight species of IP were found. Among these, smooth brome, narrow-leaf hawksbeard and oxeye daisy are considered to be highly invasive plants and need to be managed promptly. Perennail ryegrass and alsike clover are considered aggressive, pineapple weed has been found to be invasive in other jurisdictions and common timothy is potentially not problematic. Lastly, foxtail barley is a native species, however it is opportunistic and spreading rapidly across Yukon landscape and is not likely native to the KZK site. Most problematically, it forms monocultures in once-diverse native ecosystems and its awns can cause injury to grazing animals, particularly their mouth, throat and eyes. This plant should therefore be part of an invasive species monitoring program.

Two species were located that are native but may appear to have weedy habits as they colonize disturbed areas. These are bitter fleabane and horned dandelion. Both can be commonly mistaken as IP but do not need to be managed and can be allowed to remain in situ as they compete with highly invasive plant species.

Futher monitoring of disturbed areas that had been recently excavated or graded just prior to the 2015 survey will be necessary to determine presence of IP. Education and training of on-site EM and personnel will assist in controling IP infestations, as will the installation of a vehicle checkpoint at the entrance to the KZK access road.

Finally, prompt revegetation of disturbed areas with native grass mixes, coupled with ongoing monitoring and control measures for IP will assist in reducing the spread of IP infestations and the development of in-soil IP seedbanks.

4 PHOTOGRAPHS

Photographs were taken throughout the field trip to document invasive plants; a selection of these are shown below. Please refer to the following link on the Sharepoint server for a compilation of all photos collected.

https://alexcoenvironmental.sharepoint.com/sites/kzk/KZK%20Pics/Baseline/700%20Vegetation/735%20Veg%20Metal%20Uptake

Photo 1: Native bitter fleabane found along access road

Photo 2: Native horned dandelion found along access road

Photo 3: Foxtail barley found along access road

Photo 4: Invasive pineapple weed found at gatehouse

Photo 5: Common timothy found along access road

Photo 6: Foxtail barley at layby area near intersection of access road and Robert Campbell Hwy

Photo 7: Invasive oxeye daisy found at gatehouse

Photo 8: Invasive alsike clover found at layby area

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APPENDIX C:

SOIL SAMPLE ANALYTICAL DATA

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Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08412622, 08412623

Attention:KAI WOLOSHYN

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

Report Date: 2015/08/14
Report #: R2024267
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B567738
Received: 2015/08/07, 13:45

Sample Matrix: Soil
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cation Exchange Capacity (1)	21	2015/08/13	2015/08/14	AB WI-00065	Auto Calc
Conductivity @25C (Soluble) (1)	21	2015/08/13	2015/08/13	AB SOP-00033 / AB SOP-00004	SM 22 2510 B m
Elements by ICPMS (total)	4	2015/08/10	2015/08/11	BBY7SOP-00001	EPA 6020a R1 m
Elements by ICPMS (total)	17	2015/08/11	2015/08/12	BBY7SOP-00001	EPA 6020a R1 m
Potassium (Available) (1)	21	2015/08/13	2015/08/14	CAL SOP-00153 / AB SOP-00042	EPA 200.7 CFR 2012 m
Nitrate-N (Available) (1)	20	2015/08/13	2015/08/13	CAL SOP-00152 / AB SOP-00023	SM 22 4110 B m
Nitrate-N (Available) (1)	1	2015/08/13	2015/08/14	CAL SOP-00152 / AB SOP-00023	SM 22 4110 B m
Phosphorus (Available by ICP) (1)	21	2015/08/13	2015/08/14	CAL SOP-00152 / AB SOP-00042	EPA 200.7 CFR 2012 m
pH @25C (1:2 Calcium Chloride Extract) (1)	21	2015/08/13	2015/08/13	AB SOP-00033 / AB SOP-00006	SM 22 4500 H+B m
pH (2:1 DI Water Extract)	4	2015/08/10	2015/08/11	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	17	2015/08/11	2015/08/13	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Sulphur (Available) (1)	21	2015/08/13	2015/08/13	AB SOP-00029 / AB SOP-00042	EPA 200.7 CFR 2012 m
Soluble Paste (1)	21	2015/08/13	2015/08/13	AB SOP-00033	Carter 2nd ed 15.2 m
Total Carbon in Soil by LECO (1, 2)	18	2015/08/11	2015/08/12	AB SOP-00035 / CAL SOP-00243	LECO 203-821-170 m
Total Carbon in Soil by LECO (1, 2)	2	2015/08/11	2015/08/13	AB SOP-00035 / CAL SOP-00243	LECO 203-821-170 m
Total Carbon in Soil by LECO (1, 2)	1	2015/08/12	2015/08/12	AB SOP-00035 / CAL SOP-00243	LECO 203-821-170 m
Texture by Hydrometer (1)	21	N/A	2015/08/14	AB SOP-00035 / AB SOP-00030	Carter 2nd ed 55.3 m
Texture Class (1)	21	N/A	2015/08/14	AB SOP-00030	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.

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH
Your C.O.C. #: 08412622, 08412623

Attention:KAI WOLOSHYN

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

Report Date: 2015/08/14
Report #: R2024267
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B567738
Received: 2015/08/07, 13:45
(1) This test was performed by Maxxam Calgary Environmental
(2) Updated the RPD limits from 50% to 35% as per standards. Updated on 2012/11/26.

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.

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6135	MV6136	MV6137	MV6138		
Sampling Date		2015/07/29	2015/07/29	2015/07/29	2015/07/30		
COC Number		08412622	08412622	08412622	08412622		
	Units	**PA01**	**PA02**	**PA03**	**PA04**	**RDL**	**QC Batch**
Nutrients							
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	<2.0	<2.0	<2.0	2.0	8001202
Available (NH4F) Phosphorus (P)	mg/kg	38	29	1.3	1.9	1.0	8001262
Available (NH4OAc) Potassium (K)	mg/kg	13	23	10	25	2.0	8001172
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	<2.0	<2.0	<2.0	2.0	8000945
Soluble Parameters							
Soluble Conductivity	dS/m	0.060	0.075	0.066	0.10	0.020	8001330
Soluble (CaCl2) pH	pH	4.06	4.67	4.35	5.82	N/A	8000748
Saturation %	%	46	47	32	43	N/A	8000573
Physical Properties							
% sand by hydrometer	%	61	55	66	55	2.0	8000948
% silt by hydrometer	%	29	35	27	35	2.0	8000948
Clay Content	%	10	9.8	7.1	9.7	2.0	8000948
Texture	N/A	SANDY LOAM	SANDY LOAM	SANDY LOAM	SANDY LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B567738
Report Date: 2015/08/14

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

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6139	MV6140	MV6141	MV6142		
Sampling Date		2015/07/30	2015/07/30	2015/07/30	2015/07/30		
COC Number		08412622	08412622	08412622	08412622		
	Units	**PA05**	**PA06**	**PA07**	**PA08**	**RDL**	**QC Batch**
Nutrients							
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	<2.0	<2.0	<2.0	2.0	8001202
Available (NH4F) Phosphorus (P)	mg/kg	28	3.0	1.4	2.6	1.0	8001262
Available (NH4OAc) Potassium (K)	mg/kg	15	11	14	53	2.0	8001172
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	<2.0	<2.0	<2.0	2.0	8000945
Soluble Parameters							
Soluble Conductivity	dS/m	0.044	0.047	0.088	0.11	0.020	8001330
Soluble (CaCl2) pH	pH	4.75	4.05	5.63	5.29	N/A	8000748
Saturation %	%	33	36	50	34	N/A	8000573
Physical Properties							
% sand by hydrometer	%	68	74	56	53	2.0	8000948
% silt by hydrometer	%	25	21	39	37	2.0	8000948
Clay Content	%	7.4	5.4	4.7	10	2.0	8000948
Texture	N/A	SANDY LOAM	SANDY LOAM	SANDY LOAM	SANDY LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B567738
Report Date: 2015/08/14

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

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6143		MV6144		MV6148	MV6149		
Sampling Date		2015/07/31		2015/07/31		2015/07/31	2015/07/31		
COC Number		08412622		08412622		08412623	08412623		
	Units	**PA09**	**RDL**	**PA010**	**RDL**	**PA11**	**PA12**	**RDL**	**QC Batch**
Nutrients									
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	2.0	<10 (1)	10	<2.0	<2.0	2.0	8001202
Available (NH4F) Phosphorus (P)	mg/kg	3.4	1.0	13	5.0	13	3.4	1.0	8001262
Available (NH4OAc) Potassium (K)	mg/kg	21	2.0	16	10	10	19	2.0	8001172
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	2.0	<2.0	2.0	<2.0	<2.0	2.0	8000945
Soluble Parameters									
Soluble Conductivity	dS/m	0.11	0.020	0.096	0.020	0.029	0.074	0.020	8001330
Soluble (CaCl2) pH	pH	5.54	N/A	6.06	N/A	4.07	4.55	N/A	8000748
Saturation %	%	64	N/A	93	N/A	41	38	N/A	8000573
Physical Properties									
% sand by hydrometer	%	57	2.0	61	2.0	47	63	2.0	8000948
% silt by hydrometer	%	38	2.0	28	2.0	46	29	2.0	8000948
Clay Content	%	5.3	2.0	10	2.0	7.9	8.1	2.0	8000948
Texture	N/A	SANDY LOAM	N/A	SANDY LOAM	N/A	LOAM	SANDY LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to sample matrix.

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6150	MV6151			MV6152		
Sampling Date		2015/08/01	2015/08/01			2015/08/01		
COC Number		08412623	08412623			08412623		
	Units	**PA14**	**PA15**	**RDL**	**QC Batch**	**PA16**	**RDL**	**QC Batch**
Nutrients								
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	<2.0	2.0	8001202	<10 (1)	10	8001202
Available (NH4F) Phosphorus (P)	mg/kg	<1.0	1.5	1.0	8001262	45	5.0	8001262
Available (NH4OAc) Potassium (K)	mg/kg	27	6.1	2.0	8001172	<10	10	8001172
Available (CaCl2) Sulphur (S)	mg/kg	2.8	<2.0	2.0	8000945	<2.0	2.0	8000945
Soluble Parameters								
Soluble Conductivity	dS/m	0.11	0.064	0.020	8001330	0.074	0.020	8001330
Soluble (CaCl2) pH	pH	5.52	5.68	N/A	8000748	5.56	N/A	8000748
Saturation %	%	41	33	N/A	8000573	100	N/A	8000573
Physical Properties								
% sand by hydrometer	%	77	77	2.0	8000948	58	2.0	8000459
% silt by hydrometer	%	21	20	2.0	8000948	36	2.0	8000459
Clay Content	%	2.4	2.5	2.0	8000948	5.5	2.0	8000459
Texture	N/A	LOAMY SAND	LOAMY SAND	N/A	7994364	SANDY LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to sample matrix.

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6153		MV6154	MV6155	MV6156		
Sampling Date		2015/08/01		2015/08/01	2015/08/02	2015/08/02		
COC Number		08412623		08412623	08412623	08412623		
	Units	**PA17**	**QC Batch**	**PA18**	**PA19**	**PA20**	**RDL**	**QC Batch**
Nutrients								
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	8001202	<2.0	<2.0	<2.0	2.0	8001202
Available (NH4F) Phosphorus (P)	mg/kg	1.9	8001262	2.0	4.0	1.6	1.0	8001262
Available (NH4OAc) Potassium (K)	mg/kg	22	8001172	17	24	46	2.0	8001172
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	8000945	<2.0	3.1	35	2.0	8000945
Soluble Parameters								
Soluble Conductivity	dS/m	0.051	8001450	0.13	0.14	0.34	0.020	8001330
Soluble (CaCl2) pH	pH	4.35	8000748	5.60	5.25	6.52	N/A	8000748
Saturation %	%	25	8000579	46	82	140	N/A	8000573
Physical Properties								
% sand by hydrometer	%	62	8000948	73	43	30	2.0	8000948
% silt by hydrometer	%	30	8000948	22	50	62	2.0	8000948
Clay Content	%	7.7	8000948	5.2	7.5	7.7	2.0	8000948
Texture	N/A	SANDY LOAM	7994364	SANDY LOAM	LOAM	SILT LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		MV6157		MV6158		
Sampling Date		2015/07/31		2015/08/01		
COC Number		08412623		08412623		
	Units	**PA21**	**QC Batch**	**MINERAL LICK - NORTH LAKE**	**RDL**	**QC Batch**
Nutrients						
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	8001202	<2.0	2.0	8001227
Available (NH4F) Phosphorus (P)	mg/kg	2.7	8001262	<1.0	1.0	8001270
Available (NH4OAc) Potassium (K)	mg/kg	18	8001172	56	2.0	8001190
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	8000945	32	2.0	8000950
Soluble Parameters						
Soluble Conductivity	dS/m	0.069	8001330	0.58	0.020	8001450
Soluble (CaCl2) pH	pH	4.59	8000748	7.34	N/A	8000768
Saturation %	%	39	8000573	70	N/A	8000579
Physical Properties						
% sand by hydrometer	%	67	8000948	38	2.0	8000948
% silt by hydrometer	%	27	8000948	32	2.0	8000948
Clay Content	%	5.7	8000948	30	2.0	8000948
Texture	N/A	SANDY LOAM	7994364	CLAY LOAM	N/A	7994364

RDL = Reportable Detection Limit
N/A = Not Applicable

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		MV6135	MV6136	MV6137	MV6138	MV6139	MV6140	MV6141		
Sampling Date		2015/07/29	2015/07/29	2015/07/29	2015/07/30	2015/07/30	2015/07/30	2015/07/30		
COC Number		08412622	08412622	08412622	08412622	08412622	08412622	08412622		
	Units	**PA01**	**PA02**	**PA03**	**PA04**	**PA05**	**PA06**	**PA07**	**RDL**	**QC Batch**
Elements										
Cation exchange capacity	cmol+/Kg	<10	<10	<10	14	<10	<10	<10	10	8000889
RDL = Reportable Detection Limit										

Maxxam ID		MV6142	MV6143	MV6144	MV6148	MV6149	MV6150	MV6151		
Sampling Date		2015/07/30	2015/07/31	2015/07/31	2015/07/31	2015/07/31	2015/08/01	2015/08/01		
COC Number		08412622	08412622	08412622	08412623	08412623	08412623	08412623		
	Units	**PA08**	**PA09**	**PA010**	**PA11**	**PA12**	**PA14**	**PA15**	**RDL**	**QC Batch**
Elements										
Cation exchange capacity	cmol+/Kg	<10	21	68	<10	<10	<10	15	10	8000889
RDL = Reportable Detection Limit										

Maxxam ID		MV6152	MV6153	MV6154	MV6155	MV6156	MV6157		
Sampling Date		2015/08/01	2015/08/01	2015/08/01	2015/08/02	2015/08/02	2015/07/31		
COC Number		08412623	08412623	08412623	08412623	08412623	08412623		
	Units	**PA16**	**PA17**	**PA18**	**PA19**	**PA20**	**PA21**	**RDL**	**QC Batch**
Elements									
Cation exchange capacity	cmol+/Kg	60	<10	12	12	28	<10	10	8000889
RDL = Reportable Detection Limit									

Maxxam ID		MV6158		
Sampling Date		2015/08/01		
COC Number		08412623		
	Units	**MINERAL LICK - NORTH LAKE**	**RDL**	**QC Batch**
Elements				
Cation exchange capacity	cmol+/Kg	26	10	8000906
RDL = Reportable Detection Limit				

MISCELLANEOUS (SOIL)

Maxxam ID		MV6135	MV6136	MV6137	MV6138	MV6139	MV6140	MV6141		
Sampling Date		2015/07/29	2015/07/29	2015/07/29	2015/07/30	2015/07/30	2015/07/30	2015/07/30		
COC Number		08412622	08412622	08412622	08412622	08412622	08412622	08412622		
	Units	**PA01**	**PA02**	**PA03**	**PA04**	**PA05**	**PA06**	**PA07**	**RDL**	**QC Batch**
Misc. Inorganics										
Total Carbon	%	2.3	3.2	0.47	2.1	1.2	0.66	2.0	0.020	7997622

RDL = Reportable Detection Limit

Maxxam ID		MV6142	MV6143		MV6144		MV6148	MV6149	MV6150		
Sampling Date		2015/07/30	2015/07/31		2015/07/31		2015/07/31	2015/07/31	2015/08/01		
COC Number		08412622	08412622		08412622		08412623	08412623	08412623		
	Units	**PA08**	**PA09**	**RDL**	**PA010**	**RDL**	**PA11**	**PA12**	**PA14**	**RDL**	**QC Batch**
Misc. Inorganics											
Total Carbon	%	0.87	3.9	0.020	8.9 (1)	0.20	2.1	0.65	0.32	0.020	7997622

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam ID		MV6151		MV6152		MV6153	MV6154		MV6155		
Sampling Date		2015/08/01		2015/08/01		2015/08/01	2015/08/01		2015/08/02		
COC Number		08412623		08412623		08412623	08412623		08412623		
	Units	**PA15**	**RDL**	**PA16**	**RDL**	**PA17**	**PA18**	**QC Batch**	**PA19**	**RDL**	**QC Batch**
Misc. Inorganics											
Total Carbon	%	0.90	0.020	10 (1)	0.20	0.35	1.8	7997622	2.0	0.020	8000365

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam ID		MV6156		MV6157		MV6158		
Sampling Date		2015/08/02		2015/07/31		2015/08/01		
COC Number		08412623		08412623		08412623		
	Units	**PA20**	**QC Batch**	**PA21**	**RDL**	**MINERAL LICK - NORTH LAKE**	**RDL**	**QC Batch**
Misc. Inorganics								
Total Carbon	%	2.1	8000365	0.62	0.020	8.4 (1)	0.20	7997622

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6135		MV6136	MV6137	MV6138	MV6139	MV6140		
Sampling Date		2015/07/29		2015/07/29	2015/07/29	2015/07/30	2015/07/30	2015/07/30		
COC Number		08412622		08412622	08412622	08412622	08412622	08412622		
	Units	**PA01**	**QC Batch**	**PA02**	**PA03**	**PA04**	**PA05**	**PA06**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	4.77	7996558	5.55	5.32	7.29	5.69	5.00	N/A	7997646
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	10900	7996554	10300	8050	16900	15400	12900	100	7997599
Total Antimony (Sb)	mg/kg	0.60	7996554	1.78	<0.10	0.28	0.25	0.17	0.10	7997599
Total Arsenic (As)	mg/kg	28.5	7996554	96.3	2.39	22.3	11.3	12.7	0.50	7997599
Total Barium (Ba)	mg/kg	88.6	7996554	161	108	145	161	81.2	0.10	7997599
Total Beryllium (Be)	mg/kg	<0.40	7996554	<0.40	0.45	0.55	0.58	0.42	0.40	7997599
Total Bismuth (Bi)	mg/kg	0.24	7996554	0.24	0.35	0.29	0.26	0.33	0.10	7997599
Total Cadmium (Cd)	mg/kg	0.601	7996554	1.43	0.094	0.411	0.322	0.175	0.050	7997599
Total Calcium (Ca)	mg/kg	2300	7996554	7250	4330	6080	3240	2480	100	7997599
Total Chromium (Cr)	mg/kg	45.0	7996554	26.0	44.5	50.3	38.4	78.7	1.0	7997599
Total Cobalt (Co)	mg/kg	6.55	7996554	12.1	4.41	15.8	12.3	13.8	0.30	7997599
Total Copper (Cu)	mg/kg	55.1	7996554	192	3.52	31.0	23.5	13.2	0.50	7997599
Total Iron (Fe)	mg/kg	24500	7996554	36300	14500	34500	31700	29100	100	7997599
Total Lead (Pb)	mg/kg	15.8	7996554	20.0	10.1	28.0	21.0	15.1	0.10	7997599
Total Lithium (Li)	mg/kg	11.2	7996554	10.5	13.9	17.4	14.7	15.5	5.0	7997599
Total Magnesium (Mg)	mg/kg	4170	7996554	3650	6080	10100	7410	8260	100	7997599
Total Manganese (Mn)	mg/kg	192	7996554	249	112	666	584	543	0.20	7997599
Total Mercury (Hg)	mg/kg	<0.050	7996554	0.055	<0.050	<0.050	<0.050	<0.050	0.050	7997599
Total Molybdenum (Mo)	mg/kg	3.01	7996554	9.11	0.63	1.45	1.48	1.24	0.10	7997599
Total Nickel (Ni)	mg/kg	31.0	7996554	71.4	25.4	38.2	25.0	41.6	0.80	7997599
Total Phosphorus (P)	mg/kg	1600	7996554	3930	439	1180	862	972	10	7997599
Total Potassium (K)	mg/kg	554	7996554	770	498	1330	1090	1520	100	7997599
Total Selenium (Se)	mg/kg	1.25	7996554	6.52	<0.50	0.55	<0.50	<0.50	0.50	7997599
Total Silver (Ag)	mg/kg	0.487	7996554	1.13	<0.050	0.143	0.066	0.070	0.050	7997599
Total Sodium (Na)	mg/kg	<100	7996554	<100	<100	<100	<100	<100	100	7997599
Total Strontium (Sr)	mg/kg	41.7	7996554	72.1	10.8	19.8	12.1	10.7	0.10	7997599
Total Thallium (Tl)	mg/kg	0.135	7996554	0.135	0.098	0.161	0.164	0.125	0.050	7997599
Total Tin (Sn)	mg/kg	0.62	7996554	0.31	1.14	0.55	0.76	0.83	0.10	7997599
Total Titanium (Ti)	mg/kg	122	7996554	146	613	744	612	933	1.0	7997599
Total Uranium (U)	mg/kg	1.85	7996554	3.22	0.781	1.04	0.809	0.725	0.050	7997599
Total Vanadium (V)	mg/kg	44.0	7996554	39.3	31.1	58.4	49.1	50.4	2.0	7997599
Total Zinc (Zn)	mg/kg	80.0	7996554	236	28.3	121	102	83.2	1.0	7997599

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6135		MV6136	MV6137	MV6138	MV6139	MV6140		
Sampling Date		2015/07/29		2015/07/29	2015/07/29	2015/07/30	2015/07/30	2015/07/30		
COC Number		08412622		08412622	08412622	08412622	08412622	08412622		
	Units	**PA01**	**QC Batch**	**PA02**	**PA03**	**PA04**	**PA05**	**PA06**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/kg	<0.50	7996554	0.77	<0.50	0.96	0.63	0.70	0.50	7997599
RDL = Reportable Detection Limit										

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6141		MV6142		MV6143	MV6144	MV6148		
Sampling Date		2015/07/30		2015/07/30		2015/07/31	2015/07/31	2015/07/31		
COC Number		08412622		08412622		08412622	08412622	08412623		
	Units	**PA07**	**QC Batch**	**PA08**	**QC Batch**	**PA09**	**PA010**	**PA11**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	6.68	7997646	6.12	7996558	6.46	6.84	4.96	N/A	7997646
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	13900	7997599	9340	7996554	23900	13300	11600	100	7997599
Total Antimony (Sb)	mg/kg	0.34	7997599	0.42	7996554	0.20	0.14	0.41	0.10	7997599
Total Arsenic (As)	mg/kg	9.61	7997599	6.28	7996554	21.0	27.2	5.74	0.50	7997599
Total Barium (Ba)	mg/kg	104	7997599	126	7996554	151	53.7	111	0.10	7997599
Total Beryllium (Be)	mg/kg	0.48	7997599	0.51	7996554	<0.40	<0.40	0.48	0.40	7997599
Total Bismuth (Bi)	mg/kg	0.20	7997599	0.36	7996554	0.21	0.22	0.22	0.10	7997599
Total Cadmium (Cd)	mg/kg	0.680	7997599	0.246	7996554	0.325	0.520	0.149	0.050	7997599
Total Calcium (Ca)	mg/kg	5240	7997599	2150	7996554	5560	13200	1370	100	7997599
Total Chromium (Cr)	mg/kg	33.6	7997599	20.7	7996554	52.6	44.4	21.0	1.0	7997599
Total Cobalt (Co)	mg/kg	18.6	7997599	7.30	7996554	27.4	14.3	5.82	0.30	7997599
Total Copper (Cu)	mg/kg	37.8	7997599	12.9	7996554	41.0	40.9	11.3	0.50	7997599
Total Iron (Fe)	mg/kg	32100	7997599	19500	7996554	54600	30100	24000	100	7997599
Total Lead (Pb)	mg/kg	43.9	7997599	15.5	7996554	26.4	17.4	10.9	0.10	7997599
Total Lithium (Li)	mg/kg	15.8	7997599	11.6	7996554	17.9	11.0	12.3	5.0	7997599
Total Magnesium (Mg)	mg/kg	8440	7997599	3680	7996554	13600	9070	3490	100	7997599
Total Manganese (Mn)	mg/kg	777	7997599	331	7996554	861	512	263	0.20	7997599
Total Mercury (Hg)	mg/kg	<0.050	7997599	<0.050	7996554	<0.050	<0.050	0.058	0.050	7997599
Total Molybdenum (Mo)	mg/kg	1.02	7997599	1.32	7996554	1.81	1.54	1.47	0.10	7997599
Total Nickel (Ni)	mg/kg	35.2	7997599	15.0	7996554	56.9	40.6	14.8	0.80	7997599
Total Phosphorus (P)	mg/kg	870	7997599	571	7996554	1240	873	696	10	7997599
Total Potassium (K)	mg/kg	930	7997599	1610	7996554	675	576	1750	100	7997599
Total Selenium (Se)	mg/kg	0.56	7997599	<0.50	7996554	0.70	1.30	<0.50	0.50	7997599
Total Silver (Ag)	mg/kg	0.211	7997599	0.102	7996554	0.200	0.368	0.099	0.050	7997599
Total Sodium (Na)	mg/kg	<100	7997599	<100	7996554	<100	<100	<100	100	7997599
Total Strontium (Sr)	mg/kg	21.1	7997599	10.8	7996554	25.0	48.7	10.4	0.10	7997599
Total Thallium (Tl)	mg/kg	0.142	7997599	0.189	7996554	0.088	0.064	0.209	0.050	7997599
Total Tin (Sn)	mg/kg	0.43	7997599	0.38	7996554	0.23	0.25	0.55	0.10	7997599
Total Titanium (Ti)	mg/kg	583	7997599	446	7996554	206	188	418	1.0	7997599
Total Uranium (U)	mg/kg	1.20	7997599	1.89	7996554	1.07	3.35	0.806	0.050	7997599
Total Vanadium (V)	mg/kg	42.8	7997599	32.8	7996554	62.7	35.7	30.6	2.0	7997599
Total Zinc (Zn)	mg/kg	157	7997599	58.6	7996554	123	76.7	41.9	1.0	7997599

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6141		MV6142		MV6143	MV6144	MV6148		
Sampling Date		2015/07/30		2015/07/30		2015/07/31	2015/07/31	2015/07/31		
COC Number		08412622		08412622		08412622	08412622	08412623		
	Units	**PA07**	**QC Batch**	**PA08**	**QC Batch**	**PA09**	**PA010**	**PA11**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/kg	1.57	7997599	0.96	7996554	1.03	3.04	0.80	0.50	7997599

RDL = Reportable Detection Limit

Maxxam Job #: B567738
Report Date: 2015/08/14

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

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6149	MV6150		MV6151		MV6152	MV6153		
Sampling Date		2015/07/31	2015/08/01		2015/08/01		2015/08/01	2015/08/01		
COC Number		08412623	08412623		08412623		08412623	08412623		
	Units	**PA12**	**PA14**	**QC Batch**	**PA15**	**QC Batch**	**PA16**	**PA17**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.37	6.42	7997646	6.39	7996558	6.19	5.58	N/A	7997646
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	14500	7570	7997599	19400	7996554	14300	19500	100	7997599
Total Antimony (Sb)	mg/kg	0.45	0.49	7997599	0.19	7996554	0.41	0.25	0.10	7997599
Total Arsenic (As)	mg/kg	9.76	10.3	7997599	15.9	7996554	11.8	5.34	0.50	7997599
Total Barium (Ba)	mg/kg	211	75.5	7997599	148	7996554	140	297	0.10	7997599
Total Beryllium (Be)	mg/kg	0.51	<0.40	7997599	0.49	7996554	0.61	0.56	0.40	7997599
Total Bismuth (Bi)	mg/kg	0.41	0.33	7997599	0.19	7996554	0.27	0.19	0.10	7997599
Total Cadmium (Cd)	mg/kg	0.324	1.06	7997599	0.252	7996554	7.84	0.744	0.050	7997599
Total Calcium (Ca)	mg/kg	4070	2850	7997599	5530	7996554	19900	5600	100	7997599
Total Chromium (Cr)	mg/kg	48.0	18.2	7997599	27.0	7996554	15.0	31.2	1.0	7997599
Total Cobalt (Co)	mg/kg	10.6	11.3	7997599	24.1	7996554	9.11	27.4	0.30	7997599
Total Copper (Cu)	mg/kg	32.0	38.1	7997599	22.5	7996554	106	101	0.50	7997599
Total Iron (Fe)	mg/kg	28100	24200	7997599	52400	7996554	18400	54900	100	7997599
Total Lead (Pb)	mg/kg	13.8	40.9	7997599	31.3	7996554	71.5	18.5	0.10	7997599
Total Lithium (Li)	mg/kg	16.5	9.4	7997599	12.7	7996554	5.9	21.5	5.0	7997599
Total Magnesium (Mg)	mg/kg	7990	5200	7997599	12400	7996554	2510	11800	100	7997599
Total Manganese (Mn)	mg/kg	310	410	7997599	852	7996554	743	932	0.20	7997599
Total Mercury (Hg)	mg/kg	<0.050	<0.050	7997599	<0.050	7996554	0.142	<0.050	0.050	7997599
Total Molybdenum (Mo)	mg/kg	2.10	1.79	7997599	1.66	7996554	1.12	1.71	0.10	7997599
Total Nickel (Ni)	mg/kg	39.9	14.2	7997599	16.1	7996554	23.3	41.8	0.80	7997599
Total Phosphorus (P)	mg/kg	1210	830	7997599	1000	7996554	1390	1830	10	7997599
Total Potassium (K)	mg/kg	1180	1800	7997599	1100	7996554	439	3800	100	7997599
Total Selenium (Se)	mg/kg	<0.50	0.74	7997599	0.53	7996554	2.27	0.71	0.50	7997599
Total Silver (Ag)	mg/kg	0.101	0.218	7997599	0.093	7996554	1.43	0.267	0.050	7997599
Total Sodium (Na)	mg/kg	<100	<100	7997599	<100	7996554	159	<100	100	7997599
Total Strontium (Sr)	mg/kg	17.7	9.24	7997599	26.2	7996554	63.3	23.3	0.10	7997599
Total Thallium (Tl)	mg/kg	0.116	0.169	7997599	0.110	7996554	0.073	0.431	0.050	7997599
Total Tin (Sn)	mg/kg	0.62	0.31	7997599	0.34	7996554	0.23	0.60	0.10	7997599
Total Titanium (Ti)	mg/kg	621	609	7997599	1040	7996554	142	1350	1.0	7997599
Total Uranium (U)	mg/kg	1.10	1.91	7997599	1.04	7996554	9.50	1.74	0.050	7997599
Total Vanadium (V)	mg/kg	61.3	24.9	7997599	122	7996554	18.7	122	2.0	7997599
Total Zinc (Zn)	mg/kg	134	203	7997599	150	7996554	784	197	1.0	7997599

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6149	MV6150		MV6151		MV6152	MV6153		
Sampling Date		2015/07/31	2015/08/01		2015/08/01		2015/08/01	2015/08/01		
COC Number		08412623	08412623		08412623		08412623	08412623		
	Units	**PA12**	**PA14**	**QC Batch**	**PA15**	**QC Batch**	**PA16**	**PA17**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/kg	0.58	4.98	7997599	1.02	7996554	2.29	2.58	0.50	7997599
RDL = Reportable Detection Limit										

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6154		MV6155		MV6156	MV6157	MV6158		
Sampling Date		2015/08/01		2015/08/02		2015/08/02	2015/07/31	2015/08/01		
COC Number		08412623		08412623		08412623	08412623	08412623		
	Units	**PA18**	**QC Batch**	**PA19**	**QC Batch**	**PA20**	**PA21**	**MINERAL LICK - NORTH LAKE**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	6.48	7997646	5.85	7996558	7.17	5.45	8.50	N/A	7997646
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	12500	7997599	11000	7996554	8760	14300	2300	100	7997599
Total Antimony (Sb)	mg/kg	0.22	7997599	0.22	7996554	0.43	0.46	<0.10	0.10	7997599
Total Arsenic (As)	mg/kg	7.28	7997599	8.82	7996554	19.0	10.5	2.64	0.50	7997599
Total Barium (Ba)	mg/kg	133	7997599	105	7996554	838	211	504	0.10	7997599
Total Beryllium (Be)	mg/kg	0.45	7997599	<0.40	7996554	0.46	0.46	<0.40	0.40	7997599
Total Bismuth (Bi)	mg/kg	0.21	7997599	0.19	7996554	1.03	0.41	<0.10	0.10	7997599
Total Cadmium (Cd)	mg/kg	0.931	7997599	0.307	7996554	2.01	0.310	0.237	0.050	7997599
Total Calcium (Ca)	mg/kg	5000	7997599	2890	7996554	7050	3820	262000	100	7997599
Total Chromium (Cr)	mg/kg	37.2	7997599	17.8	7996554	33.9	50.5	16.5	1.0	7997599
Total Cobalt (Co)	mg/kg	14.5	7997599	13.0	7996554	15.2	10.9	23.2	0.30	7997599
Total Copper (Cu)	mg/kg	23.7	7997599	19.3	7996554	54.3	31.6	5.12	0.50	7997599
Total Iron (Fe)	mg/kg	27000	7997599	22200	7996554	28900	28800	18600	100	7997599
Total Lead (Pb)	mg/kg	21.2	7997599	23.0	7996554	69.2	14.3	3.51	0.10	7997599
Total Lithium (Li)	mg/kg	16.7	7997599	8.2	7996554	9.4	15.5	18.1	5.0	7997599
Total Magnesium (Mg)	mg/kg	7860	7997599	5640	7996554	5210	7950	5230	100	7997599
Total Manganese (Mn)	mg/kg	602	7997599	494	7996554	1250	331	773	0.20	7997599
Total Mercury (Hg)	mg/kg	<0.050	7997599	<0.050	7996554	0.055	<0.050	<0.050	0.050	7997599
Total Molybdenum (Mo)	mg/kg	1.37	7997599	0.95	7996554	3.49	1.97	0.27	0.10	7997599
Total Nickel (Ni)	mg/kg	32.9	7997599	20.4	7996554	35.6	41.9	483	0.80	7997599
Total Phosphorus (P)	mg/kg	745	7997599	581	7996554	560	1140	296	10	7997599
Total Potassium (K)	mg/kg	1610	7997599	1200	7996554	1680	1120	714	100	7997599
Total Selenium (Se)	mg/kg	0.81	7997599	0.51	7996554	2.55	<0.50	<0.50	0.50	7997599
Total Silver (Ag)	mg/kg	0.142	7997599	0.172	7996554	0.410	0.115	<0.050	0.050	7997599
Total Sodium (Na)	mg/kg	<100	7997599	<100	7996554	<100	<100	415	100	7997599
Total Strontium (Sr)	mg/kg	21.1	7997599	15.9	7996554	49.5	17.4	1420	0.10	7997599
Total Thallium (Tl)	mg/kg	0.149	7997599	0.125	7996554	0.281	0.114	0.052	0.050	7997599
Total Tin (Sn)	mg/kg	0.49	7997599	0.15	7996554	0.31	0.63	0.25	0.10	7997599
Total Titanium (Ti)	mg/kg	769	7997599	295	7996554	381	613	213	1.0	7997599
Total Uranium (U)	mg/kg	1.75	7997599	0.877	7996554	2.92	1.23	4.89	0.050	7997599
Total Vanadium (V)	mg/kg	44.9	7997599	30.4	7996554	25.2	62.0	8.9	2.0	7997599
Total Zinc (Zn)	mg/kg	115	7997599	79.0	7996554	437	131	35.3	1.0	7997599

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV6154		MV6155		MV6156	MV6157	MV6158		
Sampling Date		2015/08/01		2015/08/02		2015/08/02	2015/07/31	2015/08/01		
COC Number		08412623		08412623		08412623	08412623	08412623		
	Units	**PA18**	**QC Batch**	**PA19**	**QC Batch**	**PA20**	**PA21**	**MINERAL LICK - NORTH LAKE**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/kg	1.16	7997599	<0.50	7996554	2.17	0.59	0.84	0.50	7997599
RDL = Reportable Detection Limit										

GENERAL COMMENTS

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

Package 1	8.7°C

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC) Comments

Sample MV6144-01 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample MV6144-01 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample MV6152-01 Phosphorus (Available by ICP): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample MV6152-01 Potassium (Available): Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			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**
7996554	Total Aluminum (Al)	2015/08/11					<100	mg/kg	3.9	35	101	70 - 130
7996554	Total Antimony (Sb)	2015/08/11	93	75 - 125	94	75 - 125	<0.10	mg/kg	NC	30	93	70 - 130
7996554	Total Arsenic (As)	2015/08/11	101	75 - 125	99	75 - 125	<0.50	mg/kg	0.56	30	98	70 - 130
7996554	Total Barium (Ba)	2015/08/11	NC	75 - 125	102	75 - 125	<0.10	mg/kg	6.2	35	101	70 - 130
7996554	Total Beryllium (Be)	2015/08/11	108	75 - 125	101	75 - 125	<0.40	mg/kg	NC	30		
7996554	Total Bismuth (Bi)	2015/08/11					<0.10	mg/kg	NC	30		
7996554	Total Cadmium (Cd)	2015/08/11	104	75 - 125	105	75 - 125	<0.050	mg/kg	NC	30	101	70 - 130
7996554	Total Calcium (Ca)	2015/08/11					<100	mg/kg	4.2	30	101	70 - 130
7996554	Total Chromium (Cr)	2015/08/11	104	75 - 125	106	75 - 125	<1.0	mg/kg	4.1	30	108	70 - 130
7996554	Total Cobalt (Co)	2015/08/11	116	75 - 125	105	75 - 125	<0.30	mg/kg	0.52	30	97	70 - 130
7996554	Total Copper (Cu)	2015/08/11	100	75 - 125	105	75 - 125	<0.50	mg/kg	3.1	30	97	70 - 130
7996554	Total Iron (Fe)	2015/08/11					<100	mg/kg	5.4	30	99	70 - 130
7996554	Total Lead (Pb)	2015/08/11	103	75 - 125	104	75 - 125	<0.10	mg/kg	3.2	35	100	70 - 130
7996554	Total Lithium (Li)	2015/08/11	101	75 - 125	99	75 - 125	<5.0	mg/kg	NC	30		
7996554	Total Magnesium (Mg)	2015/08/11					<100	mg/kg	6.3	30	92	70 - 130
7996554	Total Manganese (Mn)	2015/08/11	NC	75 - 125	106	75 - 125	<0.20	mg/kg	7.4	30	99	70 - 130
7996554	Total Mercury (Hg)	2015/08/11	106	75 - 125	108	75 - 125	<0.050	mg/kg	NC	35	144 (1)	70 - 130
7996554	Total Molybdenum (Mo)	2015/08/11	99	75 - 125	95	75 - 125	<0.10	mg/kg	0.62	35	98	70 - 130
7996554	Total Nickel (Ni)	2015/08/11	103	75 - 125	103	75 - 125	<0.80	mg/kg	1.1	30	97	70 - 130
7996554	Total Phosphorus (P)	2015/08/11					<10	mg/kg	5.6	30	94	70 - 130
7996554	Total Potassium (K)	2015/08/11					<100	mg/kg	5.2	35		
7996554	Total Selenium (Se)	2015/08/11	105	75 - 125	105	75 - 125	<0.50	mg/kg	NC	30		
7996554	Total Silver (Ag)	2015/08/11	101	75 - 125	101	75 - 125	<0.050	mg/kg	NC	35	95	60 - 140
7996554	Total Sodium (Na)	2015/08/11					<100	mg/kg	NC	35		
7996554	Total Strontium (Sr)	2015/08/11	103	75 - 125	100	75 - 125	<0.10	mg/kg	2.3	35	104	70 - 130
7996554	Total Thallium (Tl)	2015/08/11	99	75 - 125	103	75 - 125	<0.050	mg/kg	NC	30	88	70 - 130
7996554	Total Tin (Sn)	2015/08/11	91	75 - 125	90	75 - 125	<0.10	mg/kg	NC	35		
7996554	Total Titanium (Ti)	2015/08/11	NC	75 - 125	100	75 - 125	<1.0	mg/kg	5.6	35	108	70 - 130
7996554	Total Uranium (U)	2015/08/11	103	75 - 125	103	75 - 125	<0.050	mg/kg	8.1	30	118	70 - 130
7996554	Total Vanadium (V)	2015/08/11	NC	75 - 125	102	75 - 125	<2.0	mg/kg	6.9	30	101	70 - 130
7996554	Total Zinc (Zn)	2015/08/11	NC	75 - 125	108	75 - 125	<1.0	mg/kg	7.6	30	97	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

			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
7996554	Total Zirconium (Zr)	2015/08/11					0.58, RDL=0.50	mg/kg	NC	30		
7996558	Soluble (2:1) pH	2015/08/11			99	97 - 103			0.33	N/A		
7997599	Total Aluminum (Al)	2015/08/12					<100	mg/kg	2.1	35	105	70 - 130
7997599	Total Antimony (Sb)	2015/08/12	102	75 - 125	92	75 - 125	<0.10	mg/kg	NC	30	105	70 - 130
7997599	Total Arsenic (As)	2015/08/12	107	75 - 125	93	75 - 125	<0.50	mg/kg	2.8	30	108	70 - 130
7997599	Total Barium (Ba)	2015/08/12	NC	75 - 125	100	75 - 125	<0.10	mg/kg	5.2	35	117	70 - 130
7997599	Total Beryllium (Be)	2015/08/12	119	75 - 125	98	75 - 125	<0.40	mg/kg	NC	30		
7997599	Total Bismuth (Bi)	2015/08/12					<0.10	mg/kg	NC	30		
7997599	Total Cadmium (Cd)	2015/08/12	112	75 - 125	98	75 - 125	<0.050	mg/kg	5.6	30	112	70 - 130
7997599	Total Calcium (Ca)	2015/08/12					<100	mg/kg	7.7	30	107	70 - 130
7997599	Total Chromium (Cr)	2015/08/12	NC	75 - 125	101	75 - 125	<1.0	mg/kg	0.68	30	118	70 - 130
7997599	Total Cobalt (Co)	2015/08/12	116	75 - 125	104	75 - 125	<0.30	mg/kg	3.6	30	110	70 - 130
7997599	Total Copper (Cu)	2015/08/12	NC	75 - 125	102	75 - 125	<0.50	mg/kg	8.9	30	103	70 - 130
7997599	Total Iron (Fe)	2015/08/12					<100	mg/kg	1.2	30	105	70 - 130
7997599	Total Lead (Pb)	2015/08/12	114	75 - 125	95	75 - 125	<0.10	mg/kg	10	35	98	70 - 130
7997599	Total Lithium (Li)	2015/08/12	114	75 - 125	97	75 - 125	<5.0	mg/kg	NC	30		
7997599	Total Magnesium (Mg)	2015/08/12					<100	mg/kg	0.45	30	103	70 - 130
7997599	Total Manganese (Mn)	2015/08/12	NC	75 - 125	99	75 - 125	<0.20	mg/kg	7.8	30	109	70 - 130
7997599	Total Mercury (Hg)	2015/08/12	110	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35	90	70 - 130
7997599	Total Molybdenum (Mo)	2015/08/12	110	75 - 125	96	75 - 125	<0.10	mg/kg	10	35	114	70 - 130
7997599	Total Nickel (Ni)	2015/08/12	NC	75 - 125	100	75 - 125	<0.80	mg/kg	3.3	30	104	70 - 130
7997599	Total Phosphorus (P)	2015/08/12					<10	mg/kg	5.3	30	103	70 - 130
7997599	Total Potassium (K)	2015/08/12					<100	mg/kg	1.8	35		
7997599	Total Selenium (Se)	2015/08/12	114	75 - 125	92	75 - 125	<0.50	mg/kg	NC	30		
7997599	Total Silver (Ag)	2015/08/12	108	75 - 125	99	75 - 125	<0.050	mg/kg	NC	35	129	60 - 140
7997599	Total Sodium (Na)	2015/08/12					<100	mg/kg	NC	35		
7997599	Total Strontium (Sr)	2015/08/12	103	75 - 125	90	75 - 125	<0.10	mg/kg	9.5	35	110	70 - 130
7997599	Total Thallium (Tl)	2015/08/12	111	75 - 125	98	75 - 125	<0.050	mg/kg	NC	30	98	70 - 130
7997599	Total Tin (Sn)	2015/08/12	100	75 - 125	87	75 - 125	<0.10	mg/kg	7.4	35		
7997599	Total Titanium (Ti)	2015/08/12	NC	75 - 125	96	75 - 125	<1.0	mg/kg	4.3	35	112	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

			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**
7997599	Total Uranium (U)	2015/08/12	109	75 - 125	93	75 - 125	<0.050	mg/kg	1.8	30	116	70 - 130
7997599	Total Vanadium (V)	2015/08/12	NC	75 - 125	98	75 - 125	<2.0	mg/kg	0.48	30	112	70 - 130
7997599	Total Zinc (Zn)	2015/08/12	NC	75 - 125	99	75 - 125	<1.0	mg/kg	2.7	30	101	70 - 130
7997599	Total Zirconium (Zr)	2015/08/12					<0.50	mg/kg	NC	30		
7997622	Total Carbon	2015/08/12			94	75 - 125	<0.020	%	9.9	35	92	75 - 125
7997646	Soluble (2:1) pH	2015/08/13			100	97 - 103			0.37	N/A		
8000365	Total Carbon	2015/08/13			91	75 - 125	<0.020	%	14	35	89	75 - 125
8000459	% sand by hydrometer	2015/08/14							0.27	35	99	93 - 107
8000459	% silt by hydrometer	2015/08/14							0.43	35	102	90 - 110
8000459	Clay Content	2015/08/14							NC	35	92	83 - 117
8000573	Saturation %	2015/08/13							2.8	12	102	75 - 125
8000579	Saturation %	2015/08/13							3.6	12	103	75 - 125
8000748	Soluble (CaCl2) pH	2015/08/13			99	97 - 103			3.0	N/A	99	98 - 102
8000768	Soluble (CaCl2) pH	2015/08/13			100	97 - 103			0.63	N/A	99	98 - 102
8000889	Cation exchange capacity	2015/08/14							NC	35		
8000906	Cation exchange capacity	2015/08/14							NC	35		
8000945	Available (CaCl2) Sulphur (S)	2015/08/13			93	80 - 120	<2.0	mg/kg	NC	35	90	75 - 125
8000948	% sand by hydrometer	2015/08/14							2.8	35	105	93 - 107
8000948	% silt by hydrometer	2015/08/14							4.1	35	97	90 - 110
8000948	Clay Content	2015/08/14							1.0	35	88	83 - 117
8000950	Available (CaCl2) Sulphur (S)	2015/08/13			95	80 - 120	<2.0	mg/kg	1.9	35	100	75 - 125
8001172	Available (NH4OAc) Potassium (K)	2015/08/14			113	80 - 120	<2.0	mg/kg	4.0	35		
8001190	Available (NH4OAc) Potassium (K)	2015/08/14			110	80 - 120	<2.0	mg/kg	0.47	35		
8001202	Available (NH4F) Nitrogen (N)	2015/08/13	100	75 - 125	101	80 - 120	<2.0	mg/kg	NC	35		
8001227	Available (NH4F) Nitrogen (N)	2015/08/14	99	75 - 125	101	80 - 120	<2.0	mg/kg	NC	35		
8001262	Available (NH4F) Phosphorus (P)	2015/08/14			111	80 - 120	<1.0	mg/kg	NC	35		
8001270	Available (NH4F) Phosphorus (P)	2015/08/14			104	80 - 120	<1.0	mg/kg	NC	35		
8001330	Soluble Conductivity	2015/08/13			100	90 - 110	<0.020	dS/m	0.56	35	105	75 - 125

QUALITY ASSURANCE REPORT(CONT'D)

			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**
8001450	Soluble Conductivity	2015/08/13			102	90 - 110	<0.020	dS/m	NC	35	102	75 - 125

N/A = Not Applicable

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

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

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

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

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

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

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

(1) Reference Material exceeds acceptance criteria for Hg. 10% of analytes failure in multielement scan is allowed. All reported results at or less than detection limit.

VALIDATION SIGNATURE PAGE

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

Peng Liang

Harry (Peng) Liang, Senior Analyst

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.

Maxxam
A Bureau Veritas Group Company

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

CHAIN OF CUSTODY RECORD

08412622

BBY FCD-00077/05

Page 1 2

Invoice Information

Company Name: BMC MINERALS LTD.
Contact Name:
Address: 530-1130 WEST PENDER ST
Vancouver, BC PC: V6E 4A4
Phone:
Email:

Report Information (if differs from invoice)

Company Name: ALEXCO ENVIRONMENTAL
Contact Name: KAI WOLOSHYN
Address: UNIT 3 151 INDUCSTRIAL RD
Whitehorse, YK PC: V1A 2V3
Phone: (867) 668-6463
Email: kwoloshyn@alexcoresource.com

Project Informat applicable)

Quotation #: B50743
P.O. #/ AFE#:
Project #: BMC-15-01 ###
Site Location: Kudz Ze Kayah
Site #:
Sampled By: Lisa Knight

Turnaround Time (TAT) Required

☒ Regular TAT 5 days (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:

Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☒ CCME (Specify) ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☒ 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

LABORATORY USE ONLY

CUSTODY SEAL Y / [✓ N]
Present: NA
Intact:
COOLER TEMPERATURES: 9 7 10 / 1 1
COOLING MEDIA PRESENT [✓ Y] / N

Analysis Requested

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	TOTAL LOW LEVEL METALS INCL. MERCURY	DISSOLVED LOW LEVEL METALS INCL. MERCURY	CARBON TOTAL ORGANIC	CEC	NPKS (Soil Nutrients) Avlable	TEXTURE	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL					# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	PA01	mV6135	2015-07-29			x		x	x	x	x	x	x												
2	PA02	MV6136	2015-07-29			x		x	x	x	x	x	x												
3	PA03	mV6137	2015-07-29			x		x	x	x	x	x	x												
4	PA04	mV6138	2015-07-30			x		x	x	x	x	x	x												
5	PA05	mV6139	2015-07-30			x		x	x	x	x	x	x												
6	PA06	mV6140	2015-07-30			x		x	x	x	x	x	x												
7	PA07	mV6141	2015-07-30			x		x	x	x	x	x	x												
8	PA08	mV6142	2015-07-30			x		x	x	x	x	x	x												
9	PA09	mV6143	2015-07-31			x		x	x	x	x	x	x												
10	PA10	mV6144	2015-07-31			x		x	x	x	x	x	x												

B567738

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
	2015/08/06	16:30		2015/08/07	13:45	B567738

Maxxam
A Bureau Veritas Group Company

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

CHAIN OF CUSTODY RECORD

08412623

BBY FCD-00077/05

Page 2 2

Invoice Information

Company Name: BMC MINERALS LTD.
Contact Name:
Address: 530-1130 WEST PENDER ST
Vancouver, BC PC: V6E 4A4
Phone:
Email:

Report Information (if differs from invoice)

Company Name: ALEXCO ENVIRONMENTAL
Contact Name: KAI WOLOSHYN
Address: UNIT 3 151 INDUCSTRIAL RD
Whitehorse, YK PC: V1A 2V3
Phone: (867) 668-6463
Email: kwoloshyn@alexcoresource.com

Project Inform

Quotation #: B50743
P.O. #/ AFE#:
Project #: BMC-15-01
Site Location: Kudz Ze Kayah
Site #:
Sampled By:

Turnaround Time (TAT) Required

☒ Regular TAT 5 days (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:

Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☐ CCME (Specify) ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ 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

Analysis Requested

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	TOTAL LOW LEVEL METALS INCL. MERCURY	DISSOLVED LOW LEVEL METALS INCL. MERCURY	CARBON TOTAL ORGANIC	CEC	NPKS (Soil Nutrients) Avlable	TEXTURE	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
11	PA11	MV6148	2015-07-31			x		x	x	x	x	x	x							
12	PA12	MV6149	2015-07-31			x		x	x	x	x	x	x							
13	PA14	MV6150	2015-08-01			x		x	x	x	x	x	x							
14	PA15	MV6151	2015-08-01			x		x	x	x	x	x	x							
15	PA16	MV6152	2015-08-01			x		x	x	x	x	x	x							
16	PA17	MV6153	2015-08-01			x		x	x	x	x	x	x							
17	PA18	MV6154	2015-08-01			x		x	x	x	x	x	x							
18	PA19	MV6155	2015-08-02			x		x	x	x	x	x	x							
19	PA20	MV6156	2015-08-02			x		x	x	x	x	x	x							
20	PA21	MV6157	2015-07-31			x		x	x	x	x	x	x							
20	Mineral Lick - North Lake	MV6158	2015-08-01			x		x	x	x	x	x	x							

LABORATORY USE ONLY

CUSTODY SEAL Y [✓ N]		COOLER TEMPERATURES
Present	Intact	
NA		9,7,10

COOLING MEDIA PRESENT [✓ Y] / N

COMMENTS

B567738

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Kirsten Scott	2015/08/	16:30	Laurel Berthier	2015/08/07	13:45	B567738

Your Project #: BMC 16-300
Your C.O.C. #: 08426072

Attention:KAI WOLOSHYN
ALEXCO ENVIRONMENTAL GROUP INC.
Unit 3 Calcite Business Centre
151 Industrial Road
WHITEHORSE, YT
Canada Y1A 2V3

Report Date: 2016/08/17
Report #: R2239407
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B665657
Received: 2016/08/05, 12:50

Sample Matrix: Soil
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cation Exchange Capacity (1)	12	2016/08/16	2016/08/17	AB WI-00065	Auto Calc
Conductivity @25C (Soluble) (1)	12	2016/08/15	2016/08/16	AB SOP-00033 / AB SOP-00004	SM 22 2510 B m
Elements by ICPMS (total)	2	2016/08/12	2016/08/12	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	10	2016/08/15	2016/08/15	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Potassium (Available) (1)	12	2016/08/15	2016/08/15	CAL SOP-00153 / AB SOP-00042	EPA 200.7 CFR 2012 m
Nitrate-N (Available) (1)	12	2016/08/15	2016/08/16	CAL SOP-00152 / AB SOP-00023	SM 22 4110 B m
Phosphorus (Available by ICP) (1)	12	2016/08/15	2016/08/16	CAL SOP-00152 / AB SOP-00042	EPA 200.7 CFR 2012 m
pH @25C (1:2 Calcium Chloride Extract) (1)	12	2016/08/11	2016/08/11	AB SOP-00033 / AB SOP-00006	SM 22 4500 H+B m
pH (2:1 DI Water Extract)	2	2016/08/12	2016/08/12	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	10	2016/08/15	2016/08/15	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Sulphur (Available) (1)	8	2016/08/15	2016/08/15	AB SOP-00029 / AB SOP-00042	EPA 200.7 CFR 2012 m
Sulphur (Available) (1)	4	2016/08/15	2016/08/16	AB SOP-00029 / AB SOP-00042	EPA 200.7 CFR 2012 m
Soluble Paste (1)	12	2016/08/15	2016/08/15	AB SOP-00033	Carter 2nd ed 15.2 m
Texture by Hydrometer (1)	12	N/A	2016/08/15	AB SOP-00035 / AB SOP-00030	Carter 2nd ed 55.3 m
Texture Class (1)	12	N/A	2016/08/15	AB SOP-00030	Auto Calc
Total Kjeldahl Nitrogen - Soil (1)	12	2016/08/15	2016/08/16	AB SOP-00008	EPA 351.1 R1978 m
TOC Soil Subcontract (2)	12	2016/08/16	2016/08/16		

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) This test was performed by Maxxam Ontario (From Burnaby)

Your Project #: BMC 16-300
Your C.O.C. #: 08426072

Attention:KAI WOLOSHYN

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

Report Date: 2016/08/17
Report #: R2239407
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B665657
Received: 2016/08/05, 12:50

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Megan Smith, Project Manager
Email: msmith@maxxam.ca
Phone# (604) 734 7276
==
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.

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		PE9222	PE9223	PE9224	PE9225		
Sampling Date		2016/07/31	2016/07/31	2016/08/01	2016/08/01		
COC Number		08426072	08426072	08426072	08426072		
	UNITS	**PA42-SOIL**	**PA72-SOIL**	**PA51-SOIL**	**PA52-SOIL**	**RDL**	**QC Batch**
Nutrients							
Available (NH4F) Nitrogen (N)	mg/kg	3.8	<2.0	<2.0	<2.0	2.0	8363484
Available (NH4F) Phosphorus (P)	mg/kg	45	40	2.4	3.8	1.0	8363737
Available (NH4OAc) Potassium (K)	mg/kg	13	13	9.7	3.1	2.0	8363488
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	<2.0	<2.0	<2.0	2.0	8363478
Soluble Parameters							
Soluble Conductivity	dS/m	0.075	0.082	0.059	0.073	0.020	8364950
Soluble (CaCl2) pH	pH	4.96	4.94	4.82	5.45	N/A	8358936
Saturation %	%	55	59	37	40	N/A	8362987
Physical Properties							
% sand by hydrometer	%	73	73	78	81	2.0	8362998
% silt by hydrometer	%	25	25	21	18	2.0	8362998
Clay Content	%	<2.0	<2.0	<2.0	<2.0	2.0	8362998
Texture	N/A	LOAMY SAND	LOAMY SAND	LOAMY SAND	LOAMY SAND	N/A	8354558

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		PE9226	PE9227		PE9228	PE9229		
Sampling Date		2016/08/02	2016/08/03		2016/08/03	2016/08/04		
COC Number		08426072	08426072		08426072	08426072		
	UNITS	**PA45-SOIL**	**PA54-SOIL**	**QC Batch**	**PA55-SOIL**	**PA56-SOIL**	**RDL**	**QC Batch**
Nutrients								
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	2.9	8363484	<2.0	<2.0	2.0	8363484
Available (NH4F) Phosphorus (P)	mg/kg	4.4	2.4	8363737	1.2	<1.0	1.0	8363737
Available (NH4OAc) Potassium (K)	mg/kg	12	33	8363488	13	35	2.0	8363488
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	6.4	8363478	2.1	3.7	2.0	8363478
Soluble Parameters								
Soluble Conductivity	dS/m	0.074	0.13	8364950	0.14	0.18	0.020	8364950
Soluble (CaCl2) pH	pH	4.10	5.87	8358869	6.97	6.14	N/A	8358936
Saturation %	%	35	130	8362987	39	37	N/A	8362987
Physical Properties								
% sand by hydrometer	%	63	41	8362998	82	52	2.0	8362998
% silt by hydrometer	%	31	53	8362998	14	33	2.0	8362998
Clay Content	%	6.0	6.8	8362998	3.6	15	2.0	8362998
Texture	N/A	SANDY LOAM	SILT LOAM	8354558	LOAMY SAND	LOAM	N/A	8354558

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B665657
Report Date: 2016/08/17

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC 16-300
Sampler Initials: LK

NPKS (AVAILABLE, PLUS TEXTURE, PH & EC)

Maxxam ID		PE9230		PE9231	PE9232	PE9233		
Sampling Date		2016/08/04		2016/08/04	2016/08/04	2016/08/04		
COC Number		08426072		08426072	08426072	08426072		
	UNITS	**PA57-SOIL**	**QC Batch**	**PA58-SOIL**	**PA59-SOIL**	**PA60-SOIL**	**RDL**	**QC Batch**
Nutrients								
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	8363484	<2.0	<2.0	<2.0	2.0	8363484
Available (NH4F) Phosphorus (P)	mg/kg	<1.0	8363737	2.4	4.8	<1.0	1.0	8363737
Available (NH4OAc) Potassium (K)	mg/kg	11	8363488	10	12	11	2.0	8363488
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	8363478	4.2	<2.0	<2.0	2.0	8363478
Soluble Parameters								
Soluble Conductivity	dS/m	0.066	8364950	0.13	0.082	0.11	0.020	8364950
Soluble (CaCl2) pH	pH	4.82	8358936	6.80	5.76	6.15	N/A	8358869
Saturation %	%	30	8362987	47	25	49	N/A	8362987
Physical Properties								
% sand by hydrometer	%	53	8362998	57	77	53	2.0	8362998
% silt by hydrometer	%	37	8362998	38	19	40	2.0	8362998
Clay Content	%	10	8362998	4.5	4.2	7.4	2.0	8362998
Texture	N/A	SANDY LOAM	8354558	SANDY LOAM	LOAMY SAND	LOAM	N/A	8354558

RDL = Reportable Detection Limit
N/A = Not Applicable

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		PE9222	PE9223		PE9224	PE9225	PE9226		
Sampling Date		2016/07/31	2016/07/31		2016/08/01	2016/08/01	2016/08/02		
COC Number		08426072	08426072		08426072	08426072	08426072		
	UNITS	**PA42-SOIL**	**PA72-SOIL**	**RDL**	**PA51-SOIL**	**PA52-SOIL**	**PA45-SOIL**	**RDL**	**QC Batch**
Parameter									
Subcontract Parameter	N/A	ATTACHED	ATTACHED	N/A	ATTACHED	ATTACHED	ATTACHED	N/A	8365147
Elements									
Cation exchange capacity	cmol+/Kg	16	15	10	<10	13	<10	10	8364975
Nutrients									
Total Kjeldahl Nitrogen	mg/kg	2200 (1)	2200 (1)	250	410 (1)	780 (1)	400 (1)	50	8362893

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam ID		PE9227		PE9228	PE9229	PE9230		PE9231		
Sampling Date		2016/08/03		2016/08/03	2016/08/04	2016/08/04		2016/08/04		
COC Number		08426072		08426072	08426072	08426072		08426072		
	UNITS	**PA54-SOIL**	**RDL**	**PA55-SOIL**	**PA56-SOIL**	**PA57-SOIL**	**RDL**	**PA58-SOIL**	**RDL**	**QC Batch**
Parameter										
Subcontract Parameter	N/A	ATTACHED	N/A	ATTACHED	ATTACHED	ATTACHED	N/A	ATTACHED	N/A	8365147
Elements										
Cation exchange capacity	cmol+/Kg	48	10	13	12	<10	10	13	10	8364975
Nutrients										
Total Kjeldahl Nitrogen	mg/kg	4400 (1)	250	660 (1)	550 (1)	330 (1)	50	1100 (1)	100	8362893

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam ID		PE9232		PE9233		
Sampling Date		2016/08/04		2016/08/04		
COC Number		08426072		08426072		
	UNITS	**PA59-SOIL**	**RDL**	**PA60-SOIL**	**RDL**	**QC Batch**
Parameter						
Subcontract Parameter	N/A	ATTACHED	N/A	ATTACHED	N/A	8365147
Elements						
Cation exchange capacity	cmol+/Kg	12	10	18	10	8364975
Nutrients						
Total Kjeldahl Nitrogen	mg/kg	520 (1)	50	1400 (1)	100	8362893

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9222		PE9223	PE9224		PE9225	PE9226		
Sampling Date		2016/07/31		2016/07/31	2016/08/01		2016/08/01	2016/08/02		
COC Number		08426072		08426072	08426072		08426072	08426072		
	UNITS	**PA42-SOIL**	**QC Batch**	**PA72-SOIL**	**PA51-SOIL**	**QC Batch**	**PA52-SOIL**	**PA45-SOIL**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.81	8360705	7.02	5.76	8362895	6.34	5.05	N/A	8363066
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	12100	8360689	11600	14100	8362884	27300	17200	100	8363058
Total Antimony (Sb)	mg/kg	0.16	8360689	0.42	0.36	8362884	0.29	0.24	0.10	8363058
Total Arsenic (As)	mg/kg	9.51	8360689	40.0	16.4	8362884	51.1	23.7	0.50	8363058
Total Barium (Ba)	mg/kg	111	8360689	200	388	8362884	219	76.5	0.10	8363058
Total Beryllium (Be)	mg/kg	<0.40	8360689	0.45	<0.40	8362884	<0.40	<0.40	0.40	8363058
Total Bismuth (Bi)	mg/kg	0.21	8360689	0.17	0.45	8362884	0.15	0.19	0.10	8363058
Total Cadmium (Cd)	mg/kg	0.523	8360689	1.43	0.259	8362884	0.831	0.335	0.050	8363058
Total Calcium (Ca)	mg/kg	3800	8360689	7590	3320	8362884	5040	2890	100	8363058
Total Chromium (Cr)	mg/kg	29.1	8360689	40.0	48.6	8362884	80.0	51.0	1.0	8363058
Total Cobalt (Co)	mg/kg	9.30	8360689	14.2	18.7	8362884	37.6	16.0	0.30	8363058
Total Copper (Cu)	mg/kg	12.5	8360689	32.9	18.0	8362884	50.7	37.2	0.50	8363058
Total Iron (Fe)	mg/kg	21600	8360689	29800	37900	8362884	58100	44800	100	8363058
Total Lead (Pb)	mg/kg	18.9	8360689	17.8	47.0	8362884	53.2	28.1	0.10	8363058
Total Lithium (Li)	mg/kg	11.0	8360689	14.0	23.0	8362884	16.1	12.3	5.0	8363058
Total Magnesium (Mg)	mg/kg	5560	8360689	7730	10100	8362884	21200	11100	100	8363058
Total Manganese (Mn)	mg/kg	473	8360689	773	498	8362884	1320	513	0.20	8363058
Total Mercury (Hg)	mg/kg	<0.050	8360689	0.062	<0.050	8362884	<0.050	<0.050	0.050	8363058
Total Molybdenum (Mo)	mg/kg	1.14	8360689	1.60	1.92	8362884	1.79	2.65	0.10	8363058
Total Nickel (Ni)	mg/kg	14.8	8360689	38.9	29.7	8362884	65.5	36.9	0.80	8363058
Total Phosphorus (P)	mg/kg	761	8360689	1200	484	8362884	837	1160	10	8363058
Total Potassium (K)	mg/kg	745	8360689	598	2740	8362884	628	517	100	8363058
Total Selenium (Se)	mg/kg	<0.50	8360689	1.10	<0.50	8362884	<0.50	0.65	0.50	8363058
Total Silver (Ag)	mg/kg	<0.050	8360689	0.240	<0.050	8362884	0.261	0.062	0.050	8363058
Total Sodium (Na)	mg/kg	<100	8360689	<100	<100	8362884	<100	<100	100	8363058
Total Strontium (Sr)	mg/kg	14.7	8360689	25.8	16.5	8362884	25.8	12.5	0.10	8363058
Total Thallium (Tl)	mg/kg	0.088	8360689	0.102	0.266	8362884	0.131	0.098	0.050	8363058
Total Tin (Sn)	mg/kg	0.59	8360689	0.42	0.77	8362884	0.30	0.30	0.10	8363058
Total Titanium (Ti)	mg/kg	468	8360689	573	1250	8362884	1150	453	1.0	8363058
Total Uranium (U)	mg/kg	1.20	8360689	1.41	0.655	8362884	1.65	0.655	0.050	8363058
Total Vanadium (V)	mg/kg	34.9	8360689	44.6	66.3	8362884	104	74.9	2.0	8363058

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9222		PE9223	PE9224		PE9225	PE9226		
Sampling Date		2016/07/31		2016/07/31	2016/08/01		2016/08/01	2016/08/02		
COC Number		08426072		08426072	08426072		08426072	08426072		
	UNITS	**PA42-SOIL**	**QC Batch**	**PA72-SOIL**	**PA51-SOIL**	**QC Batch**	**PA52-SOIL**	**PA45-SOIL**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	147	8360689	130	154	8362884	197	136	1.0	8363058
Total Zirconium (Zr)	mg/kg	<0.50	8360689	2.39	2.30	8362884	1.28	<0.50	0.50	8363058

RDL = Reportable Detection Limit

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9227	PE9228	PE9229	PE9230		PE9231		
Sampling Date		2016/08/03	2016/08/03	2016/08/04	2016/08/04		2016/08/04		
COC Number		08426072	08426072	08426072	08426072		08426072		
	UNITS	**PA54-SOIL**	**PA55-SOIL**	**PA56-SOIL**	**PA57-SOIL**	**QC Batch**	**PA58-SOIL**	**RDL**	**QC Batch**
Physical Properties									
Soluble (2:1) pH	pH	6.53	7.77	6.76	5.78	8363066	7.52	N/A	8360705
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	10000	10700	15100	14400	8363058	11000	100	8360689
Total Antimony (Sb)	mg/kg	0.36	0.36	0.24	0.42	8363058	0.58	0.10	8360689
Total Arsenic (As)	mg/kg	4.18	15.5	5.17	12.5	8363058	13.1	0.50	8360689
Total Barium (Ba)	mg/kg	143	164	224	145	8363058	148	0.10	8360689
Total Beryllium (Be)	mg/kg	0.43	<0.40	0.54	0.42	8363058	<0.40	0.40	8360689
Total Bismuth (Bi)	mg/kg	0.29	0.13	0.24	0.17	8363058	0.18	0.10	8360689
Total Cadmium (Cd)	mg/kg	0.548	0.698	1.46	0.549	8363058	0.341	0.050	8360689
Total Calcium (Ca)	mg/kg	6880	6200	4750	3790	8363058	5150	100	8360689
Total Chromium (Cr)	mg/kg	16.9	31.6	46.4	43.6	8363058	32.8	1.0	8360689
Total Cobalt (Co)	mg/kg	6.11	12.7	15.3	15.7	8363058	11.3	0.30	8360689
Total Copper (Cu)	mg/kg	13.2	23.0	35.7	37.3	8363058	23.5	0.50	8360689
Total Iron (Fe)	mg/kg	19400	26500	29400	32000	8363058	23000	100	8360689
Total Lead (Pb)	mg/kg	21.9	15.9	16.5	24.1	8363058	19.6	0.10	8360689
Total Lithium (Li)	mg/kg	10.8	10.5	22.4	13.8	8363058	11.7	5.0	8360689
Total Magnesium (Mg)	mg/kg	4020	6830	9480	9320	8363058	6150	100	8360689
Total Manganese (Mn)	mg/kg	341	489	979	521	8363058	472	0.20	8360689
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	8363058	<0.050	0.050	8360689
Total Molybdenum (Mo)	mg/kg	1.30	1.12	1.14	1.31	8363058	1.33	0.10	8360689
Total Nickel (Ni)	mg/kg	9.96	26.8	41.6	33.0	8363058	26.6	0.80	8360689
Total Phosphorus (P)	mg/kg	647	970	871	1070	8363058	1180	10	8360689
Total Potassium (K)	mg/kg	2500	821	4540	1150	8363058	699	100	8360689
Total Selenium (Se)	mg/kg	<0.50	0.74	<0.50	<0.50	8363058	<0.50	0.50	8360689
Total Silver (Ag)	mg/kg	0.213	0.105	0.139	0.128	8363058	0.213	0.050	8360689
Total Sodium (Na)	mg/kg	<100	<100	125	<100	8363058	<100	100	8360689
Total Strontium (Sr)	mg/kg	24.7	23.1	16.8	15.6	8363058	22.2	0.10	8360689
Total Thallium (Tl)	mg/kg	0.233	0.080	0.258	0.126	8363058	0.104	0.050	8360689
Total Tin (Sn)	mg/kg	0.42	0.21	0.81	0.33	8363058	0.38	0.10	8360689
Total Titanium (Ti)	mg/kg	542	449	1300	702	8363058	457	1.0	8360689
Total Uranium (U)	mg/kg	2.18	0.899	2.44	0.877	8363058	1.02	0.050	8360689
Total Vanadium (V)	mg/kg	28.7	44.0	52.4	52.3	8363058	38.4	2.0	8360689

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9227	PE9228	PE9229	PE9230		PE9231		
Sampling Date		2016/08/03	2016/08/03	2016/08/04	2016/08/04		2016/08/04		
COC Number		08426072	08426072	08426072	08426072		08426072		
	UNITS	**PA54-SOIL**	**PA55-SOIL**	**PA56-SOIL**	**PA57-SOIL**	**QC Batch**	**PA58-SOIL**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	90.6	96.9	145	132	8363058	113	1.0	8360689
Total Zirconium (Zr)	mg/kg	2.93	1.19	1.85	2.72	8363058	0.85	0.50	8360689
RDL = Reportable Detection Limit									

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9232		PE9233		
Sampling Date		2016/08/04		2016/08/04		
COC Number		08426072		08426072		
	UNITS	**PA59-SOIL**	**QC Batch**	**PA60-SOIL**	**RDL**	**QC Batch**
Physical Properties						
Soluble (2:1) pH	pH	6.58	8363066	5.85	N/A	8362895
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	9940	8363058	12300	100	8362884
Total Antimony (Sb)	mg/kg	0.64	8363058	0.16	0.10	8362884
Total Arsenic (As)	mg/kg	25.1	8363058	10.5	0.50	8362884
Total Barium (Ba)	mg/kg	109	8363058	120	0.10	8362884
Total Beryllium (Be)	mg/kg	<0.40	8363058	<0.40	0.40	8362884
Total Bismuth (Bi)	mg/kg	0.26	8363058	0.22	0.10	8362884
Total Cadmium (Cd)	mg/kg	2.48	8363058	0.715	0.050	8362884
Total Calcium (Ca)	mg/kg	5980	8363058	4170	100	8362884
Total Chromium (Cr)	mg/kg	29.8	8363058	31.3	1.0	8362884
Total Cobalt (Co)	mg/kg	11.3	8363058	9.53	0.30	8362884
Total Copper (Cu)	mg/kg	63.1	8363058	13.0	0.50	8362884
Total Iron (Fe)	mg/kg	27500	8363058	22600	100	8362884
Total Lead (Pb)	mg/kg	54.3	8363058	20.5	0.10	8362884
Total Lithium (Li)	mg/kg	12.8	8363058	10.9	5.0	8362884
Total Magnesium (Mg)	mg/kg	5660	8363058	5660	100	8362884
Total Manganese (Mn)	mg/kg	407	8363058	459	0.20	8362884
Total Mercury (Hg)	mg/kg	<0.050	8363058	<0.050	0.050	8362884
Total Molybdenum (Mo)	mg/kg	3.66	8363058	1.11	0.10	8362884
Total Nickel (Ni)	mg/kg	33.6	8363058	15.8	0.80	8362884
Total Phosphorus (P)	mg/kg	1580	8363058	886	10	8362884
Total Potassium (K)	mg/kg	1010	8363058	746	100	8362884
Total Selenium (Se)	mg/kg	2.05	8363058	<0.50	0.50	8362884
Total Silver (Ag)	mg/kg	1.45	8363058	0.069	0.050	8362884
Total Sodium (Na)	mg/kg	<100	8363058	<100	100	8362884
Total Strontium (Sr)	mg/kg	29.8	8363058	16.5	0.10	8362884
Total Thallium (Tl)	mg/kg	0.116	8363058	0.085	0.050	8362884
Total Tin (Sn)	mg/kg	0.42	8363058	0.52	0.10	8362884
Total Titanium (Ti)	mg/kg	727	8363058	457	1.0	8362884
Total Uranium (U)	mg/kg	2.70	8363058	1.29	0.050	8362884
Total Vanadium (V)	mg/kg	62.5	8363058	36.9	2.0	8362884

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PE9232		PE9233		
Sampling Date		2016/08/04		2016/08/04		
COC Number		08426072		08426072		
	UNITS	**PA59-SOIL**	**QC Batch**	**PA60-SOIL**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	248	8363058	157	1.0	8362884
Total Zirconium (Zr)	mg/kg	2.83	8363058	<0.50	0.50	8362884
RDL = Reportable Detection Limit						

TEST SUMMARY

Maxxam ID: PE9222
Sample ID: PA42-SOIL
Matrix: Soil

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8360689	2016/08/12	2016/08/12	David Jung
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8360705	2016/08/12	2016/08/12	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9222 Dup
Sample ID: PA42-SOIL
Matrix: Soil

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger

Maxxam ID: PE9223
Sample ID: PA72-SOIL
Matrix: Soil

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8362884	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8362895	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk

TEST SUMMARY

Maxxam ID: PE9223
Sample ID: PA72-SOIL
Matrix: Soil

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9224
Sample ID: PA51-SOIL
Matrix: Soil

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8362884	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8362895	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9225
Sample ID: PA52-SOIL
Matrix: Soil

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

TEST SUMMARY

Maxxam ID: PE9226
Sample ID: PA45-SOIL
Matrix: Soil

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358869	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9226 Dup
Sample ID: PA45-SOIL
Matrix: Soil

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt

Maxxam ID: PE9227
Sample ID: PA54-SOIL
Matrix: Soil

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358869	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/16	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

TEST SUMMARY

Maxxam ID: PE9228
Sample ID: PA55-SOIL
Matrix: Soil

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/16	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9229
Sample ID: PA56-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/16	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9230
Sample ID: PA57-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan

TEST SUMMARY

Maxxam ID: PE9230
Sample ID: PA57-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358936	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9231
Sample ID: PA58-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8360689	2016/08/12	2016/08/12	David Jung
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358869	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8360705	2016/08/12	2016/08/12	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/16	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9232
Sample ID: PA59-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8363058	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358869	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8363066	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati

TEST SUMMARY

Maxxam ID: PE9232
Sample ID: PA59-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

Maxxam ID: PE9233
Sample ID: PA60-SOIL
Matrix: Soil

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cation Exchange Capacity	ICPA	8364975	2016/08/16	2016/08/17	Automated Statchk
Conductivity @25C (Soluble)	COND	8364950	2016/08/15	2016/08/16	Fadia Mostafa
Elements by ICPMS (total)	ICPM/MS	8362884	2016/08/15	2016/08/15	John Choo
Potassium (Available)	ICPA	8363488	2016/08/15	2016/08/15	Jason Buxton
Nitrate-N (Available)	IC/UV	8363484	2016/08/15	2016/08/16	Lesley Quan
Phosphorus (Available by ICP)	ICPA	8363737	2016/08/15	2016/08/16	Jason Buxton
pH @25C (1:2 Calcium Chloride Extract)	PH	8358869	2016/08/11	2016/08/11	Yan Xu
pH (2:1 DI Water Extract)	PH/PH	8362895	2016/08/15	2016/08/15	Bradley Collicutt
Sulphur (Available)	ICPA	8363478	2016/08/15	2016/08/15	Jason Buxton
Soluble Paste	BAL	8362987	2016/08/15	2016/08/15	Hala AlSharbati
Texture by Hydrometer	HY	8362998	N/A	2016/08/15	Bipin Lamichhane
Texture Class	CALC	8354558	N/A	2016/08/15	Automated Statchk
Total Kjeldahl Nitrogen - Soil	KONE	8362893	2016/08/15	2016/08/16	Marjolen Busslinger
TOC Soil Subcontract	PREP	8365147	2016/08/16	2016/08/16	Megan Smith

GENERAL COMMENTS

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

Package 1	5.7°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			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
8358869	Soluble (CaCl2) pH	2016/08/11			100	97 - 103			0	N/A	100	98 - 102
8358936	Soluble (CaCl2) pH	2016/08/11			100	97 - 103			0.25	N/A	101	98 - 102
8360689	Total Aluminum (Al)	2016/08/12					<100	mg/kg	3.7	35	100	70 - 130
8360689	Total Antimony (Sb)	2016/08/12	99	75 - 125	107	75 - 125	<0.10	mg/kg	0.96	30	106	70 - 130
8360689	Total Arsenic (As)	2016/08/12	98	75 - 125	102	75 - 125	<0.50	mg/kg	5.1	30	83	70 - 130
8360689	Total Barium (Ba)	2016/08/12	NC	75 - 125	108	75 - 125	<0.10	mg/kg	12	35	103	70 - 130
8360689	Total Beryllium (Be)	2016/08/12	103	75 - 125	103	75 - 125	<0.40	mg/kg	NC	30	101	70 - 130
8360689	Total Bismuth (Bi)	2016/08/12					<0.10	mg/kg	NC	30		
8360689	Total Cadmium (Cd)	2016/08/12	112	75 - 125	119	75 - 125	<0.050	mg/kg	0.50	30	130	70 - 130
8360689	Total Calcium (Ca)	2016/08/12					<100	mg/kg	1.4	30	96	70 - 130
8360689	Total Chromium (Cr)	2016/08/12	NC	75 - 125	106	75 - 125	<1.0	mg/kg	2.4	30	107	70 - 130
8360689	Total Cobalt (Co)	2016/08/12	100	75 - 125	109	75 - 125	<0.30	mg/kg	0.39	30	98	70 - 130
8360689	Total Copper (Cu)	2016/08/12	NC	75 - 125	109	75 - 125	<0.50	mg/kg	3.7	30	99	70 - 130
8360689	Total Iron (Fe)	2016/08/12					<100	mg/kg	0.12	30	96	70 - 130
8360689	Total Lead (Pb)	2016/08/12	102	75 - 125	108	75 - 125	<0.10	mg/kg	1.8	35	107	70 - 130
8360689	Total Lithium (Li)	2016/08/12	103	75 - 125	105	75 - 125	<5.0	mg/kg	NC	30	98	70 - 130
8360689	Total Magnesium (Mg)	2016/08/12					<100	mg/kg	0.37	30	102	70 - 130
8360689	Total Manganese (Mn)	2016/08/12	NC	75 - 125	106	75 - 125	<0.20	mg/kg	5.7	30	105	70 - 130
8360689	Total Mercury (Hg)	2016/08/12	103	75 - 125	109	75 - 125	<0.050	mg/kg	NC	35	119	70 - 130
8360689	Total Molybdenum (Mo)	2016/08/12	106	75 - 125	103	75 - 125	<0.10	mg/kg	5.7	35	111	70 - 130
8360689	Total Nickel (Ni)	2016/08/12	NC	75 - 125	106	75 - 125	<0.80	mg/kg	1.2	30	105	70 - 130
8360689	Total Phosphorus (P)	2016/08/12					<10	mg/kg	3.0	30	98	70 - 130
8360689	Total Potassium (K)	2016/08/12					<100	mg/kg	1.9	35	94	70 - 130
8360689	Total Selenium (Se)	2016/08/12	103	75 - 125	107	75 - 125	<0.50	mg/kg	NC	30		
8360689	Total Silver (Ag)	2016/08/12	94	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35	87	70 - 130
8360689	Total Sodium (Na)	2016/08/12					<100	mg/kg	NC	35	89	70 - 130
8360689	Total Strontium (Sr)	2016/08/12	NC	75 - 125	96	75 - 125	<0.10	mg/kg	4.8	35	98	70 - 130
8360689	Total Thallium (Tl)	2016/08/12	99	75 - 125	105	75 - 125	<0.050	mg/kg	NC	30	89	70 - 130
8360689	Total Tin (Sn)	2016/08/12	93	75 - 125	98	75 - 125	<0.10	mg/kg	NC	35	89	70 - 130
8360689	Total Titanium (Ti)	2016/08/12	NC	75 - 125	104	75 - 125	<1.0	mg/kg	4.8	35		
8360689	Total Uranium (U)	2016/08/12	102	75 - 125	102	75 - 125	<0.050	mg/kg	2.2	30	106	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

			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
8360689	Total Vanadium (V)	2016/08/12	NC	75 - 125	102	75 - 125	<2.0	mg/kg	1.3	30	103	70 - 130
8360689	Total Zinc (Zn)	2016/08/12	NC	75 - 125	116	75 - 125	<1.0	mg/kg	0.41	30	106	70 - 130
8360689	Total Zirconium (Zr)	2016/08/12					<0.50	mg/kg	5.3	30		
8360705	Soluble (2:1) pH	2016/08/12			100	97 - 103			0.23	N/A		
8362884	Total Aluminum (Al)	2016/08/15					<100	mg/kg	0.81	35	101	70 - 130
8362884	Total Antimony (Sb)	2016/08/15	91	75 - 125	95	75 - 125	<0.10	mg/kg	NC	30	116	70 - 130
8362884	Total Arsenic (As)	2016/08/15	98	75 - 125	97	75 - 125	<0.50	mg/kg	1.4	30	98	70 - 130
8362884	Total Barium (Ba)	2016/08/15	NC	75 - 125	98	75 - 125	<0.10	mg/kg	1.4	35	105	70 - 130
8362884	Total Beryllium (Be)	2016/08/15	97	75 - 125	96	75 - 125	<0.40	mg/kg	NC	30	117	70 - 130
8362884	Total Bismuth (Bi)	2016/08/15					<0.10	mg/kg	NC	30		
8362884	Total Cadmium (Cd)	2016/08/15	112	75 - 125	108	75 - 125	<0.050	mg/kg	2.0	30	126	70 - 130
8362884	Total Calcium (Ca)	2016/08/15					<100	mg/kg	11	30	99	70 - 130
8362884	Total Chromium (Cr)	2016/08/15	NC	75 - 125	99	75 - 125	<1.0	mg/kg	2.3	30	112	70 - 130
8362884	Total Cobalt (Co)	2016/08/15	101	75 - 125	102	75 - 125	<0.30	mg/kg	2.1	30	104	70 - 130
8362884	Total Copper (Cu)	2016/08/15	NC	75 - 125	97	75 - 125	<0.50	mg/kg	12	30	105	70 - 130
8362884	Total Iron (Fe)	2016/08/15					<100	mg/kg	1.4	30	101	70 - 130
8362884	Total Lead (Pb)	2016/08/15	96	75 - 125	96	75 - 125	<0.10	mg/kg	1.9	35	118	70 - 130
8362884	Total Lithium (Li)	2016/08/15	96	75 - 125	94	75 - 125	<5.0	mg/kg	NC	30	102	70 - 130
8362884	Total Magnesium (Mg)	2016/08/15					<100	mg/kg	1.8	30	103	70 - 130
8362884	Total Manganese (Mn)	2016/08/15	NC	75 - 125	98	75 - 125	<0.20	mg/kg	0.32	30	106	70 - 130
8362884	Total Mercury (Hg)	2016/08/15	109	75 - 125	102	75 - 125	<0.050	mg/kg	NC	35	134 (1)	70 - 130
8362884	Total Molybdenum (Mo)	2016/08/15	102	75 - 125	91	75 - 125	<0.10	mg/kg	7.1	35	109	70 - 130
8362884	Total Nickel (Ni)	2016/08/15	NC	75 - 125	94	75 - 125	<0.80	mg/kg	0.64	30	103	70 - 130
8362884	Total Phosphorus (P)	2016/08/15					<10	mg/kg	3.1	30	100	70 - 130
8362884	Total Potassium (K)	2016/08/15					<100	mg/kg	0.28	35	96	70 - 130
8362884	Total Selenium (Se)	2016/08/15	103	75 - 125	104	75 - 125	<0.50	mg/kg	NC	30		
8362884	Total Silver (Ag)	2016/08/15	97	75 - 125	95	75 - 125	<0.050	mg/kg	NC	35	104	70 - 130
8362884	Total Sodium (Na)	2016/08/15					<100	mg/kg	2.5	35	97	70 - 130
8362884	Total Strontium (Sr)	2016/08/15	NC	75 - 125	90	75 - 125	<0.10	mg/kg	3.6	35	101	70 - 130
8362884	Total Thallium (Tl)	2016/08/15	97	75 - 125	97	75 - 125	<0.050	mg/kg	NC	30	88	70 - 130
8362884	Total Tin (Sn)	2016/08/15	93	75 - 125	87	75 - 125	<0.10	mg/kg	5.4	35	101	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

			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
8362884	Total Titanium (Ti)	2016/08/15	NC	75 - 125	93	75 - 125	<1.0	mg/kg	1.2	35		
8362884	Total Uranium (U)	2016/08/15	99	75 - 125	93	75 - 125	<0.050	mg/kg	1.0	30	105	70 - 130
8362884	Total Vanadium (V)	2016/08/15	NC	75 - 125	99	75 - 125	<2.0	mg/kg	0.73	30	108	70 - 130
8362884	Total Zinc (Zn)	2016/08/15	NC	75 - 125	104	75 - 125	<1.0	mg/kg	1.2	30	108	70 - 130
8362884	Total Zirconium (Zr)	2016/08/15					<0.50	mg/kg	3.2	30		
8362893	Total Kjeldahl Nitrogen	2016/08/16	NC	75 - 125	91	75 - 125	<10	mg/kg	6.3	35	93	75 - 125
8362895	Soluble (2:1) pH	2016/08/15			100	97 - 103			1.2	N/A		
8362987	Saturation %	2016/08/15							7.6	12	103	75 - 125
8362998	% sand by hydrometer	2016/08/15							4.1	35	102	93 - 107
8362998	% silt by hydrometer	2016/08/15							14	35	95	90 - 110
8362998	Clay Content	2016/08/15							NC	35	99	86 - 114
8363058	Total Aluminum (Al)	2016/08/15					<100	mg/kg	4.5	35	96	70 - 130
8363058	Total Antimony (Sb)	2016/08/15	96	75 - 125	95	75 - 125	<0.10	mg/kg	NC	30	115	70 - 130
8363058	Total Arsenic (As)	2016/08/15	100	75 - 125	98	75 - 125	<0.50	mg/kg	1.2	30	102	70 - 130
8363058	Total Barium (Ba)	2016/08/15	NC	75 - 125	99	75 - 125	<0.10	mg/kg	2.5	35	101	70 - 130
8363058	Total Beryllium (Be)	2016/08/15	102	75 - 125	99	75 - 125	<0.40	mg/kg	NC	30	94	70 - 130
8363058	Total Bismuth (Bi)	2016/08/15					<0.10	mg/kg	NC	30		
8363058	Total Cadmium (Cd)	2016/08/15	111	75 - 125	110	75 - 125	<0.050	mg/kg	20	30	145 (2)	70 - 130
8363058	Total Calcium (Ca)	2016/08/15					<100	mg/kg	9.8	30	101	70 - 130
8363058	Total Chromium (Cr)	2016/08/15	NC	75 - 125	99	75 - 125	<1.0	mg/kg	3.2	30	104	70 - 130
8363058	Total Cobalt (Co)	2016/08/15	99	75 - 125	104	75 - 125	<0.30	mg/kg	0.53	30	101	70 - 130
8363058	Total Copper (Cu)	2016/08/15	NC	75 - 125	101	75 - 125	<0.50	mg/kg	3.3	30	106	70 - 130
8363058	Total Iron (Fe)	2016/08/15					<100	mg/kg	0.85	30	98	70 - 130
8363058	Total Lead (Pb)	2016/08/15	NC	75 - 125	99	75 - 125	<0.10	mg/kg	2.6	35	108	70 - 130
8363058	Total Lithium (Li)	2016/08/15	96	75 - 125	96	75 - 125	<5.0	mg/kg	NC	30	99	70 - 130
8363058	Total Magnesium (Mg)	2016/08/15					<100	mg/kg	4.1	30	101	70 - 130
8363058	Total Manganese (Mn)	2016/08/15	NC	75 - 125	102	75 - 125	<0.20	mg/kg	4.0	30	102	70 - 130
8363058	Total Mercury (Hg)	2016/08/15	108	75 - 125	104	75 - 125	<0.050	mg/kg	NC	35	70	70 - 130
8363058	Total Molybdenum (Mo)	2016/08/15	107	75 - 125	91	75 - 125	<0.10	mg/kg	0.031	35	104	70 - 130
8363058	Total Nickel (Ni)	2016/08/15	NC	75 - 125	97	75 - 125	<0.80	mg/kg	6.1	30	103	70 - 130
8363058	Total Phosphorus (P)	2016/08/15					<10	mg/kg	11	30	98	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

			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
8363058	Total Potassium (K)	2016/08/15					<100	mg/kg	1.6	35	87	70 - 130
8363058	Total Selenium (Se)	2016/08/15	101	75 - 125	106	75 - 125	<0.50	mg/kg	NC	30		
8363058	Total Silver (Ag)	2016/08/15	94	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35	103	70 - 130
8363058	Total Sodium (Na)	2016/08/15					<100	mg/kg	NC	35	88	70 - 130
8363058	Total Strontium (Sr)	2016/08/15	94	75 - 125	95	75 - 125	<0.10	mg/kg	3.1	35	103	70 - 130
8363058	Total Thallium (Tl)	2016/08/15	101	75 - 125	97	75 - 125	<0.050	mg/kg	NC	30	101	70 - 130
8363058	Total Tin (Sn)	2016/08/15	93	75 - 125	88	75 - 125	<0.10	mg/kg	NC	35	94	70 - 130
8363058	Total Titanium (Ti)	2016/08/15	NC	75 - 125	97	75 - 125	<1.0	mg/kg	4.7	35		
8363058	Total Uranium (U)	2016/08/15	100	75 - 125	96	75 - 125	<0.050	mg/kg	0.11	30	106	70 - 130
8363058	Total Vanadium (V)	2016/08/15	NC	75 - 125	103	75 - 125	<2.0	mg/kg	0.71	30	104	70 - 130
8363058	Total Zinc (Zn)	2016/08/15	NC	75 - 125	106	75 - 125	<1.0	mg/kg	7.4	30	107	70 - 130
8363058	Total Zirconium (Zr)	2016/08/15					<0.50	mg/kg	NC	30		
8363066	Soluble (2:1) pH	2016/08/15			100	97 - 103			0	N/A		
8363478	Available (CaCl2) Sulphur (S)	2016/08/15			99	80 - 120	<2.0	mg/kg	NC	35	93	75 - 125
8363484	Available (NH4F) Nitrogen (N)	2016/08/16	101	75 - 125	103	80 - 120	<2.0	mg/kg	NC	35		
8363488	Available (NH4OAc) Potassium (K)	2016/08/15			100	80 - 120	<2.0	mg/kg	11	35		
8363737	Available (NH4F) Phosphorus (P)	2016/08/16			104	80 - 120	<1.0	mg/kg	12	35		
8364950	Soluble Conductivity	2016/08/16			99	90 - 110	<0.020	dS/m	0.49	35	104	75 - 125

QUALITY ASSURANCE REPORT(CONT'D)

			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**
8364975	Cation exchange capacity	2016/08/17							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).

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

(2) Reference Matrial exceeds acceptance criteria for Cadmium. 10% of analytes failure in multielement scan is allowed.

VALIDATION SIGNATURE PAGE

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

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Peng Liang

Harry (Peng) Liang, Senior Analyst

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 2

LAB USE ONLY
MAXXAM JOB # B665657

ANALYSIS RE

08426072

LAB USE ONLY

RECEVIED IN WHITEHORSE
BY: Slyms @ 1250
2016 -08- 05
TEMP: 5 / 6 / 6

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: BMC 16-300 Soils and Vegetation

COMPANY ADDRESS:
#3 Calcite Business Center
151 Industrial Rd.
Whitehorse, YT
Y1A 2V3

TEL.: 867-668-6463 x233

E-MAIL: kwoloshyn@accessconsulting.ca
nichole@accessconsulting.ca

FAX: 867-667-6680

SAMPLER NAME (PRINT): LK MH

PROJECT MANAGER: Kai Woloshyn

LABORATORY CONTACT:

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	MATRIX: GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	SAMPLING: DATE DD/MM/YY	TIME	# CONTAINERS	ICP Metals	pH	Carbon Total Organic	CEC	NPKS	Texture	Total Kjeldahl nitrogen (TKN)
1	PA42-Soil					X		31/07/16		1	X	X	X	X	X	X	X
2	PA72-Soil					X		31/07/16		1	X	X	X	X	X	X	X
3	PA51-Soil					X		01/08/16		1	X	X	X	X	X	X	X
4	PA52-Soil					X		01/08/16		1	X	X	X	X	X	X	X
5	PA45-Soil					X		02/08/16		1	X	X	X	X	X	X	X
6	PA54-Soil					X		03/08/16		1	X	X	X	X	X	X	X
7	PA55-Soil					X		03/08/16		1	X	X	X	X	X	X	X
8	PA56-Soil					X		04/08/16		1	X	X	X	X	X	X	X
9	PA57-Soil					X		04/08/16		1	X	X	X	X	X	X	X
10	PA58-Soil					X		04/08/16		1	X	X	X	X	X	X	X
11	PA59-Soil					X		04/08/16		1	X	X	X	X	X	X	X
12	PA60-Soil							04/08/16		1	X	X	X	X	X	X	X

B665657_COC

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

STANDARD 5 BUSINESS DAYS ☒
RUSH 3 BUSINESS DAYS ☐
RUSH 2 BUSINESS DAYS ☐
URGENT 1 BUSINESS DAY ☐
OTHER BUSINESS DAYS ____

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

☐ CCME
☐ CSR
☐ AB TIER 1
☐ OTHER

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 864 11 CS:NA
DUE DATE:
LOG IN CHECK:

ACCOUNTING CONTACT: 867-668-6463

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

RELINQUISHED BY SAMPLER: L Knight
DATE: DD/MM/YY Aug 5/16
TIME: 12:50
RECEIVED BY:

RELINQUISHED BY:
DATE: DD/MM/YY
TIME:
RECEIVED BY:

RELINQUISHED BY:
DATE: DD/MM/YY
TIME:
RECEIVED BY LABORATORY: Laurel Berthier 2016/08/08 09:50

CUSTODY RECORD

COCFORM - BC - 20070822

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APPENDIX D:

VEGETATION SAMPLE ANALYTICAL DATA

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Your Project #: BMC 16-300
Your C.O.C. #: 08426071, 08426070

Attention:KAI WOLOSHYN

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

Report Date: 2016/12/05
Report #: R2311635
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B665602
Received: 2016/08/05, 12:51

Sample Matrix: Tissue (Plant)
Samples Received: 33

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by CRC ICPMS - Tissue Dry Wt	3	2016/11/30	2016/12/02	BBY WI-00033	Auto Calc
Elements in Tissue by CRC ICPMS - Dry Wt	20	2016/08/31	2016/09/02	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	10	2016/08/31	2016/09/03	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS - Tissue Wet Wt	20	2016/08/29	2016/09/02	BBY7SOP-00021,	BCLM2005,EPA6020bR2m
Elements by CRC ICPMS - Tissue Wet Wt	10	2016/08/29	2016/09/03	BBY7SOP-00021,	BCLM2005,EPA6020bR2m
Elements by CRC ICPMS - Tissue Wet Wt	3	2016/09/08	2016/09/08	BBY7SOP-00021,	BCLM2005,EPA6020bR2m
Moisture in Tissue	33	N/A	2016/09/08	BBY8SOP-00017	OMOE E3139 3.1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
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.

Your Project #: BMC 16-300
Your C.O.C. #: 08426071, 08426070

Attention:KAI WOLOSHYN

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

Report Date: 2016/12/05
Report #: R2311635
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B665602
Received: 2016/08/05, 12:51

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Megan Smith, Project Manager
Email: msmith@maxxam.ca
Phone# (604) 734 7276
==
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 #: B665602
Report Date: 2016/12/05

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC 16-300
Sampler Initials: LK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE8994	PE8995	PE8996	PE8997			PE8998		
Sampling Date		2016/07/31	2016/07/31	2016/08/01	2016/08/01			2016/08/01		
COC Number		08426071	08426071	08426071	08426071			08426071		
	UNITS	**PA42-HORSE TAIL**	**PA42-SALIX**	**PA51-LICHEN**	**PA51-SALIX**	**RDL**	**QC Batch**	**PA51-BB**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	4.9	4.7	47.4	12.2	1.0	8383260	5.5	1.5	8489373
Total Antimony (Sb)	mg/kg	0.0060	0.0150	0.0065	<0.0050	0.0050	8383260	<0.0075	0.0075	8489373
Total Arsenic (As)	mg/kg	0.242	<0.050	0.057	<0.050	0.050	8383260	<0.038	0.038	8489373
Total Barium (Ba)	mg/kg	74.7	45.8	11.0	194	0.10	8383260	32.4	0.075	8489373
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383260	<0.015	0.015	8489373
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383260	<0.15	0.15	8489373
Total Boron (B)	mg/kg	14.0	3.7	3.5	<2.0	2.0	8383260	4.3	3.0	8489373
Total Cadmium (Cd)	mg/kg	0.322	8.34	0.102	2.12	0.010	8383260	0.386	0.015	8489373
Total Calcium (Ca)	mg/kg	27000	23900	714	17100	10	8383260	2030	15	8489373
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	8383260	<0.075	0.075	8489373
Total Cobalt (Co)	mg/kg	<0.020	0.245	0.048	0.603	0.020	8383260	<0.030	0.030	8489373
Total Copper (Cu)	mg/kg	4.06	3.90	0.638	3.33	0.050	8383260	3.91	0.075	8489373
Total Iron (Fe)	mg/kg	38	44	79	54	10	8383260	16.0	7.5	8489373
Total Lead (Pb)	mg/kg	0.031	0.037	0.166	0.077	0.010	8383260	<0.015	0.015	8489373
Total Magnesium (Mg)	mg/kg	2430	3790	196	2950	10	8383260	696	15	8489373
Total Manganese (Mn)	mg/kg	13.8	128	41.0	227	0.10	8383260	216	0.15	8489373
Total Mercury (Hg)	mg/kg	0.011	<0.010	0.012	<0.010	0.010	8383260	<0.015	0.015	8489373
Total Molybdenum (Mo)	mg/kg	0.331	0.184	<0.050	0.162	0.050	8383260	0.185	0.075	8489373
Total Nickel (Ni)	mg/kg	0.244	1.18	0.153	0.666	0.050	8383260	0.369	0.075	8489373
Total Phosphorus (P)	mg/kg	1590	2010	462	2540	10	8383260	1480	15	8489373
Total Potassium (K)	mg/kg	31900	10700	1020	18400	10	8383260	7430	15	8489373
Total Selenium (Se)	mg/kg	0.808	0.053	<0.050	<0.050	0.050	8383260	<0.075	0.075	8489373
Total Silver (Ag)	mg/kg	<0.020 (1)	<0.020	<0.020	<0.020	0.020	8383260	<0.030	0.030	8489373
Total Sodium (Na)	mg/kg	116	16	<10	45	10	8383260	<15	15	8489373
Total Strontium (Sr)	mg/kg	69.0	64.0	2.65	87.6	0.10	8383260	8.75	0.075	8489373
Total Thallium (Tl)	mg/kg	<0.0020	0.0140	<0.0020	<0.0020	0.0020	8383260	<0.0030	0.0030	8489373
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383260	0.17	0.15	8489373
Total Titanium (Ti)	mg/kg	<1.0	<1.0	2.5	<1.0	1.0	8383260	<0.38	0.38	8489373
Total Uranium (U)	mg/kg	0.0020	<0.0020	0.0036	<0.0020	0.0020	8383260	<0.0030	0.0030	8489373
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	8383260	<0.15	0.15	8489373
Total Zinc (Zn)	mg/kg	44.3	268	14.3	70.6	0.20	8383260	22.1	0.30	8489373

RDL = Reportable Detection Limit

(1) Matrix Spike outside acceptance criteria (10% of analytes failure allowed).

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE8999	PE9000	PE9001	PE9002	PE9776	PE9777		
Sampling Date		2016/08/01	2016/08/01	2016/08/02	2016/08/02	2016/08/02	2016/08/02		
COC Number		08426071	08426071	08426071	08426071	08426071	08426071		
	UNITS	**PA52-LICHEN**	**PA52-SALIX**	**PA45-LICHEN**	**PA45-SALIX**	**PA53-LICHEN**	**PA53-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	63.4	25.3	52.6	19.8	31.1	20.0	1.0	8383260
Total Antimony (Sb)	mg/kg	0.0050	0.0060	<0.0050	<0.0050	0.0119	0.0061	0.0050	8383260
Total Arsenic (As)	mg/kg	0.071	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8383260
Total Barium (Ba)	mg/kg	5.23	96.2	6.92	58.4	3.15	154	0.10	8383260
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Boron (B)	mg/kg	2.2	5.7	3.1	2.2	<2.0	2.4	2.0	8383260
Total Cadmium (Cd)	mg/kg	0.199	10.7	0.118	2.95	0.120	21.9	0.010	8383260
Total Calcium (Ca)	mg/kg	772	20000	637	17000	375	18900	10	8383260
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383260
Total Cobalt (Co)	mg/kg	0.054	0.282	0.127	2.38	0.035	0.937	0.020	8383260
Total Copper (Cu)	mg/kg	0.723	3.37	0.907	3.41	0.762	5.60	0.050	8383260
Total Iron (Fe)	mg/kg	131	80	49	44	51	47	10	8383260
Total Lead (Pb)	mg/kg	0.185	0.132	0.142	0.095	0.182	0.380	0.010	8383260
Total Magnesium (Mg)	mg/kg	268	4830	243	6110	185	4130	10	8383260
Total Manganese (Mn)	mg/kg	59.2	200	76.5	310	70.4	122	0.10	8383260
Total Mercury (Hg)	mg/kg	0.013	<0.010	0.023	<0.010	0.013	<0.010	0.010	8383260
Total Molybdenum (Mo)	mg/kg	<0.050	0.388	<0.050	0.153	<0.050	0.093	0.050	8383260
Total Nickel (Ni)	mg/kg	0.256	4.87	0.302	19.6	0.216	6.85	0.050	8383260
Total Phosphorus (P)	mg/kg	478	1230	806	5870	691	1950	10	8383260
Total Potassium (K)	mg/kg	1050	7180	1560	12100	1520	17300	10	8383260
Total Selenium (Se)	mg/kg	<0.050	0.063	<0.050	0.120	<0.050	0.307	0.050	8383260
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.023	<0.020	<0.020	<0.020	0.020	8383260
Total Sodium (Na)	mg/kg	<10	<10	<10	12	<10	<10	10	8383260
Total Strontium (Sr)	mg/kg	3.02	96.5	2.56	71.2	0.78	62.6	0.10	8383260
Total Thallium (Tl)	mg/kg	<0.0020	0.0222	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8383260
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Titanium (Ti)	mg/kg	3.0	1.4	1.1	<1.0	1.2	<1.0	1.0	8383260
Total Uranium (U)	mg/kg	0.0037	0.0021	0.0056	<0.0020	0.0029	<0.0020	0.0020	8383260
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383260
Total Zinc (Zn)	mg/kg	19.5	243	25.3	90.7	26.4	640	0.20	8383260
RDL = Reportable Detection Limit									

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE9778	PE9779	PE9780	PE9781	PE9782	PE9783		
Sampling Date		2016/08/03	2016/08/03	2016/08/03	2016/08/03	2016/08/03	2016/08/03		
COC Number		08426071	08426070	08426070	08426070	08426070	08426070		
	UNITS	**PA54-HORSE TAIL**	**PA54-SALIX**	**PA74-HORSE TAIL**	**PA55-SALIX**	**PA55-LICHEN**	**PA75-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	6.1	7.2	5.4	7.0	20.9	10.3	1.0	8383260
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	0.0072	<0.0050	0.0070	0.0057	0.0050	8383260
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8383260
Total Barium (Ba)	mg/kg	31.4	5.66	31.1	15.4	6.18	12.1	0.10	8383260
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Boron (B)	mg/kg	16.1	6.6	17.4	6.7	4.3	4.7	2.0	8383260
Total Cadmium (Cd)	mg/kg	0.373	2.80	0.243	2.55	0.141	2.30	0.010	8383260
Total Calcium (Ca)	mg/kg	23400	6450	23800	9130	1410	9320	10	8383260
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383260
Total Cobalt (Co)	mg/kg	<0.020	0.143	<0.020	0.486	0.037	0.473	0.020	8383260
Total Copper (Cu)	mg/kg	4.77	1.94	7.41	3.04	1.38	3.28	0.050	8383260
Total Iron (Fe)	mg/kg	46	48	43	55	45	61	10	8383260
Total Lead (Pb)	mg/kg	0.071	0.072	0.210	0.039	0.165	0.052	0.010	8383260
Total Magnesium (Mg)	mg/kg	3840	770	4480	2040	332	2080	10	8383260
Total Manganese (Mn)	mg/kg	41.1	458	30.1	53.1	18.9	56.9	0.10	8383260
Total Mercury (Hg)	mg/kg	0.011	<0.010	<0.010	<0.010	0.013	<0.010	0.010	8383260
Total Molybdenum (Mo)	mg/kg	0.341	<0.050	0.374	0.276	<0.050	0.250	0.050	8383260
Total Nickel (Ni)	mg/kg	0.270	0.314	0.235	3.13	0.214	2.81	0.050	8383260
Total Phosphorus (P)	mg/kg	1290	824	1440	1060	573	1130	10	8383260
Total Potassium (K)	mg/kg	49900	9290	48800	16000	1650	17100	10	8383260
Total Selenium (Se)	mg/kg	0.052	<0.050	0.111	1.76	<0.050	1.56	0.050	8383260
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8383260
Total Sodium (Na)	mg/kg	61	<10	36	<10	17	<10	10	8383260
Total Strontium (Sr)	mg/kg	56.3	13.3	51.4	20.4	2.96	19.3	0.10	8383260
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8383260
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10	8383260
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8383260
Total Uranium (U)	mg/kg	<0.0020	<0.0020	0.0024	<0.0020	0.0020	<0.0020	0.0020	8383260
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383260
Total Zinc (Zn)	mg/kg	33.9	97.1	31.0	119	27.1	80.7	0.20	8383260
RDL = Reportable Detection Limit									

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE9809	PE9810	PE9811	PE9812		PE9813		
Sampling Date		2016/08/03	2016/08/04	2016/08/04	2016/08/04		2016/08/04		
COC Number		08426070	08426070	08426070	08426070		08426070		
	UNITS	**PA75-LICHEN**	**PA56-SALIX**	**PA56-HORSE TAIL**	**PA56-LICHEN**	**QC Batch**	**PA57-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	23.5	10.3	4.2	84.4	8383260	12.9	1.0	8383265
Total Antimony (Sb)	mg/kg	0.0086	<0.0050	<0.0050	0.0091	8383260	<0.0050	0.0050	8383265
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.069	8383260	<0.050	0.050	8383265
Total Barium (Ba)	mg/kg	5.20	26.4	42.5	7.77	8383260	54.1	0.10	8383265
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	8383260	<0.10	0.10	8383265
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	8383260	<0.10	0.10	8383265
Total Boron (B)	mg/kg	4.2	13.1	10.0	4.4	8383260	3.5	2.0	8383265
Total Cadmium (Cd)	mg/kg	0.123	20.4	0.565	0.132	8383260	3.29	0.010	8383265
Total Calcium (Ca)	mg/kg	1290	15700	30700	741	8383260	11200	10	8383265
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	8383260	<0.20	0.20	8383265
Total Cobalt (Co)	mg/kg	0.032	0.153	0.080	0.079	8383260	0.393	0.020	8383265
Total Copper (Cu)	mg/kg	0.781	4.95	4.45	0.923	8383260	4.44	0.050	8383265
Total Iron (Fe)	mg/kg	42	54	52	91	8383260	47	10	8383265
Total Lead (Pb)	mg/kg	0.131	0.056	0.056	0.264	8383260	0.046	0.010	8383265
Total Magnesium (Mg)	mg/kg	335	3390	3370	228	8383260	4740	10	8383265
Total Manganese (Mn)	mg/kg	19.0	74.9	20.4	87.9	8383260	216	0.10	8383265
Total Mercury (Hg)	mg/kg	0.013	<0.010	<0.010	0.024	8383260	0.011	0.010	8383265
Total Molybdenum (Mo)	mg/kg	<0.050	0.208	0.224	<0.050	8383260	0.284	0.050	8383265
Total Nickel (Ni)	mg/kg	0.172	1.33	0.550	0.358	8383260	12.2	0.050	8383265
Total Phosphorus (P)	mg/kg	509	1440	1420	416	8383260	1320	10	8383265
Total Potassium (K)	mg/kg	1340	19100	37400	1000	8383260	11900	10	8383265
Total Selenium (Se)	mg/kg	<0.050	0.839	0.258	<0.050	8383260	0.101	0.050	8383265
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	0.035	8383260	<0.020	0.020	8383265
Total Sodium (Na)	mg/kg	<10	<10	63	16	8383260	<10	10	8383265
Total Strontium (Sr)	mg/kg	2.74	35.1	78.2	2.35	8383260	38.2	0.10	8383265
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0067	8383260	0.0041	0.0020	8383265
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	8383260	<0.10	0.10	8383265
Total Titanium (Ti)	mg/kg	1.0	<1.0	<1.0	3.4	8383260	<1.0	1.0	8383265
Total Uranium (U)	mg/kg	<0.0020	<0.0020	0.0038	0.0358	8383260	<0.0020	0.0020	8383265
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	8383260	<0.20	0.20	8383265
Total Zinc (Zn)	mg/kg	24.2	1010	51.5	17.0	8383260	74.0	0.20	8383265

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE9814	PE9815	PE9816	PE9817		
Sampling Date		2016/08/04	2016/08/04	2016/08/04	2016/08/04		
COC Number		08426070	08426070	08426071	08426071		
	UNITS	**PA57-LICHEN**	**PA58-HORSE TAIL**	**PA58-LICHEN**	**PA58-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS							
Total Aluminum (Al)	mg/kg	44.7	3.8	30.2	4.4	1.0	8383265
Total Antimony (Sb)	mg/kg	0.0106	<0.0050	0.0057	<0.0050	0.0050	8383265
Total Arsenic (As)	mg/kg	0.053	<0.050	<0.050	<0.050	0.050	8383265
Total Barium (Ba)	mg/kg	5.09	49.6	6.80	9.85	0.10	8383265
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383265
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383265
Total Boron (B)	mg/kg	3.3	13.3	3.2	6.5	2.0	8383265
Total Cadmium (Cd)	mg/kg	0.086	0.891	0.106	3.72	0.010	8383265
Total Calcium (Ca)	mg/kg	587	16600	1210	9610	10	8383265
Total Chromium (Cr)	mg/kg	0.31	<0.20	<0.20	<0.20	0.20	8383265
Total Cobalt (Co)	mg/kg	0.047	0.094	0.054	0.747	0.020	8383265
Total Copper (Cu)	mg/kg	1.19	5.07	1.19	1.96	0.050	8383265
Total Iron (Fe)	mg/kg	80	39	57	40	10	8383265
Total Lead (Pb)	mg/kg	0.242	0.061	0.116	0.022	0.010	8383265
Total Magnesium (Mg)	mg/kg	243	5040	480	3060	10	8383265
Total Manganese (Mn)	mg/kg	146	55.6	194	444	0.10	8383265
Total Mercury (Hg)	mg/kg	0.014	0.015	0.023	<0.010	0.010	8383265
Total Molybdenum (Mo)	mg/kg	<0.050	0.811	<0.050	0.912	0.050	8383265
Total Nickel (Ni)	mg/kg	0.622	0.320	0.250	0.562	0.050	8383265
Total Phosphorus (P)	mg/kg	451	1530	580	1310	10	8383265
Total Potassium (K)	mg/kg	1040	39400	1520	7170	10	8383265
Total Selenium (Se)	mg/kg	<0.050	2.63	<0.050	0.236	0.050	8383265
Total Silver (Ag)	mg/kg	<0.020	0.077	<0.020	<0.020	0.020	8383265
Total Sodium (Na)	mg/kg	16	73	12	<10	10	8383265
Total Strontium (Sr)	mg/kg	1.13	50.9	2.42	23.2	0.10	8383265
Total Thallium (Tl)	mg/kg	<0.0020	0.0074	<0.0020	<0.0020	0.0020	8383265
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	8383265
Total Titanium (Ti)	mg/kg	1.9	<1.0	1.6	<1.0	1.0	8383265
Total Uranium (U)	mg/kg	0.0058	<0.0020	0.0022	<0.0020	0.0020	8383265
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	8383265
Total Zinc (Zn)	mg/kg	25.3	27.0	44.4	91.8	0.20	8383265
RDL = Reportable Detection Limit							

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE9818			PE9819	PE9820	PE9821		
Sampling Date		2016/08/04			2016/08/04	2016/08/04	2016/08/04		
COC Number		08426071			08426071	08426071	08426071		
	UNITS	**PA59-BLUEBERRIES**	**RDL**	**QC Batch**	**PA59-HORSE TAIL**	**PA59-SALIX**	**PA59-LICHEN**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	8.5	2.2	8489373	2.8	4.1	28.3	1.0	8383265
Total Antimony (Sb)	mg/kg	<0.011	0.011	8489373	<0.0050	<0.0050	0.0062	0.0050	8383265
Total Arsenic (As)	mg/kg	<0.055	0.055	8489373	<0.050	<0.050	<0.050	0.050	8383265
Total Barium (Ba)	mg/kg	16.8	0.11	8489373	28.5	7.69	1.70	0.10	8383265
Total Beryllium (Be)	mg/kg	<0.022	0.022	8489373	<0.10	<0.10	<0.10	0.10	8383265
Total Bismuth (Bi)	mg/kg	<0.22	0.22	8489373	<0.10	<0.10	<0.10	0.10	8383265
Total Boron (B)	mg/kg	21.0	4.4	8489373	15.6	4.7	4.4	2.0	8383265
Total Cadmium (Cd)	mg/kg	1.50	0.022	8489373	0.614	11.1	0.306	0.010	8383265
Total Calcium (Ca)	mg/kg	2380	22	8489373	23800	12200	566	10	8383265
Total Chromium (Cr)	mg/kg	<0.11	0.11	8489373	<0.20	<0.20	<0.20	0.20	8383265
Total Cobalt (Co)	mg/kg	<0.044	0.044	8489373	0.031	0.383	0.022	0.020	8383265
Total Copper (Cu)	mg/kg	6.15	0.11	8489373	5.88	5.43	0.841	0.050	8383265
Total Iron (Fe)	mg/kg	27	11	8489373	39	35	45	10	8383265
Total Lead (Pb)	mg/kg	0.095	0.022	8489373	0.028	0.032	0.137	0.010	8383265
Total Magnesium (Mg)	mg/kg	1020	22	8489373	7950	6680	274	10	8383265
Total Manganese (Mn)	mg/kg	367	0.22	8489373	43.1	186	31.4	0.10	8383265
Total Mercury (Hg)	mg/kg	<0.022	0.022	8489373	0.010	<0.010	0.018	0.010	8383265
Total Molybdenum (Mo)	mg/kg	1.72	0.11	8489373	1.51	1.58	<0.050	0.050	8383265
Total Nickel (Ni)	mg/kg	0.80	0.11	8489373	0.501	4.48	0.179	0.050	8383265
Total Phosphorus (P)	mg/kg	2210	22	8489373	1930	1600	404	10	8383265
Total Potassium (K)	mg/kg	9640	22	8489373	22600	7020	1150	10	8383265
Total Selenium (Se)	mg/kg	<0.11	0.11	8489373	7.65	0.533	<0.050	0.050	8383265
Total Silver (Ag)	mg/kg	<0.044	0.044	8489373	<0.020	<0.020	<0.020	0.020	8383265
Total Sodium (Na)	mg/kg	24	22	8489373	54	<10	<10	10	8383265
Total Strontium (Sr)	mg/kg	3.36	0.11	8489373	58.7	29.0	1.24	0.10	8383265
Total Thallium (Tl)	mg/kg	<0.0044	0.0044	8489373	0.317	0.0020	<0.0020	0.0020	8383265
Total Tin (Sn)	mg/kg	1.13	0.22	8489373	<0.10	<0.10	<0.10	0.10	8383265
Total Titanium (Ti)	mg/kg	<0.55	0.55	8489373	<1.0	<1.0	<1.0	1.0	8383265
Total Uranium (U)	mg/kg	0.0079	0.0044	8489373	<0.0020	<0.0020	<0.0020	0.0020	8383265
Total Vanadium (V)	mg/kg	<0.22	0.22	8489373	<0.20	<0.20	<0.20	0.20	8383265
Total Zinc (Zn)	mg/kg	43.4	0.44	8489373	62.1	228	17.0	0.20	8383265

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE (PLANT))

Maxxam ID		PE9822			PE9823	PE9824		
Sampling Date		2016/08/04			2016/08/04	2016/08/04		
COC Number		08426071			08426071	08426071		
	UNITS	**PA60-BLUEBERRIES**	**RDL**	**QC Batch**	**PA60-SALIX**	**PA60-LICHEN**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	5.7	1.3	8489373	4.0	25.6	1.0	8383265
Total Antimony (Sb)	mg/kg	<0.0064	0.0064	8489373	<0.0050	<0.0050	0.0050	8383265
Total Arsenic (As)	mg/kg	<0.032	0.032	8489373	<0.050	<0.050	0.050	8383265
Total Barium (Ba)	mg/kg	9.22	0.064	8489373	29.4	2.75	0.10	8383265
Total Beryllium (Be)	mg/kg	<0.013	0.013	8489373	<0.10	<0.10	0.10	8383265
Total Bismuth (Bi)	mg/kg	<0.13	0.13	8489373	<0.10	<0.10	0.10	8383265
Total Boron (B)	mg/kg	16.1	2.6	8489373	5.8	3.8	2.0	8383265
Total Cadmium (Cd)	mg/kg	0.426	0.013	8489373	4.35	0.337	0.010	8383265
Total Calcium (Ca)	mg/kg	1130	13	8489373	15200	615	10	8383265
Total Chromium (Cr)	mg/kg	<0.064	0.064	8489373	<0.20	<0.20	0.20	8383265
Total Cobalt (Co)	mg/kg	<0.026	0.026	8489373	0.182	0.036	0.020	8383265
Total Copper (Cu)	mg/kg	4.29	0.064	8489373	3.30	0.943	0.050	8383265
Total Iron (Fe)	mg/kg	17.2	6.4	8489373	36	39	10	8383265
Total Lead (Pb)	mg/kg	0.052	0.013	8489373	0.029	0.089	0.010	8383265
Total Magnesium (Mg)	mg/kg	505	13	8489373	5630	237	10	8383265
Total Manganese (Mn)	mg/kg	106	0.13	8489373	131	25.6	0.10	8383265
Total Mercury (Hg)	mg/kg	<0.013	0.013	8489373	<0.010	0.013	0.010	8383265
Total Molybdenum (Mo)	mg/kg	0.154	0.064	8489373	0.200	<0.050	0.050	8383265
Total Nickel (Ni)	mg/kg	0.474	0.064	8489373	2.24	0.174	0.050	8383265
Total Phosphorus (P)	mg/kg	1060	13	8489373	861	530	10	8383265
Total Potassium (K)	mg/kg	7550	13	8489373	6290	1530	10	8383265
Total Selenium (Se)	mg/kg	<0.064	0.064	8489373	0.216	0.084	0.050	8383265
Total Silver (Ag)	mg/kg	<0.026	0.026	8489373	<0.020	<0.020	0.020	8383265
Total Sodium (Na)	mg/kg	<13	13	8489373	<10	12	10	8383265
Total Strontium (Sr)	mg/kg	2.05	0.064	8489373	38.0	1.46	0.10	8383265
Total Thallium (Tl)	mg/kg	<0.0026	0.0026	8489373	<0.0020	<0.0020	0.0020	8383265
Total Tin (Sn)	mg/kg	0.48	0.13	8489373	<0.10	0.10	0.10	8383265
Total Titanium (Ti)	mg/kg	<0.32	0.32	8489373	<1.0	<1.0	1.0	8383265
Total Uranium (U)	mg/kg	<0.0026	0.0026	8489373	<0.0020	0.0021	0.0020	8383265
Total Vanadium (V)	mg/kg	<0.13	0.13	8489373	<0.20	<0.20	0.20	8383265
Total Zinc (Zn)	mg/kg	28.6	0.26	8489373	212	20.5	0.20	8383265
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE8994		PE8995		PE8996		PE8997		
Sampling Date		2016/07/31		2016/07/31		2016/08/01		2016/08/01		
COC Number		08426071		08426071		08426071		08426071		
	UNITS	**PA42-HORSE TAIL**	**RDL**	**PA42-SALIX**	**RDL**	**PA51-LICHEN**	**RDL**	**PA51-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	1.04	0.21	1.59	0.34	26.0	0.55	4.13	0.34	8490769
Total Antimony (Sb)	mg/kg	0.0013	0.0011	0.0051	0.0017	0.0035	0.0027	<0.0017	0.0017	8490769
Total Arsenic (As)	mg/kg	0.052	0.011	<0.017	0.017	0.031	0.027	<0.017	0.017	8490769
Total Barium (Ba)	mg/kg	15.9	0.021	15.5	0.034	6.00	0.055	65.9	0.034	8490769
Total Beryllium (Be)	mg/kg	<0.021	0.021	<0.034	0.034	<0.055	0.055	<0.034	0.034	8490769
Total Bismuth (Bi)	mg/kg	<0.021	0.021	<0.034	0.034	<0.055	0.055	<0.034	0.034	8490769
Total Boron (B)	mg/kg	2.99	0.43	1.26	0.68	1.9	1.1	<0.68	0.68	8490769
Total Cadmium (Cd)	mg/kg	0.0685	0.0021	2.82	0.0034	0.0557	0.0055	0.719	0.0034	8490769
Total Calcium (Ca)	mg/kg	5760	2.1	8090	3.4	391	5.5	5810	3.4	8490769
Total Chromium (Cr)	mg/kg	<0.043	0.043	<0.068	0.068	<0.11	0.11	<0.068	0.068	8490769
Total Cobalt (Co)	mg/kg	<0.0043	0.0043	0.0829	0.0068	0.026	0.011	0.204	0.0068	8490769
Total Copper (Cu)	mg/kg	0.866	0.011	1.32	0.017	0.349	0.027	1.13	0.017	8490769
Total Iron (Fe)	mg/kg	8.2	2.1	14.7	3.4	43.2	5.5	18.5	3.4	8490769
Total Lead (Pb)	mg/kg	0.0066	0.0021	0.0127	0.0034	0.0907	0.0055	0.0263	0.0034	8490769
Total Magnesium (Mg)	mg/kg	518	2.1	1280	3.4	107	5.5	999	3.4	8490769
Total Manganese (Mn)	mg/kg	2.95	0.021	43.3	0.034	22.4	0.055	77.0	0.034	8490769
Total Mercury (Hg)	mg/kg	0.0024	0.0021	<0.0034	0.0034	0.0065	0.0055	<0.0034	0.0034	8490769
Total Molybdenum (Mo)	mg/kg	0.070	0.011	0.062	0.017	<0.027	0.027	0.055	0.017	8490769
Total Nickel (Ni)	mg/kg	0.052	0.011	0.397	0.017	0.084	0.027	0.226	0.017	8490769
Total Phosphorus (P)	mg/kg	338	2.1	678	3.4	253	5.5	860	3.4	8490769
Total Potassium (K)	mg/kg	6790	2.1	3620	3.4	557	5.5	6240	3.4	8490769
Total Selenium (Se)	mg/kg	0.172	0.011	0.018	0.017	<0.027	0.027	<0.017	0.017	8490769
Total Silver (Ag)	mg/kg	<0.0043	0.0043	<0.0068	0.0068	<0.011	0.011	<0.0068	0.0068	8490769
Total Sodium (Na)	mg/kg	24.7	2.1	5.5	3.4	<5.5	5.5	15.1	3.4	8490769
Total Strontium (Sr)	mg/kg	14.7	0.021	21.6	0.034	1.45	0.055	29.7	0.034	8490769
Total Thallium (Tl)	mg/kg	<0.00043	0.00043	0.00470	0.00068	<0.0011	0.0011	<0.00068	0.00068	8490769
Total Tin (Sn)	mg/kg	<0.021	0.021	<0.034	0.034	<0.055	0.055	<0.034	0.034	8490769
Total Titanium (Ti)	mg/kg	<0.21	0.21	<0.34	0.34	1.39	0.55	<0.34	0.34	8490769
Total Uranium (U)	mg/kg	<0.00043	0.00043	<0.00068	0.00068	0.0019	0.0011	<0.00068	0.00068	8490769
Total Vanadium (V)	mg/kg	<0.043	0.043	<0.068	0.068	<0.11	0.11	<0.068	0.068	8490769
Total Zinc (Zn)	mg/kg	9.44	0.043	90.7	0.068	7.83	0.11	23.9	0.068	8490769

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE8998			PE8999		PE9000		
Sampling Date		2016/08/01			2016/08/01		2016/08/01		
COC Number		08426071			08426071		08426071		
	UNITS	**PA51-BB**	**RDL**	**QC Batch**	**PA52-LICHEN**	**RDL**	**PA52-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	0.73	0.20	8391087	46.8	0.74	9.86	0.39	8490769
Total Antimony (Sb)	mg/kg	<0.0010	0.0010	8391087	0.0037	0.0037	0.0023	0.0020	8490769
Total Arsenic (As)	mg/kg	<0.0050	0.0050	8391087	0.053	0.037	<0.020	0.020	8490769
Total Barium (Ba)	mg/kg	4.31	0.010	8391087	3.86	0.074	37.5	0.039	8490769
Total Beryllium (Be)	mg/kg	<0.0020	0.0020	8391087	<0.074	0.074	<0.039	0.039	8490769
Total Bismuth (Bi)	mg/kg	<0.020	0.020	8391087	<0.074	0.074	<0.039	0.039	8490769
Total Boron (B)	mg/kg	0.57	0.40	8391087	1.6	1.5	2.24	0.78	8490769
Total Cadmium (Cd)	mg/kg	0.0513	0.0020	8391087	0.147	0.0074	4.16	0.0039	8490769
Total Calcium (Ca)	mg/kg	270	2.0	8391087	570	7.4	7800	3.9	8490769
Total Chromium (Cr)	mg/kg	<0.010	0.010	8391087	<0.15	0.15	<0.078	0.078	8490769
Total Cobalt (Co)	mg/kg	<0.0040	0.0040	8391087	0.040	0.015	0.110	0.0078	8490769
Total Copper (Cu)	mg/kg	0.520	0.010	8391087	0.534	0.037	1.31	0.020	8490769
Total Iron (Fe)	mg/kg	2.1	1.0	8391087	96.4	7.4	31.3	3.9	8490769
Total Lead (Pb)	mg/kg	<0.0020	0.0020	8391087	0.137	0.0074	0.0515	0.0039	8490769
Total Magnesium (Mg)	mg/kg	92.6	2.0	8391087	198	7.4	1880	3.9	8490769
Total Manganese (Mn)	mg/kg	28.8	0.020	8391087	43.7	0.074	77.9	0.039	8490769
Total Mercury (Hg)	mg/kg	<0.0020	0.0020	8391087	0.0097	0.0074	<0.0039	0.0039	8490769
Total Molybdenum (Mo)	mg/kg	0.025	0.010	8391087	<0.037	0.037	0.151	0.020	8490769
Total Nickel (Ni)	mg/kg	0.049	0.010	8391087	0.189	0.037	1.90	0.020	8490769
Total Phosphorus (P)	mg/kg	197	2.0	8391087	353	7.4	481	3.9	8490769
Total Potassium (K)	mg/kg	988	2.0	8391087	774	7.4	2800	3.9	8490769
Total Selenium (Se)	mg/kg	<0.010	0.010	8391087	<0.037	0.037	0.025	0.020	8490769
Total Silver (Ag)	mg/kg	<0.0040	0.0040	8391087	<0.015	0.015	<0.0078	0.0078	8490769
Total Sodium (Na)	mg/kg	<2.0	2.0	8391087	<7.4	7.4	<3.9	3.9	8490769
Total Strontium (Sr)	mg/kg	1.16	0.010	8391087	2.23	0.074	37.6	0.039	8490769
Total Thallium (Tl)	mg/kg	<0.00040	0.00040	8391087	<0.0015	0.0015	0.00870	0.00078	8490769
Total Tin (Sn)	mg/kg	0.023	0.020	8391087	<0.074	0.074	<0.039	0.039	8490769
Total Titanium (Ti)	mg/kg	<0.050	0.050	8391087	2.21	0.74	0.55	0.39	8490769
Total Uranium (U)	mg/kg	<0.00040	0.00040	8391087	0.0027	0.0015	0.00080	0.00078	8490769
Total Vanadium (V)	mg/kg	<0.020	0.020	8391087	<0.15	0.15	<0.078	0.078	8490769
Total Zinc (Zn)	mg/kg	2.94	0.040	8391087	14.4	0.15	94.9	0.078	8490769

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9001		PE9002		PE9776		PE9777		
Sampling Date		2016/08/02		2016/08/02		2016/08/02		2016/08/02		
COC Number		08426071		08426071		08426071		08426071		
	UNITS	**PA45-LICHEN**	**RDL**	**PA45-SALIX**	**RDL**	**PA53-LICHEN**	**RDL**	**PA53-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	45.6	0.87	7.23	0.37	28.0	0.90	7.11	0.36	8490769
Total Antimony (Sb)	mg/kg	<0.0043	0.0043	<0.0018	0.0018	0.0107	0.0045	0.0022	0.0018	8490769
Total Arsenic (As)	mg/kg	<0.043	0.043	<0.018	0.018	<0.045	0.045	<0.018	0.018	8490769
Total Barium (Ba)	mg/kg	6.00	0.087	21.3	0.037	2.83	0.090	54.7	0.036	8490769
Total Beryllium (Be)	mg/kg	<0.087	0.087	<0.037	0.037	<0.090	0.090	<0.036	0.036	8490769
Total Bismuth (Bi)	mg/kg	<0.087	0.087	<0.037	0.037	<0.090	0.090	<0.036	0.036	8490769
Total Boron (B)	mg/kg	2.7	1.7	0.79	0.73	<1.8	1.8	0.84	0.71	8490769
Total Cadmium (Cd)	mg/kg	0.102	0.0087	1.08	0.0037	0.108	0.0090	7.77	0.0036	8490769
Total Calcium (Ca)	mg/kg	552	8.7	6220	3.7	337	9.0	6710	3.6	8490769
Total Chromium (Cr)	mg/kg	<0.17	0.17	<0.073	0.073	<0.18	0.18	<0.071	0.071	8490769
Total Cobalt (Co)	mg/kg	0.110	0.017	0.870	0.0073	0.032	0.018	0.333	0.0071	8490769
Total Copper (Cu)	mg/kg	0.787	0.043	1.24	0.018	0.685	0.045	1.99	0.018	8490769
Total Iron (Fe)	mg/kg	42.3	8.7	15.9	3.7	45.5	9.0	16.9	3.6	8490769
Total Lead (Pb)	mg/kg	0.123	0.0087	0.0348	0.0037	0.164	0.0090	0.135	0.0036	8490769
Total Magnesium (Mg)	mg/kg	211	8.7	2230	3.7	167	9.0	1470	3.6	8490769
Total Manganese (Mn)	mg/kg	66.3	0.087	113	0.037	63.3	0.090	43.3	0.036	8490769
Total Mercury (Hg)	mg/kg	0.0197	0.0087	<0.0037	0.0037	0.0113	0.0090	<0.0036	0.0036	8490769
Total Molybdenum (Mo)	mg/kg	<0.043	0.043	0.056	0.018	<0.045	0.045	0.033	0.018	8490769
Total Nickel (Ni)	mg/kg	0.262	0.043	7.17	0.018	0.194	0.045	2.43	0.018	8490769
Total Phosphorus (P)	mg/kg	699	8.7	2140	3.7	621	9.0	693	3.6	8490769
Total Potassium (K)	mg/kg	1350	8.7	4430	3.7	1370	9.0	6140	3.6	8490769
Total Selenium (Se)	mg/kg	<0.043	0.043	0.044	0.018	<0.045	0.045	0.109	0.018	8490769
Total Silver (Ag)	mg/kg	0.020	0.017	<0.0073	0.0073	<0.018	0.018	<0.0071	0.0071	8490769
Total Sodium (Na)	mg/kg	<8.7	8.7	4.2	3.7	<9.0	9.0	<3.6	3.6	8490769
Total Strontium (Sr)	mg/kg	2.22	0.087	26.0	0.037	0.700	0.090	22.2	0.036	8490769
Total Thallium (Tl)	mg/kg	<0.0017	0.0017	<0.00073	0.00073	<0.0018	0.0018	<0.00071	0.00071	8490769
Total Tin (Sn)	mg/kg	<0.087	0.087	<0.037	0.037	<0.090	0.090	<0.036	0.036	8490769
Total Titanium (Ti)	mg/kg	0.95	0.87	<0.37	0.37	1.08	0.90	<0.36	0.36	8490769
Total Uranium (U)	mg/kg	0.0048	0.0017	<0.00073	0.00073	0.0026	0.0018	<0.00071	0.00071	8490769
Total Vanadium (V)	mg/kg	<0.17	0.17	<0.073	0.073	<0.18	0.18	<0.071	0.071	8490769
Total Zinc (Zn)	mg/kg	21.9	0.17	33.1	0.073	23.7	0.18	227	0.071	8490769

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9778		PE9779		PE9780		
Sampling Date		2016/08/03		2016/08/03		2016/08/03		
COC Number		08426071		08426070		08426070		
	UNITS	**PA54-HORSE TAIL**	**RDL**	**PA54-SALIX**	**RDL**	**PA74-HORSE TAIL**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	1.11	0.18	2.64	0.37	1.02	0.19	8490769
Total Antimony (Sb)	mg/kg	<0.00091	0.00091	<0.0018	0.0018	0.00140	0.00095	8490769
Total Arsenic (As)	mg/kg	<0.0091	0.0091	<0.018	0.018	<0.0095	0.0095	8490769
Total Barium (Ba)	mg/kg	5.68	0.018	2.08	0.037	5.91	0.019	8490769
Total Beryllium (Be)	mg/kg	<0.018	0.018	<0.037	0.037	<0.019	0.019	8490769
Total Bismuth (Bi)	mg/kg	<0.018	0.018	<0.037	0.037	<0.019	0.019	8490769
Total Boron (B)	mg/kg	2.92	0.36	2.42	0.73	3.30	0.38	8490769
Total Cadmium (Cd)	mg/kg	0.0675	0.0018	1.03	0.0037	0.0462	0.0019	8490769
Total Calcium (Ca)	mg/kg	4230	1.8	2370	3.7	4520	1.9	8490769
Total Chromium (Cr)	mg/kg	<0.036	0.036	<0.073	0.073	<0.038	0.038	8490769
Total Cobalt (Co)	mg/kg	<0.0036	0.0036	0.0523	0.0073	<0.0038	0.0038	8490769
Total Copper (Cu)	mg/kg	0.864	0.0091	0.713	0.018	1.41	0.0095	8490769
Total Iron (Fe)	mg/kg	8.3	1.8	17.6	3.7	8.2	1.9	8490769
Total Lead (Pb)	mg/kg	0.0129	0.0018	0.0263	0.0037	0.0398	0.0019	8490769
Total Magnesium (Mg)	mg/kg	695	1.8	282	3.7	851	1.9	8490769
Total Manganese (Mn)	mg/kg	7.44	0.018	168	0.037	5.71	0.019	8490769
Total Mercury (Hg)	mg/kg	0.0020	0.0018	<0.0037	0.0037	<0.0019	0.0019	8490769
Total Molybdenum (Mo)	mg/kg	0.0617	0.0091	<0.018	0.018	0.0710	0.0095	8490769
Total Nickel (Ni)	mg/kg	0.0489	0.0091	0.115	0.018	0.0447	0.0095	8490769
Total Phosphorus (P)	mg/kg	233	1.8	302	3.7	274	1.9	8490769
Total Potassium (K)	mg/kg	9020	1.8	3410	3.7	9270	1.9	8490769
Total Selenium (Se)	mg/kg	0.0094	0.0091	<0.018	0.018	0.0210	0.0095	8490769
Total Silver (Ag)	mg/kg	<0.0036	0.0036	<0.0073	0.0073	<0.0038	0.0038	8490769
Total Sodium (Na)	mg/kg	11.0	1.8	<3.7	3.7	6.8	1.9	8490769
Total Strontium (Sr)	mg/kg	10.2	0.018	4.89	0.037	9.76	0.019	8490769
Total Thallium (Tl)	mg/kg	<0.00036	0.00036	<0.00073	0.00073	<0.00038	0.00038	8490769
Total Tin (Sn)	mg/kg	<0.018	0.018	<0.037	0.037	0.020	0.019	8490769
Total Titanium (Ti)	mg/kg	<0.18	0.18	<0.37	0.37	<0.19	0.19	8490769
Total Uranium (U)	mg/kg	<0.00036	0.00036	<0.00073	0.00073	0.00040	0.00038	8490769
Total Vanadium (V)	mg/kg	<0.036	0.036	<0.073	0.073	<0.038	0.038	8490769
Total Zinc (Zn)	mg/kg	6.14	0.036	35.6	0.073	5.89	0.038	8490769
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9781		PE9782		PE9783		PE9809		
Sampling Date		2016/08/03		2016/08/03		2016/08/03		2016/08/03		
COC Number		08426070		08426070		08426070		08426070		
	UNITS	**PA55-SALIX**	**RDL**	**PA55-LICHEN**	**RDL**	**PA75-SALIX**	**RDL**	**PA75-LICHEN**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	2.63	0.38	6.20	0.30	3.43	0.33	8.33	0.35	8490769
Total Antimony (Sb)	mg/kg	<0.0019	0.0019	0.0021	0.0015	0.0019	0.0017	0.0031	0.0018	8490769
Total Arsenic (As)	mg/kg	<0.019	0.019	<0.015	0.015	<0.017	0.017	<0.018	0.018	8490769
Total Barium (Ba)	mg/kg	5.79	0.038	1.84	0.030	4.01	0.033	1.84	0.035	8490769
Total Beryllium (Be)	mg/kg	<0.038	0.038	<0.030	0.030	<0.033	0.033	<0.035	0.035	8490769
Total Bismuth (Bi)	mg/kg	<0.038	0.038	<0.030	0.030	<0.033	0.033	<0.035	0.035	8490769
Total Boron (B)	mg/kg	2.51	0.75	1.26	0.59	1.56	0.66	1.49	0.71	8490769
Total Cadmium (Cd)	mg/kg	0.960	0.0038	0.0419	0.0030	0.763	0.0033	0.0434	0.0035	8490769
Total Calcium (Ca)	mg/kg	3440	3.8	418	3.0	3090	3.3	457	3.5	8490769
Total Chromium (Cr)	mg/kg	<0.075	0.075	<0.059	0.059	<0.066	0.066	<0.071	0.071	8490769
Total Cobalt (Co)	mg/kg	0.183	0.0075	0.0109	0.0059	0.157	0.0066	0.0113	0.0071	8490769
Total Copper (Cu)	mg/kg	1.15	0.019	0.410	0.015	1.09	0.017	0.276	0.018	8490769
Total Iron (Fe)	mg/kg	20.7	3.8	13.5	3.0	20.2	3.3	14.9	3.5	8490769
Total Lead (Pb)	mg/kg	0.0146	0.0038	0.0491	0.0030	0.0173	0.0033	0.0464	0.0035	8490769
Total Magnesium (Mg)	mg/kg	768	3.8	98.7	3.0	691	3.3	119	3.5	8490769
Total Manganese (Mn)	mg/kg	20.0	0.038	5.61	0.030	18.9	0.033	6.71	0.035	8490769
Total Mercury (Hg)	mg/kg	<0.0038	0.0038	0.0038	0.0030	<0.0033	0.0033	0.0046	0.0035	8490769
Total Molybdenum (Mo)	mg/kg	0.104	0.019	<0.015	0.015	0.083	0.017	<0.018	0.018	8490769
Total Nickel (Ni)	mg/kg	1.18	0.019	0.064	0.015	0.932	0.017	0.061	0.018	8490769
Total Phosphorus (P)	mg/kg	399	3.8	170	3.0	375	3.3	180	3.5	8490769
Total Potassium (K)	mg/kg	6040	3.8	491	3.0	5690	3.3	473	3.5	8490769
Total Selenium (Se)	mg/kg	0.662	0.019	<0.015	0.015	0.519	0.017	<0.018	0.018	8490769
Total Silver (Ag)	mg/kg	<0.0075	0.0075	<0.0059	0.0059	<0.0066	0.0066	<0.0071	0.0071	8490769
Total Sodium (Na)	mg/kg	<3.8	3.8	5.2	3.0	<3.3	3.3	<3.5	3.5	8490769
Total Strontium (Sr)	mg/kg	7.68	0.038	0.879	0.030	6.40	0.033	0.969	0.035	8490769
Total Thallium (Tl)	mg/kg	<0.00075	0.00075	<0.00059	0.00059	<0.00066	0.00066	<0.00071	0.00071	8490769
Total Tin (Sn)	mg/kg	<0.038	0.038	<0.030	0.030	<0.033	0.033	<0.035	0.035	8490769
Total Titanium (Ti)	mg/kg	<0.38	0.38	<0.30	0.30	<0.33	0.33	0.37	0.35	8490769
Total Uranium (U)	mg/kg	<0.00075	0.00075	0.00060	0.00059	<0.00066	0.00066	<0.00071	0.00071	8490769
Total Vanadium (V)	mg/kg	<0.075	0.075	<0.059	0.059	<0.066	0.066	<0.071	0.071	8490769
Total Zinc (Zn)	mg/kg	44.9	0.075	8.03	0.059	26.8	0.066	8.58	0.071	8490769
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9810		PE9811		PE9812		PE9813		
Sampling Date		2016/08/04		2016/08/04		2016/08/04		2016/08/04		
COC Number		08426070		08426070		08426070		08426070		
	UNITS	**PA56-SALIX**	**RDL**	**PA56-HORSE TAIL**	**RDL**	**PA56-LICHEN**	**RDL**	**PA57-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	2.70	0.26	0.73	0.18	29.6	0.35	4.63	0.36	8490769
Total Antimony (Sb)	mg/kg	<0.0013	0.0013	<0.00088	0.00088	0.0032	0.0018	<0.0018	0.0018	8490769
Total Arsenic (As)	mg/kg	<0.013	0.013	<0.0088	0.0088	0.024	0.018	<0.018	0.018	8490769
Total Barium (Ba)	mg/kg	6.90	0.026	7.48	0.018	2.73	0.035	19.4	0.036	8490769
Total Beryllium (Be)	mg/kg	<0.026	0.026	<0.018	0.018	<0.035	0.035	<0.036	0.036	8490769
Total Bismuth (Bi)	mg/kg	<0.026	0.026	<0.018	0.018	<0.035	0.035	<0.036	0.036	8490769
Total Boron (B)	mg/kg	3.43	0.52	1.77	0.35	1.56	0.70	1.25	0.72	8490769
Total Cadmium (Cd)	mg/kg	5.32	0.0026	0.0994	0.0018	0.0463	0.0035	1.18	0.0036	8490769
Total Calcium (Ca)	mg/kg	4110	2.6	5400	1.8	260	3.5	4030	3.6	8490769
Total Chromium (Cr)	mg/kg	<0.052	0.052	<0.035	0.035	<0.070	0.070	<0.072	0.072	8490769
Total Cobalt (Co)	mg/kg	0.0399	0.0052	0.0141	0.0035	0.0279	0.0070	0.141	0.0072	8490769
Total Copper (Cu)	mg/kg	1.29	0.013	0.783	0.0088	0.324	0.018	1.59	0.018	8490769
Total Iron (Fe)	mg/kg	14.0	2.6	9.2	1.8	32.1	3.5	16.7	3.6	8490769
Total Lead (Pb)	mg/kg	0.0146	0.0026	0.0098	0.0018	0.0928	0.0035	0.0166	0.0036	8490769
Total Magnesium (Mg)	mg/kg	885	2.6	593	1.8	80.0	3.5	1700	3.6	8490769
Total Manganese (Mn)	mg/kg	19.6	0.026	3.60	0.018	30.8	0.035	77.3	0.036	8490769
Total Mercury (Hg)	mg/kg	<0.0026	0.0026	<0.0018	0.0018	0.0083	0.0035	0.0041	0.0036	8490769
Total Molybdenum (Mo)	mg/kg	0.054	0.013	0.0394	0.0088	<0.018	0.018	0.102	0.018	8490769
Total Nickel (Ni)	mg/kg	0.348	0.013	0.0968	0.0088	0.126	0.018	4.37	0.018	8490769
Total Phosphorus (P)	mg/kg	376	2.6	250	1.8	146	3.5	472	3.6	8490769
Total Potassium (K)	mg/kg	4990	2.6	6580	1.8	352	3.5	4260	3.6	8490769
Total Selenium (Se)	mg/kg	0.219	0.013	0.0455	0.0088	<0.018	0.018	0.036	0.018	8490769
Total Silver (Ag)	mg/kg	<0.0052	0.0052	<0.0035	0.0035	0.0121	0.0070	<0.0072	0.0072	8490769
Total Sodium (Na)	mg/kg	<2.6	2.6	11.1	1.8	5.6	3.5	<3.6	3.6	8490769
Total Strontium (Sr)	mg/kg	9.16	0.026	13.8	0.018	0.827	0.035	13.7	0.036	8490769
Total Thallium (Tl)	mg/kg	<0.00052	0.00052	<0.00035	0.00035	0.00230	0.00070	0.00150	0.00072	8490769
Total Tin (Sn)	mg/kg	<0.026	0.026	<0.018	0.018	<0.035	0.035	<0.036	0.036	8490769
Total Titanium (Ti)	mg/kg	<0.26	0.26	<0.18	0.18	1.18	0.35	<0.36	0.36	8490769
Total Uranium (U)	mg/kg	<0.00052	0.00052	0.00070	0.00035	0.0126	0.00070	<0.00072	0.00072	8490769
Total Vanadium (V)	mg/kg	<0.052	0.052	<0.035	0.035	<0.070	0.070	<0.072	0.072	8490769
Total Zinc (Zn)	mg/kg	264	0.052	9.07	0.035	5.98	0.070	26.5	0.072	8490769

RDL = Reportable Detection Limit

Maxxam Job #: B665602
Report Date: 2016/12/05

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC 16-300
Sampler Initials: LK

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9814		PE9815		PE9816		PE9817		
Sampling Date		2016/08/04		2016/08/04		2016/08/04		2016/08/04		
COC Number		08426070		08426070		08426071		08426071		
	UNITS	**PA57-LICHEN**	**RDL**	**PA58-HORSE TAIL**	**RDL**	**PA58-LICHEN**	**RDL**	**PA58-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	17.6	0.39	0.71	0.18	14.3	0.48	1.77	0.40	8490769
Total Antimony (Sb)	mg/kg	0.0042	0.0020	<0.00092	0.00092	0.0027	0.0024	<0.0020	0.0020	8490769
Total Arsenic (As)	mg/kg	0.021	0.020	<0.0092	0.0092	<0.024	0.024	<0.020	0.020	8490769
Total Barium (Ba)	mg/kg	2.00	0.039	9.12	0.018	3.23	0.048	3.98	0.040	8490769
Total Beryllium (Be)	mg/kg	<0.039	0.039	<0.018	0.018	<0.048	0.048	<0.040	0.040	8490769
Total Bismuth (Bi)	mg/kg	<0.039	0.039	<0.018	0.018	<0.048	0.048	<0.040	0.040	8490769
Total Boron (B)	mg/kg	1.29	0.79	2.45	0.37	1.54	0.95	2.64	0.81	8490769
Total Cadmium (Cd)	mg/kg	0.0339	0.0039	0.164	0.0018	0.0504	0.0048	1.50	0.0040	8490769
Total Calcium (Ca)	mg/kg	231	3.9	3050	1.8	573	4.8	3880	4.0	8490769
Total Chromium (Cr)	mg/kg	0.121	0.079	<0.037	0.037	<0.095	0.095	<0.081	0.081	8490769
Total Cobalt (Co)	mg/kg	0.0183	0.0079	0.0174	0.0037	0.0256	0.0095	0.302	0.0081	8490769
Total Copper (Cu)	mg/kg	0.468	0.020	0.933	0.0092	0.566	0.024	0.793	0.020	8490769
Total Iron (Fe)	mg/kg	31.5	3.9	7.2	1.8	27.1	4.8	16.0	4.0	8490769
Total Lead (Pb)	mg/kg	0.0952	0.0039	0.0113	0.0018	0.0552	0.0048	0.0088	0.0040	8490769
Total Magnesium (Mg)	mg/kg	95.6	3.9	927	1.8	228	4.8	1240	4.0	8490769
Total Manganese (Mn)	mg/kg	57.3	0.039	10.2	0.018	92.1	0.048	179	0.040	8490769
Total Mercury (Hg)	mg/kg	0.0055	0.0039	0.0028	0.0018	0.0110	0.0048	<0.0040	0.0040	8490769
Total Molybdenum (Mo)	mg/kg	<0.020	0.020	0.149	0.0092	<0.024	0.024	0.369	0.020	8490769
Total Nickel (Ni)	mg/kg	0.245	0.020	0.0588	0.0092	0.119	0.024	0.227	0.020	8490769
Total Phosphorus (P)	mg/kg	177	3.9	281	1.8	275	4.8	527	4.0	8490769
Total Potassium (K)	mg/kg	410	3.9	7250	1.8	720	4.8	2900	4.0	8490769
Total Selenium (Se)	mg/kg	<0.020	0.020	0.484	0.0092	<0.024	0.024	0.096	0.020	8490769
Total Silver (Ag)	mg/kg	<0.0079	0.0079	0.0142	0.0037	<0.0095	0.0095	<0.0081	0.0081	8490769
Total Sodium (Na)	mg/kg	6.4	3.9	13.4	1.8	5.5	4.8	<4.0	4.0	8490769
Total Strontium (Sr)	mg/kg	0.445	0.039	9.37	0.018	1.15	0.048	9.36	0.040	8490769
Total Thallium (Tl)	mg/kg	<0.00079	0.00079	0.00140	0.00037	<0.00095	0.00095	<0.00081	0.00081	8490769
Total Tin (Sn)	mg/kg	<0.039	0.039	<0.018	0.018	<0.048	0.048	<0.040	0.040	8490769
Total Titanium (Ti)	mg/kg	0.73	0.39	<0.18	0.18	0.78	0.48	<0.40	0.40	8490769
Total Uranium (U)	mg/kg	0.00230	0.00079	<0.00037	0.00037	0.00110	0.00095	<0.00081	0.00081	8490769
Total Vanadium (V)	mg/kg	<0.079	0.079	<0.037	0.037	<0.095	0.095	<0.081	0.081	8490769
Total Zinc (Zn)	mg/kg	9.95	0.079	4.97	0.037	21.1	0.095	37.1	0.081	8490769
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9818			PE9819		PE9820		
Sampling Date		2016/08/04			2016/08/04		2016/08/04		
COC Number		08426071			08426071		08426071		
	UNITS	**PA59-BLUEBERRIES**	**RDL**	**QC Batch**	**PA59-HORSE TAIL**	**RDL**	**PA59-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	0.77	0.20	8391087	0.59	0.22	1.65	0.40	8490769
Total Antimony (Sb)	mg/kg	<0.0010	0.0010	8391087	<0.0011	0.0011	<0.0020	0.0020	8490769
Total Arsenic (As)	mg/kg	<0.0050	0.0050	8391087	<0.011	0.011	<0.020	0.020	8490769
Total Barium (Ba)	mg/kg	1.53	0.010	8391087	6.15	0.022	3.09	0.040	8490769
Total Beryllium (Be)	mg/kg	<0.0020	0.0020	8391087	<0.022	0.022	<0.040	0.040	8490769
Total Bismuth (Bi)	mg/kg	<0.020	0.020	8391087	<0.022	0.022	<0.040	0.040	8490769
Total Boron (B)	mg/kg	1.91	0.40	8391087	3.37	0.43	1.89	0.80	8490769
Total Cadmium (Cd)	mg/kg	0.136	0.0020	8391087	0.133	0.0022	4.45	0.0040	8490769
Total Calcium (Ca)	mg/kg	217	2.0	8391087	5140	2.2	4910	4.0	8490769
Total Chromium (Cr)	mg/kg	<0.010	0.010	8391087	<0.043	0.043	<0.080	0.080	8490769
Total Cobalt (Co)	mg/kg	<0.0040	0.0040	8391087	0.0066	0.0043	0.154	0.0080	8490769
Total Copper (Cu)	mg/kg	0.559	0.010	8391087	1.27	0.011	2.18	0.020	8490769
Total Iron (Fe)	mg/kg	2.4	1.0	8391087	8.4	2.2	14.0	4.0	8490769
Total Lead (Pb)	mg/kg	0.0086	0.0020	8391087	0.0061	0.0022	0.0129	0.0040	8490769
Total Magnesium (Mg)	mg/kg	92.6	2.0	8391087	1720	2.2	2680	4.0	8490769
Total Manganese (Mn)	mg/kg	33.4	0.020	8391087	9.32	0.022	74.9	0.040	8490769
Total Mercury (Hg)	mg/kg	<0.0020	0.0020	8391087	0.0022	0.0022	<0.0040	0.0040	8490769
Total Molybdenum (Mo)	mg/kg	0.156	0.010	8391087	0.326	0.011	0.636	0.020	8490769
Total Nickel (Ni)	mg/kg	0.073	0.010	8391087	0.108	0.011	1.80	0.020	8490769
Total Phosphorus (P)	mg/kg	201	2.0	8391087	416	2.2	642	4.0	8490769
Total Potassium (K)	mg/kg	877	2.0	8391087	4880	2.2	2820	4.0	8490769
Total Selenium (Se)	mg/kg	<0.010	0.010	8391087	1.65	0.011	0.214	0.020	8490769
Total Silver (Ag)	mg/kg	<0.0040	0.0040	8391087	<0.0043	0.0043	<0.0080	0.0080	8490769
Total Sodium (Na)	mg/kg	2.2	2.0	8391087	11.7	2.2	<4.0	4.0	8490769
Total Strontium (Sr)	mg/kg	0.306	0.010	8391087	12.7	0.022	11.7	0.040	8490769
Total Thallium (Tl)	mg/kg	<0.00040	0.00040	8391087	0.0685	0.00043	0.00080	0.00080	8490769
Total Tin (Sn)	mg/kg	0.103	0.020	8391087	<0.022	0.022	<0.040	0.040	8490769
Total Titanium (Ti)	mg/kg	<0.050	0.050	8391087	<0.22	0.22	<0.40	0.40	8490769
Total Uranium (U)	mg/kg	0.00072	0.00040	8391087	<0.00043	0.00043	<0.00080	0.00080	8490769
Total Vanadium (V)	mg/kg	<0.020	0.020	8391087	<0.043	0.043	<0.080	0.080	8490769
Total Zinc (Zn)	mg/kg	3.95	0.040	8391087	13.4	0.043	91.5	0.080	8490769

RDL = Reportable Detection Limit

Maxxam Job #: B665602
Report Date: 2016/12/05

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC 16-300
Sampler Initials: LK

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9821			PE9822			PE9823		
Sampling Date		2016/08/04			2016/08/04			2016/08/04		
COC Number		08426071			08426071			08426071		
	UNITS	**PA59-LICHEN**	**RDL**	**QC Batch**	**PA60-BLUEBERRIES**	**RDL**	**QC Batch**	**PA60-SALIX**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	15.5	0.55	8490769	0.89	0.20	8391087	1.53	0.38	8490769
Total Antimony (Sb)	mg/kg	0.0034	0.0027	8490769	<0.0010	0.0010	8391087	<0.0019	0.0019	8490769
Total Arsenic (As)	mg/kg	<0.027	0.027	8490769	<0.0050	0.0050	8391087	<0.019	0.019	8490769
Total Barium (Ba)	mg/kg	0.927	0.055	8490769	1.44	0.010	8391087	11.1	0.038	8490769
Total Beryllium (Be)	mg/kg	<0.055	0.055	8490769	<0.0020	0.0020	8391087	<0.038	0.038	8490769
Total Bismuth (Bi)	mg/kg	<0.055	0.055	8490769	<0.020	0.020	8391087	<0.038	0.038	8490769
Total Boron (B)	mg/kg	2.4	1.1	8490769	2.51	0.40	8391087	2.21	0.76	8490769
Total Cadmium (Cd)	mg/kg	0.168	0.0055	8490769	0.0665	0.0020	8391087	1.64	0.0038	8490769
Total Calcium (Ca)	mg/kg	309	5.5	8490769	177	2.0	8391087	5760	3.8	8490769
Total Chromium (Cr)	mg/kg	<0.11	0.11	8490769	<0.010	0.010	8391087	<0.076	0.076	8490769
Total Cobalt (Co)	mg/kg	0.012	0.011	8490769	<0.0040	0.0040	8391087	0.0688	0.0076	8490769
Total Copper (Cu)	mg/kg	0.460	0.027	8490769	0.670	0.010	8391087	1.25	0.019	8490769
Total Iron (Fe)	mg/kg	24.5	5.5	8490769	2.7	1.0	8391087	13.5	3.8	8490769
Total Lead (Pb)	mg/kg	0.0750	0.0055	8490769	0.0080	0.0020	8391087	0.0109	0.0038	8490769
Total Magnesium (Mg)	mg/kg	150	5.5	8490769	78.7	2.0	8391087	2130	3.8	8490769
Total Manganese (Mn)	mg/kg	17.2	0.055	8490769	16.6	0.020	8391087	49.5	0.038	8490769
Total Mercury (Hg)	mg/kg	0.0096	0.0055	8490769	<0.0020	0.0020	8391087	<0.0038	0.0038	8490769
Total Molybdenum (Mo)	mg/kg	<0.027	0.027	8490769	0.024	0.010	8391087	0.076	0.019	8490769
Total Nickel (Ni)	mg/kg	0.098	0.027	8490769	0.074	0.010	8391087	0.845	0.019	8490769
Total Phosphorus (P)	mg/kg	221	5.5	8490769	165	2.0	8391087	326	3.8	8490769
Total Potassium (K)	mg/kg	631	5.5	8490769	1180	2.0	8391087	2380	3.8	8490769
Total Selenium (Se)	mg/kg	<0.027	0.027	8490769	<0.010	0.010	8391087	0.082	0.019	8490769
Total Silver (Ag)	mg/kg	<0.011	0.011	8490769	<0.0040	0.0040	8391087	<0.0076	0.0076	8490769
Total Sodium (Na)	mg/kg	<5.5	5.5	8490769	<2.0	2.0	8391087	<3.8	3.8	8490769
Total Strontium (Sr)	mg/kg	0.676	0.055	8490769	0.319	0.010	8391087	14.4	0.038	8490769
Total Thallium (Tl)	mg/kg	<0.0011	0.0011	8490769	<0.00040	0.00040	8391087	<0.00076	0.00076	8490769
Total Tin (Sn)	mg/kg	<0.055	0.055	8490769	0.075	0.020	8391087	<0.038	0.038	8490769
Total Titanium (Ti)	mg/kg	<0.55	0.55	8490769	<0.050	0.050	8391087	<0.38	0.38	8490769
Total Uranium (U)	mg/kg	<0.0011	0.0011	8490769	<0.00040	0.00040	8391087	<0.00076	0.00076	8490769
Total Vanadium (V)	mg/kg	<0.11	0.11	8490769	<0.020	0.020	8391087	<0.076	0.076	8490769
Total Zinc (Zn)	mg/kg	9.30	0.11	8490769	4.46	0.040	8391087	80.0	0.076	8490769
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE (PLANT))

Maxxam ID		PE9824		
Sampling Date		2016/08/04		
COC Number		08426071		
	UNITS	**PA60-LICHEN**	**RDL**	**QC Batch**
Total Metals by ICPMS				
Total Aluminum (Al)	mg/kg	16.3	0.64	8490769
Total Antimony (Sb)	mg/kg	<0.0032	0.0032	8490769
Total Arsenic (As)	mg/kg	<0.032	0.032	8490769
Total Barium (Ba)	mg/kg	1.75	0.064	8490769
Total Beryllium (Be)	mg/kg	<0.064	0.064	8490769
Total Bismuth (Bi)	mg/kg	<0.064	0.064	8490769
Total Boron (B)	mg/kg	2.5	1.3	8490769
Total Cadmium (Cd)	mg/kg	0.215	0.0064	8490769
Total Calcium (Ca)	mg/kg	392	6.4	8490769
Total Chromium (Cr)	mg/kg	<0.13	0.13	8490769
Total Cobalt (Co)	mg/kg	0.023	0.013	8490769
Total Copper (Cu)	mg/kg	0.601	0.032	8490769
Total Iron (Fe)	mg/kg	24.6	6.4	8490769
Total Lead (Pb)	mg/kg	0.0566	0.0064	8490769
Total Magnesium (Mg)	mg/kg	151	6.4	8490769
Total Manganese (Mn)	mg/kg	16.3	0.064	8490769
Total Mercury (Hg)	mg/kg	0.0083	0.0064	8490769
Total Molybdenum (Mo)	mg/kg	<0.032	0.032	8490769
Total Nickel (Ni)	mg/kg	0.111	0.032	8490769
Total Phosphorus (P)	mg/kg	338	6.4	8490769
Total Potassium (K)	mg/kg	975	6.4	8490769
Total Selenium (Se)	mg/kg	0.054	0.032	8490769
Total Silver (Ag)	mg/kg	<0.013	0.013	8490769
Total Sodium (Na)	mg/kg	7.3	6.4	8490769
Total Strontium (Sr)	mg/kg	0.932	0.064	8490769
Total Thallium (Tl)	mg/kg	<0.0013	0.0013	8490769
Total Tin (Sn)	mg/kg	0.064	0.064	8490769
Total Titanium (Ti)	mg/kg	<0.64	0.64	8490769
Total Uranium (U)	mg/kg	0.0013	0.0013	8490769
Total Vanadium (V)	mg/kg	<0.13	0.13	8490769
Total Zinc (Zn)	mg/kg	13.1	0.13	8490769

RDL = Reportable Detection Limit

PHYSICAL TESTING (TISSUE (PLANT))

Maxxam ID		PE8994	PE8995	PE8996	PE8997	PE8998	PE8999		
Sampling Date		2016/07/31	2016/07/31	2016/08/01	2016/08/01	2016/08/01	2016/08/01		
COC Number		08426071	08426071	08426071	08426071	08426071	08426071		
	UNITS	**PA42-HORSE TAIL**	**PA42-SALIX**	**PA51-LICHEN**	**PA51-SALIX**	**PA51-BB**	**PA52-LICHEN**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	79	66	45	66	87	26	0.30	8390388
RDL = Reportable Detection Limit									

Maxxam ID		PE9000	PE9001	PE9002	PE9776	PE9777	PE9778		
Sampling Date		2016/08/01	2016/08/02	2016/08/02	2016/08/02	2016/08/02	2016/08/03		
COC Number		08426071	08426071	08426071	08426071	08426071	08426071		
	UNITS	**PA52-SALIX**	**PA45-LICHEN**	**PA45-SALIX**	**PA53-LICHEN**	**PA53-SALIX**	**PA54-HORSE TAIL**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	61	13	64	10	65	82	0.30	8390388
RDL = Reportable Detection Limit									

Maxxam ID		PE9779	PE9780	PE9781	PE9782	PE9783	PE9809		
Sampling Date		2016/08/03	2016/08/03	2016/08/03	2016/08/03	2016/08/03	2016/08/03		
COC Number		08426070	08426070	08426070	08426070	08426070	08426070		
	UNITS	**PA54-SALIX**	**PA74-HORSE TAIL**	**PA55-SALIX**	**PA55-LICHEN**	**PA75-SALIX**	**PA75-LICHEN**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	63	81	62	70	67	65	0.30	8390388
RDL = Reportable Detection Limit									

Maxxam ID		PE9810	PE9811		PE9812	PE9813	PE9814		
Sampling Date		2016/08/04	2016/08/04		2016/08/04	2016/08/04	2016/08/04		
COC Number		08426070	08426070		08426070	08426070	08426070		
	UNITS	**PA56-SALIX**	**PA56-HORSE TAIL**	**QC Batch**	**PA56-LICHEN**	**PA57-SALIX**	**PA57-LICHEN**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	74	82	8390388	65	64	61	0.30	8390391
RDL = Reportable Detection Limit									

Maxxam ID		PE9815	PE9816	PE9817	PE9818	PE9819		
Sampling Date		2016/08/04	2016/08/04	2016/08/04	2016/08/04	2016/08/04		
COC Number		08426070	08426071	08426071	08426071	08426071		
	UNITS	**PA58-HORSE TAIL**	**PA58-LICHEN**	**PA58-SALIX**	**PA59-BLUEBERRIES**	**PA59-HORSE TAIL**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	82	53	60	91	78	0.30	8390391
RDL = Reportable Detection Limit								

PHYSICAL TESTING (TISSUE (PLANT))

Maxxam ID		PE9820	PE9821	PE9822	PE9823	PE9824		
Sampling Date		2016/08/04	2016/08/04	2016/08/04	2016/08/04	2016/08/04		
COC Number		08426071	08426071	08426071	08426071	08426071		
	UNITS	**PA59-SALIX**	**PA59-LICHEN**	**PA60-BLUEBERRIES**	**PA60-SALIX**	**PA60-LICHEN**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	60	45	84	62	36	0.30	8390391

RDL = Reportable Detection Limit

TEST SUMMARY

Maxxam ID: PE8994
Sample ID: PA42-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE8994 Dup
Sample ID: PA42-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith

Maxxam ID: PE8995
Sample ID: PA42-SALIX
Matrix: Tissue (Plant)

Collected: 2016/07/31
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE8996
Sample ID: PA51-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE8997
Sample ID: PA51-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE8998
Sample ID: PA51-BB
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	8489373	2016/12/02	2016/12/02	David Huang
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8391087	2016/09/08	2016/09/08	John Choo
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

TEST SUMMARY

Maxxam ID: PE8998 Dup
Sample ID: PA51-BB
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8391087	2016/09/08	2016/09/08	John Choo

Maxxam ID: PE8999
Sample ID: PA52-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9000
Sample ID: PA52-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/01
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9001
Sample ID: PA45-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9002
Sample ID: PA45-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9776
Sample ID: PA53-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

TEST SUMMARY

Maxxam ID: PE9777
Sample ID: PA53-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/02
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9778
Sample ID: PA54-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9779
Sample ID: PA54-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9780
Sample ID: PA74-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9781
Sample ID: PA55-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9782
Sample ID: PA55-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith

TEST SUMMARY

Maxxam ID: PE9782
Sample ID: PA55-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9783
Sample ID: PA75-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9809
Sample ID: PA75-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/03
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9810
Sample ID: PA56-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9811
Sample ID: PA56-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9811 Dup
Sample ID: PA56-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture in Tissue	BAL/BAL	8390388	N/A	2016/09/08	Cyrhea Goda

TEST SUMMARY

Maxxam ID: PE9812
Sample ID: PA56-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383260	2016/08/31	2016/09/02	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/02	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9813
Sample ID: PA57-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9813 Dup
Sample ID: PA57-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith

Maxxam ID: PE9814
Sample ID: PA57-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9815
Sample ID: PA58-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9816
Sample ID: PA58-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

TEST SUMMARY

Maxxam ID: PE9817
Sample ID: PA58-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9818
Sample ID: PA59-BLUEBERRIES
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	8489373	2016/12/02	2016/12/02	David Huang
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8391087	2016/09/08	2016/09/08	John Choo
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9819
Sample ID: PA59-HORSE TAIL
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9820
Sample ID: PA59-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9821
Sample ID: PA59-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9822
Sample ID: PA60-BLUEBERRIES
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	8489373	2016/12/02	2016/12/02	David Huang

TEST SUMMARY

Maxxam ID: PE9822
Sample ID: PA60-BLUEBERRIES
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8391087	2016/09/08	2016/09/08	John Choo
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9823
Sample ID: PA60-SALIX
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9824
Sample ID: PA60-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8383265	2016/08/31	2016/09/03	Gary Smith
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490769	2016/08/29	2016/09/03	David Huang
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

Maxxam ID: PE9824 Dup
Sample ID: PA60-LICHEN
Matrix: Tissue (Plant)

Collected: 2016/08/04
Shipped:
Received: 2016/08/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture in Tissue	BAL/BAL	8390391	N/A	2016/09/08	Cyrhea Goda

GENERAL COMMENTS

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

Package 1	9.0°C

Revised Report V2 (M_S, 2016/12/05): Revised reportable parameters as per client request.

Results relate only to the items tested.

Maxxam Job #: B665602
Report Date: 2016/12/05

QUALITY ASSURANCE REPORT

ALEXCO ENVIRONMENTAL GROUP INC.
Client Project #: BMC 16-300
Sampler Initials: LK

			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**
8383260	Total Aluminum (Al)	2016/09/02					<1.0	mg/kg	NC	35	44	17 - 93
8383260	Total Antimony (Sb)	2016/09/02	106	75 - 125	107	75 - 125	<0.0050	mg/kg	NC	35		
8383260	Total Arsenic (As)	2016/09/02	92	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	94	42 - 199
8383260	Total Barium (Ba)	2016/09/02	NC	75 - 125	117	75 - 125	<0.10	mg/kg	5.9	35		
8383260	Total Beryllium (Be)	2016/09/02	104	75 - 125	105	75 - 125	<0.10	mg/kg	NC	35		
8383260	Total Bismuth (Bi)	2016/09/02					<0.10	mg/kg	NC	35		
8383260	Total Boron (B)	2016/09/02					<2.0	mg/kg	1.4	35	105	75 - 125
8383260	Total Cadmium (Cd)	2016/09/02	97	75 - 125	102	75 - 125	<0.010	mg/kg	3.0	35	100	75 - 125
8383260	Total Calcium (Ca)	2016/09/02					<10	mg/kg	5.8	35	97	75 - 125
8383260	Total Chromium (Cr)	2016/09/02	87	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
8383260	Total Cobalt (Co)	2016/09/02	89	75 - 125	103	75 - 125	<0.020	mg/kg	NC	35	83	75 - 125
8383260	Total Copper (Cu)	2016/09/02	NC	75 - 125	103	75 - 125	<0.050	mg/kg	4.1	35	89	75 - 125
8383260	Total Iron (Fe)	2016/09/02					<10	mg/kg	NC	35		
8383260	Total Lead (Pb)	2016/09/02	92	75 - 125	104	75 - 125	<0.010	mg/kg	NC	35		
8383260	Total Magnesium (Mg)	2016/09/02					<10	mg/kg	4.5	35		
8383260	Total Manganese (Mn)	2016/09/02	NC	75 - 125	106	75 - 125	<0.10	mg/kg	4.8	35	96	75 - 125
8383260	Total Mercury (Hg)	2016/09/02	111	75 - 125	109	75 - 125	<0.010	mg/kg	NC	35	107	75 - 125
8383260	Total Molybdenum (Mo)	2016/09/02	101	75 - 125	104	75 - 125	<0.050	mg/kg	5.9	35		
8383260	Total Nickel (Ni)	2016/09/02	86	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	77	75 - 125
8383260	Total Phosphorus (P)	2016/09/02					<10	mg/kg	3.3	35	115	75 - 125
8383260	Total Potassium (K)	2016/09/02					<10	mg/kg	3.6	35	101	75 - 125
8383260	Total Selenium (Se)	2016/09/02	96	75 - 125	104	75 - 125	<0.050	mg/kg	2.9	35	114	75 - 125
8383260	Total Silver (Ag)	2016/09/02	74 (1)	75 - 125	87	75 - 125	<0.020	mg/kg	NC	35		
8383260	Total Sodium (Na)	2016/09/02					<10	mg/kg	2.5	35	98	75 - 125
8383260	Total Strontium (Sr)	2016/09/02	NC	75 - 125	101	75 - 125	<0.10	mg/kg	3.0	35	101	75 - 125
8383260	Total Thallium (Tl)	2016/09/02	97	75 - 125	93	75 - 125	<0.0020	mg/kg	NC	35		
8383260	Total Tin (Sn)	2016/09/02	90	75 - 125	103	75 - 125	<0.10	mg/kg	NC	35		
8383260	Total Titanium (Ti)	2016/09/02	106	75 - 125	106	75 - 125	<1.0	mg/kg	NC	35		
8383260	Total Uranium (U)	2016/09/02	96	75 - 125	105	75 - 125	<0.0020	mg/kg	NC	35		
8383260	Total Vanadium (V)	2016/09/02	91	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
8383260	Total Zinc (Zn)	2016/09/02	NC	75 - 125	104	75 - 125	<0.20	mg/kg	2.0	35	96	75 - 125

			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
8383265	Total Aluminum (Al)	2016/09/03					<1.0	mg/kg	16	35	43	17 - 93
8383265	Total Antimony (Sb)	2016/09/03	105	75 - 125	106	75 - 125	<0.0050	mg/kg	NC	35		
8383265	Total Arsenic (As)	2016/09/03	101	75 - 125	105	75 - 125	<0.050	mg/kg	NC	35	99	42 - 199
8383265	Total Barium (Ba)	2016/09/03	NC	75 - 125	120	75 - 125	<0.10	mg/kg	10	35		
8383265	Total Beryllium (Be)	2016/09/03	103	75 - 125	105	75 - 125	<0.10	mg/kg	NC	35		
8383265	Total Bismuth (Bi)	2016/09/03					<0.10	mg/kg	NC	35		
8383265	Total Boron (B)	2016/09/03					<2.0	mg/kg	NC	35	112	75 - 125
8383265	Total Cadmium (Cd)	2016/09/03	NC	75 - 125	103	75 - 125	<0.010	mg/kg	6.0	35	108	75 - 125
8383265	Total Calcium (Ca)	2016/09/03					<10	mg/kg	7.5	35	113	75 - 125
8383265	Total Chromium (Cr)	2016/09/03	106	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
8383265	Total Cobalt (Co)	2016/09/03	109	75 - 125	102	75 - 125	<0.020	mg/kg	10	35	101	75 - 125
8383265	Total Copper (Cu)	2016/09/03	NC	75 - 125	103	75 - 125	<0.050	mg/kg	12	35	105	75 - 125
8383265	Total Iron (Fe)	2016/09/03					<10	mg/kg	NC	35		
8383265	Total Lead (Pb)	2016/09/03	99	75 - 125	104	75 - 125	<0.010	mg/kg	NC	35		
8383265	Total Magnesium (Mg)	2016/09/03					<10	mg/kg	10	35		
8383265	Total Manganese (Mn)	2016/09/03	NC	75 - 125	103	75 - 125	<0.10	mg/kg	12	35	107	75 - 125
8383265	Total Mercury (Hg)	2016/09/03	112	75 - 125	112	75 - 125	0.013, RDL=0.010	mg/kg	NC	35	91	75 - 125
8383265	Total Molybdenum (Mo)	2016/09/03	109	75 - 125	104	75 - 125	<0.050	mg/kg	6.9	35		
8383265	Total Nickel (Ni)	2016/09/03	NC	75 - 125	103	75 - 125	<0.050	mg/kg	11	35	94	75 - 125
8383265	Total Phosphorus (P)	2016/09/03					<10	mg/kg	12	35	122	75 - 125
8383265	Total Potassium (K)	2016/09/03					<10	mg/kg	12	35	113	75 - 125
8383265	Total Selenium (Se)	2016/09/03	110	75 - 125	104	75 - 125	<0.050	mg/kg	NC	35	120	75 - 125
8383265	Total Silver (Ag)	2016/09/03	85	75 - 125	87	75 - 125	<0.020	mg/kg	NC	35		
8383265	Total Sodium (Na)	2016/09/03					<10	mg/kg	NC	35	115	75 - 125
8383265	Total Strontium (Sr)	2016/09/03	NC	75 - 125	98	75 - 125	<0.10	mg/kg	6.2	35	114	75 - 125
8383265	Total Thallium (Tl)	2016/09/03	109	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
8383265	Total Tin (Sn)	2016/09/03	99	75 - 125	103	75 - 125	<0.10	mg/kg	NC	35		
8383265	Total Titanium (Ti)	2016/09/03	104	75 - 125	110	75 - 125	<1.0	mg/kg	NC	35		
8383265	Total Uranium (U)	2016/09/03	102	75 - 125	103	75 - 125	<0.0020	mg/kg	NC	35		
8383265	Total Vanadium (V)	2016/09/03	113	75 - 125	101	75 - 125	<0.20	mg/kg	NC	35		

QUALITY ASSURANCE REPORT(CONT'D)

			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
8383265	Total Zinc (Zn)	2016/09/03	NC	75 - 125	103	75 - 125	<0.20	mg/kg	9.7	35	108	75 - 125
8390388	Moisture	2016/09/08					<0.30	%	1.4	20		
8390391	Moisture	2016/09/08					<0.30	%	0	20		
8391087	Total Aluminum (Al)	2016/09/08					<0.20	mg/kg	NC	35		
8391087	Total Antimony (Sb)	2016/09/08	106	75 - 125	103	75 - 125	<0.0010	mg/kg	NC	35		
8391087	Total Arsenic (As)	2016/09/08	110	75 - 125	107	75 - 125	<0.0050	mg/kg	NC	35	104	75 - 125
8391087	Total Barium (Ba)	2016/09/08	NC	75 - 125	109	75 - 125	<0.010	mg/kg	1.5	35		
8391087	Total Beryllium (Be)	2016/09/08	112	75 - 125	107	75 - 125	<0.0020	mg/kg	NC	35		
8391087	Total Bismuth (Bi)	2016/09/08					<0.020	mg/kg	NC	35		
8391087	Total Boron (B)	2016/09/08					<0.40	mg/kg	NC	35		
8391087	Total Cadmium (Cd)	2016/09/08	105	75 - 125	102	75 - 125	<0.0020	mg/kg	5.2	35	105	75 - 125
8391087	Total Calcium (Ca)	2016/09/08					<2.0	mg/kg	5.8	35		
8391087	Total Chromium (Cr)	2016/09/08	105	75 - 125	100	75 - 125	<0.010	mg/kg	NC	35	83	75 - 125
8391087	Total Cobalt (Co)	2016/09/08	105	75 - 125	101	75 - 125	<0.0040	mg/kg	NC	35		
8391087	Total Copper (Cu)	2016/09/08	NC	75 - 125	102	75 - 125	<0.010	mg/kg	9.5	35	97	75 - 125
8391087	Total Iron (Fe)	2016/09/08					<1.0	mg/kg	NC	35	102	75 - 125
8391087	Total Lead (Pb)	2016/09/08	97	75 - 125	100	75 - 125	<0.0020	mg/kg	NC	35	64 (2)	75 - 125
8391087	Total Magnesium (Mg)	2016/09/08					<2.0	mg/kg	1.6	35		
8391087	Total Manganese (Mn)	2016/09/08	NC	75 - 125	104	75 - 125	<0.020	mg/kg	4.1	35		
8391087	Total Mercury (Hg)	2016/09/08	104	75 - 125	113	75 - 125	0.0033, RDL=0.0020	mg/kg	NC	35	106	75 - 125
8391087	Total Molybdenum (Mo)	2016/09/08	104	75 - 125	104	75 - 125	<0.010	mg/kg	NC	35		
8391087	Total Nickel (Ni)	2016/09/08	105	75 - 125	98	75 - 125	<0.010	mg/kg	NC	35	89	75 - 125
8391087	Total Phosphorus (P)	2016/09/08					<2.0	mg/kg	12	35		
8391087	Total Potassium (K)	2016/09/08					<2.0	mg/kg	1.7	35		
8391087	Total Selenium (Se)	2016/09/08	105	75 - 125	101	75 - 125	<0.010	mg/kg	NC	35	106	75 - 125
8391087	Total Silver (Ag)	2016/09/08	90	75 - 125	94	75 - 125	<0.0040	mg/kg	NC	35		
8391087	Total Sodium (Na)	2016/09/08					<2.0	mg/kg	NC	35		
8391087	Total Strontium (Sr)	2016/09/08	NC	75 - 125	101	75 - 125	<0.010	mg/kg	12	35		
8391087	Total Thallium (Tl)	2016/09/08	106	75 - 125	103	75 - 125	<0.00040	mg/kg	NC	35		
8391087	Total Tin (Sn)	2016/09/08	111	75 - 125	96	75 - 125	<0.020	mg/kg	NC	35		

			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
8391087	Total Titanium (Ti)	2016/09/08	108	75 - 125	101	75 - 125	<0.050	mg/kg	NC	35		
8391087	Total Uranium (U)	2016/09/08	98	75 - 125	99	75 - 125	<0.00040	mg/kg	NC	35		
8391087	Total Vanadium (V)	2016/09/08	107	75 - 125	100	75 - 125	<0.020	mg/kg	NC	35		
8391087	Total Zinc (Zn)	2016/09/08	NC	75 - 125	105	75 - 125	<0.040	mg/kg	6.1	35	103	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.

(2) Reference Material outside acceptance criteria (10% of analytes failure allowed).

VALIDATION SIGNATURE PAGE

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

Andy Lu, Ph.D., P.Chem., Scientific Specialist

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

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

Maxxam
Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF ___

LAB USE ONLY
MAXXAM JOB #

ANALYSIS REC

08426070

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: BMC 16-300 Soils and Vegetation

COMPANY ADDRESS:
#3 Calcite Business Center
151 Industrial Rd.
Whitehorse, YT
Y1A 2V3

TEL.: 867-668-6463 x223
E-MAIL: kwoloshyn@accessconsulting.ca
nichole@accessconsulting.ca
FAX: 867-667-6680

SAMPLER NAME (PRINT): LK, MH

PROJECT MANAGER: Kai Woloshyn

LABORATORY CONTACT:

LAB USE ONLY

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	MATRIX: GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	SAMPLING: DATE DD/MM/YY	TIME	# CONTAINERS	ICP Metals	Wet and Dry Weights	%moisture
1	PA54-Salix						X	03/08/16		1	X	X	X
2	PA 74-horsetail						X	03/08/16		1	X	X	X
3	PA55-Salix						X	03/08/16		1	X	X	X
4	PA55 - lichen						X	03/08/16		1	X	X	X
5	PA 75 - Salix						X	03/08/16		1	X	X	X
6	PA 75 - lichen						X	03/08/16		1	X	X	X
7	PA56- Salix						X	04/08/16		1	X	X	X
8	PA 56 - horsetail						X	04/08/16		1	X	X	X
9	PA 56 - lichen						X	04/08/16		1	X	X	X
10	PA 57 - Salix						X	04/08/16		1	X	X	X
11	PA 57 - lichen						X	04/08/16		1	X	X	X
12	PA 58 - horsetail						X	04/08/16		1	X	X	X

B665602_COC

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

STANDARD	5 BUSINESS DAYS	X
RUSH	3 BUSINESS DAYS	
RUSH	2 BUSINESS DAYS	
URGENT	1 BUSINESS DAY	

OTHER BUSINESS DAYS ______

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

☐ CCME
☐ CSR
☐ AB TIER 1
☐ OTHER

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 6, 6, 7 CS:MA
DUE DATE:
LOG IN CHECK:

RELINQUINSHED BY SAMPLER: L Knight	DATE: DD/MM/YY	TIME:	RECEIVED BY:
RELINQUINSHED BY:	DATE: DD/MM/YY	TIME:	RECEIVED BY:
RELINQUINSHED BY:	DATE: DD/MM/YY	TIME:	RECEIVED BY LABORATORY: Laurel Berthier 2016/08/08 09:50

CUSTODY RECORD

COCFORM - BC - 20070822

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF ___

LAB USE ONLY
MAXXAM JOB # B665602

ANALYSIS RE(

08426069

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: BMC 16-300 Soils and Vegetation

COMPANY ADDRESS:
#3 Calcite Business Center
151 Industrial Rd.
Whitehorse, YT
Y1A 2V3

TEL.: 867-668-6463 x223

E-MAIL: kwoloshyn@accessconsulting.ca
nichole@accessconsulting.ca

FAX: 867-667-6680

SAMPLER NAME (PRINT): LK, MH

PROJECT MANAGER: Kai Woloshyn

LABORATORY CONTACT:

LAB USE ONLY

RECEVIED IN WHITEHORSE
BY: @ 1251
2016 -08- 05
TEMP: 11 / 8 / 8

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	MATRIX GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	SAMPLING DATE DD/MM/YY	TIME	# CONTAINERS	ICP Metals	Wet and Dry Weights	%moisture
1	PA42 - horse tail						X	31/07/16		1	X	X	X
2	PA 42 - Salix						X	31/07/16		1	X	X	X
3	PA51 - lichen						X	01/08/16		1	X	X	X
4	PA51 - Salix						X	01/08/16		1	X	X	X
5	PA 51 - BB						X	01/08/16		1	X	X	X
6	PA52 - Lichen						X	01/08/16		1	X	X	X
7	PA52 - Salix						X	01/08/16		1	X	X	X
8	PA 45 - Lichen						X	02/08/16		1	X	X	X
9	PA 45 - Salix						X	02/08/16		1	X	X	X
10	PA53 - lichen						X	02/08/16		1	X	X	X
11	PA53 - Salix						X	02/08/16		1	X	X	X
12	PA 54 - Horsetail						X	03/08/16		1	X	X	X

B665602_COC

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory
STANDARD 5 BUSINESS DAYS ☒
RUSH 3 BUSINESS DAYS ☐
RUSH 2 BUSINESS DAYS ☐
URGENT 1 BUSINESS DAY ☐
OTHER BUSINESS DAYS ___

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

☐ CCME
☐ CSR
☐ AB TIER 1
☐ OTHER

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 6,6,7 CS:NA
DUE DATE:
LOG IN CHECK:

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

RELINQUISHED BY SAMPLER: L Knight
DATE: DD/MM/YY Aug/5/16
TIME: 12:57
RECEIVED BY:

RELINQUISHED BY:
DATE: DD/MM/YY
TIME:
RECEIVED BY:

RELINQUISHED BY:
DATE: DD/MM/YY
TIME:
RECEIVED BY LABORATORY: Laurel Kathner 2016/08/08 09:50

CUSTODY RECORD

COCFORM - BC - 20070822

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Burnaby, BC V5A 4N5
www.maxxamanalytics.com

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CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF __

LAB USE ONLY
MAXXAM JOB #
B665602

ANALYSIS RE
08426071

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: BMC 16-300 Soils and Vegetation

COMPANY ADDRESS:
#3 Calcite Business Center
151 Industrial Rd.
Whitehorse, YT
Y1A 2V3

TEL.: 867-668-6463 x223
E-MAIL: kwoloshyn@accessconsulting.ca
nichole@accessconsulting.ca
FAX: 867-667-6680

SAMPLER NAME (PRINT): LK, MH

PROJECT MANAGER: Kai Woloshyn

LABORATORY CONTACT:

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	MATRIX					SAMPLING		# CONTAINERS	ICP Metals	Wet and Dry Weights	%moisture
			GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME				
1	PA58-lichen						X	04/08/16		1	X	X	X
2	PA58 - Salix						X	04/08/16		1	X	X	X
3	PA59 - blueberries						X	04/08/16		1	X	X	X
4	PA59 - horsetail						X	04/08/16		1	X	X	X
5	PA59- Salix						X	04/08/16		1	X	X	X
6	PA59- lichen						X	04/08/16		1	X	X	X
7	PA60 - BBlue berries						X	04/08/16		1	X	X	X
8	PA60- Salix						X	04/08/16		1	X	X	X
9	PA60 - lichen						X	04/09/16		1	X	X	X
10							X			1	X	X	X
11							X			1	X	X	X
12							X			1	X	X	X

LAB USE ONLY

B665602_COC

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

TANDARD	5 BUSINESS DAYS	X
USH	3 BUSINESS DAYS	
USH	2 BUSINESS DAYS	
RGENT	1 BUSINESS DAY	

THER BUSINESS DAYS ______

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

☐ CCME
☐ CSR
☐ AB TIER 1
☐ OTHER

LAB USE ONLY

ARRIVAL TEMPERATURE °C: 6,6,7 CS:NA

DUE DATE:

LOG IN CHECK:

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

RELINQUINSHED BY SAMPLER: L Knight

DATE: DD/MM/YY

TIME:

RECEIVED BY:

RELINQUINSHED BY:

DATE: DD/MM/YY

TIME:

RECEIVED BY:

RELINQUINSHED BY:

DATE: DD/MM/YY

TIME:

RECEIVED BY LABORATORY: Laurel Beattie 2016/08/08 09:50

CUSTODY RECORD

COCFORM - BC - 20070822

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

Attention:KAI WOLOSHYN
ALEXCO ENVIRONMENTAL GROUP INC.
Unit 3 Calcite Business Centre
151 Industrial Road
WHITEHORSE, YT
Canada Y1A 2V3

Your C.O.C. #: 08412624, 08412625, 08412627, 08412626

Report Date: 2016/12/05
Report #: R2311636
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B567723
Received: 2015/08/07, 13:45

Sample Matrix: VEGETATION
Samples Received: 36

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements in Tissue by CRC ICPMS - Dry Wt	13	2015/08/11	2015/08/14	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	20	2015/08/11	2015/08/17	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	3	2015/08/11	2015/08/20	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS - Tissue Wet Wt	33	2015/08/10	2015/08/17	BBY7SOP-00021,	BCLM2005,EPA6020bR2m
Moisture in Tissue	33	N/A	2015/08/25	BBY8SOP-00017	OMOE E3139 3.1 m

Sample Matrix: TISSUE
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by CRC ICPMS - Tissue Dry Wt	4	2015/08/07	2015/08/17	BBY WI-00033	Auto Calc
Elements by CRC ICPMS - Tissue Wet Wt	4	2015/08/12	2015/08/14	BBY7SOP-00021,	BCLM2005,EPA6020bR2m
Moisture in Tissue	4	N/A	2015/08/13	BBY8SOP-00017	OMOE E3139 3.1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.

Your Project #: BMC-15-01
Site Location: KUDZ ZE KAYAH

Attention:KAI WOLOSHYN

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

Your C.O.C. #: 08412624, 08412625, 08412627, 08412626

Report Date: 2016/12/05
Report #: R2311636
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B567723
Received: 2015/08/07, 13:45

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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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Total Cover Pages : 2

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6013	MV6014	MV6015	MV6016	MV6017	MV6018		
Sampling Date		2015/07/30	2015/07/30	2015/07/30	2015/07/30	2015/07/31	2015/07/31		
COC Number		08412624	08412624	08412624	08412624	08412624	08412624		
	UNITS	**PA01- GRASS**	**PA01- WILLOW**	**PA02- WILLOW**	**PA03- WILLOW**	**PA05- GRASS**	**PA05- WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	12.4	48.9	19.5	11.8	3.7	14.9	1.0	7998735
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	0.0132	<0.0050	0.0145	0.0574	0.0050	7998735
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Barium (Ba)	mg/kg	46.6	33.7	50.7	94.4	14.8	96.1	0.10	7998735
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Boron (B)	mg/kg	2.3	5.0	3.7	<2.0	2.6	2.1	2.0	7998735
Total Cadmium (Cd)	mg/kg	0.065	4.44	18.7	2.20	0.042	4.31	0.010	7998735
Total Calcium (Ca)	mg/kg	2910	5020	11200	15200	3290	29500	10	7998735
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Cobalt (Co)	mg/kg	0.038	3.13	0.809	1.34	<0.020	0.140	0.020	7998735
Total Copper (Cu)	mg/kg	2.86	5.79	4.44	2.82	3.59	4.95	0.050	7998735
Total Iron (Fe)	mg/kg	44	41	39	38	45	38	10	7998735
Total Lead (Pb)	mg/kg	0.057	0.027	0.058	0.031	0.072	0.085	0.010	7998735
Total Magnesium (Mg)	mg/kg	881	2630	6950	7180	1040	9130	10	7998735
Total Manganese (Mn)	mg/kg	315	353	399	416	205	99.3	0.10	7998735
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7998735
Total Molybdenum (Mo)	mg/kg	2.02	0.257	0.365	0.145	0.724	0.242	0.050	7998735
Total Nickel (Ni)	mg/kg	3.32	10.1	9.90	7.52	8.19	5.70	0.050	7998735
Total Phosphorus (P)	mg/kg	2280	5460	5440	2660	1500	1930	10	7998735
Total Potassium (K)	mg/kg	6860	8860	9760	5700	10900	7140	10	7998735
Total Selenium (Se)	mg/kg	0.086	0.114	<0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7998735
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	7998735
Total Strontium (Sr)	mg/kg	15.3	39.2	67.4	74.2	6.38	76.7	0.10	7998735
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0032	0.0174	0.0083	0.0063	0.0020	7998735
Total Tin (Sn)	mg/kg	0.19	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7998735
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Zinc (Zn)	mg/kg	30.9	343	160	39.8	36.3	132	0.20	7998735

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6019	MV6020	MV6021	MV6022	MV6040		
Sampling Date		2015/07/31	2015/07/31	2015/07/31	2015/07/31	2015/07/31		
COC Number		08412624	08412624	08412624	08412624	08412625		
	UNITS	**PA06- GRASS**	**PA06- WILLOW**	**PA07- WILLOW**	**PA08- WILLOW**	**PA09 - GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	12.8	123	7.2	6.2	4.7	1.0	7998735
Total Antimony (Sb)	mg/kg	0.0241	<0.0050	0.0177	0.0101	<0.0050	0.0050	7998735
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Barium (Ba)	mg/kg	24.9	249	21.8	28.6	38.2	0.10	7998735
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Boron (B)	mg/kg	2.5	<2.0	14.4	8.1	3.6	2.0	7998735
Total Cadmium (Cd)	mg/kg	0.055	2.51	3.92	4.29	0.086	0.010	7998735
Total Calcium (Ca)	mg/kg	3730	18100	22500	10300	3840	10	7998735
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Cobalt (Co)	mg/kg	0.053	1.24	0.056	0.674	0.070	0.020	7998735
Total Copper (Cu)	mg/kg	2.38	4.07	5.17	4.91	2.26	0.050	7998735
Total Iron (Fe)	mg/kg	33	41	30	43	33	10	7998735
Total Lead (Pb)	mg/kg	0.051	0.177	0.019	0.030	0.070	0.010	7998735
Total Magnesium (Mg)	mg/kg	792	6850	2800	2020	746	10	7998735
Total Manganese (Mn)	mg/kg	625	462	42.8	755	633	0.10	7998735
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7998735
Total Molybdenum (Mo)	mg/kg	0.262	<0.050	0.138	0.289	0.596	0.050	7998735
Total Nickel (Ni)	mg/kg	1.97	17.0	5.97	2.99	2.38	0.050	7998735
Total Phosphorus (P)	mg/kg	2010	2120	1310	1810	1520	10	7998735
Total Potassium (K)	mg/kg	11500	6350	9500	9870	11400	10	7998735
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7998735
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	7998735
Total Strontium (Sr)	mg/kg	15.7	120	61.6	23.7	12.0	0.10	7998735
Total Thallium (Tl)	mg/kg	0.0050	0.0021	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7998735
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Zinc (Zn)	mg/kg	19.1	93.4	699	130	22.3	0.20	7998735

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6041	MV6043	MV6045	MV6047	MV6048		
Sampling Date		2015/07/31	2015/07/31	2015/07/31	2015/07/31	2015/07/31		
COC Number		08412625	08412625	08412625	08412625	08412625		
	UNITS	**PA09 - WILLOW**	**PA10 - WILLOW**	**PA11 - WILLOW**	**PA12 - GRASS**	**PA12 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	5.6	5.6	113	5.3	7.3	1.0	7998735
Total Antimony (Sb)	mg/kg	<0.0050	0.0244	<0.0050	<0.0050	0.0106	0.0050	7998735
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Barium (Ba)	mg/kg	20.1	9.88	39.4	63.8	145	0.10	7998735
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Boron (B)	mg/kg	<2.0	7.6	9.8	3.6	2.3	2.0	7998735
Total Cadmium (Cd)	mg/kg	2.11	3.61	5.26	0.060	3.29	0.010	7998735
Total Calcium (Ca)	mg/kg	9660	27000	5990	5210	20600	10	7998735
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Cobalt (Co)	mg/kg	0.669	0.172	2.83	<0.020	0.471	0.020	7998735
Total Copper (Cu)	mg/kg	3.05	4.19	3.65	3.96	4.38	0.050	7998735
Total Iron (Fe)	mg/kg	29	41	50	33	38	10	7998735
Total Lead (Pb)	mg/kg	0.222	0.020	0.030	0.039	0.029	0.010	7998735
Total Magnesium (Mg)	mg/kg	1750	2700	2310	1020	3170	10	7998735
Total Manganese (Mn)	mg/kg	206	134	495	237	207	0.10	7998735
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	0.011	<0.010	0.010	7998735
Total Molybdenum (Mo)	mg/kg	0.093	1.42	0.083	0.906	0.320	0.050	7998735
Total Nickel (Ni)	mg/kg	8.40	3.26	9.21	4.09	9.95	0.050	7998735
Total Phosphorus (P)	mg/kg	1540	1290	2800	4040	4620	10	7998735
Total Potassium (K)	mg/kg	6980	13600	14600	22600	15400	10	7998735
Total Selenium (Se)	mg/kg	<0.050	0.070	<0.050	<0.050	<0.050	0.050	7998735
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7998735
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	7998735
Total Strontium (Sr)	mg/kg	29.3	77.9	22.3	13.0	56.3	0.10	7998735
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7998735
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Zinc (Zn)	mg/kg	42.9	161	117	24.3	101	0.20	7998735
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6049	MV6050	MV6056	MV6057		
Sampling Date		2015/07/31	2015/08/01	2015/08/01	2015/08/01		
COC Number		08412625	08412625	08412627	08412627		
	UNITS	**PA13 - HORSETAIL**	**PA14 - GRASS**	**PA14 - WILLOW**	**PA14 - HORSETAIL**	**RDL**	**QC Batch**
Total Metals by ICPMS							
Total Aluminum (Al)	mg/kg	1.9	10.1	5.6	5.2	1.0	7998735
Total Antimony (Sb)	mg/kg	<0.0050	0.0294	0.0238	0.0236	0.0050	7998735
Total Arsenic (As)	mg/kg	0.050	<0.050	<0.050	<0.050	0.050	7998735
Total Barium (Ba)	mg/kg	21.8	14.7	77.0	58.8	0.10	7998735
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Boron (B)	mg/kg	7.1	3.0	4.3	8.8	2.0	7998735
Total Cadmium (Cd)	mg/kg	0.034	0.321	1.56	2.02	0.010	7998735
Total Calcium (Ca)	mg/kg	15400	4500	24100	20100	10	7998735
Total Chromium (Cr)	mg/kg	0.20	0.22	<0.20	<0.20	0.20	7998735
Total Cobalt (Co)	mg/kg	0.065	0.029	0.192	0.182	0.020	7998735
Total Copper (Cu)	mg/kg	2.63	3.55	4.99	7.29	0.050	7998735
Total Iron (Fe)	mg/kg	25	46	42	65	10	7998735
Total Lead (Pb)	mg/kg	0.025	0.111	0.051	0.194	0.010	7998735
Total Magnesium (Mg)	mg/kg	2180	1090	5180	4990	10	7998735
Total Manganese (Mn)	mg/kg	26.0	104	66.0	35.9	0.10	7998735
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7998735
Total Molybdenum (Mo)	mg/kg	0.126	0.151	0.211	0.204	0.050	7998735
Total Nickel (Ni)	mg/kg	0.092	1.53	3.98	2.70	0.050	7998735
Total Phosphorus (P)	mg/kg	937	1750	2150	2370	10	7998735
Total Potassium (K)	mg/kg	29500	14400	13200	36500	10	7998735
Total Selenium (Se)	mg/kg	0.123	<0.050	0.227	0.386	0.050	7998735
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	0.035	0.020	7998735
Total Sodium (Na)	mg/kg	16	<10	<10	29	10	7998735
Total Strontium (Sr)	mg/kg	43.7	11.6	66.1	62.3	0.10	7998735
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0063	0.0020	7998735
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	7998735
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	1.0	7998735
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998735
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	7998735
Total Zinc (Zn)	mg/kg	22.1	89.4	284	112	0.20	7998735
RDL = Reportable Detection Limit							

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6058	MV6059	MV6061	MV6062	MV6063		
Sampling Date		2015/08/01	2015/08/01	2015/08/01	2015/08/01	2015/08/01		
COC Number		08412627	08412627	08412627	08412627	08412627		
	UNITS	**PA15 - GRASS**	**PA15 - WILLOW**	**PA16 - GRASS**	**PA16 - WILLOW**	**WEST OF PA17 GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	13.8	3.7	4.8	6.4	4.1	1.0	7998740
Total Antimony (Sb)	mg/kg	0.0089	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7998740
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998740
Total Barium (Ba)	mg/kg	12.9	26.1	10.5	22.3	28.7	0.10	7998740
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Boron (B)	mg/kg	3.1	3.0	3.9	6.1	<2.0	2.0	7998740
Total Cadmium (Cd)	mg/kg	0.026	1.57	0.131	8.67	0.018	0.010	7998740
Total Calcium (Ca)	mg/kg	4320	28600	5610	25700	1200	10	7998740
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998740
Total Cobalt (Co)	mg/kg	<0.020	0.235	<0.020	0.029	0.065	0.020	7998740
Total Copper (Cu)	mg/kg	2.74	3.96	4.62	3.72	2.11	0.050	7998740
Total Iron (Fe)	mg/kg	42	36	33	39	30	10	7998740
Total Lead (Pb)	mg/kg	0.054	0.014	0.105	0.088	0.059	0.010	7998740
Total Magnesium (Mg)	mg/kg	666	2740	849	2270	338	10	7998740
Total Manganese (Mn)	mg/kg	92.8	90.4	61.7	23.4	547	0.10	7998740
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7998740
Total Molybdenum (Mo)	mg/kg	1.06	0.375	0.317	0.274	0.201	0.050	7998740
Total Nickel (Ni)	mg/kg	0.398	1.28	0.296	0.315	0.756	0.050	7998740
Total Phosphorus (P)	mg/kg	1150	1040	1510	1120	982	10	7998740
Total Potassium (K)	mg/kg	11400	6570	15800	14100	9250	10	7998740
Total Selenium (Se)	mg/kg	<0.050	0.075	<0.050	<0.050	<0.050	0.050	7998740
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7998740
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	7998740
Total Strontium (Sr)	mg/kg	9.34	74.8	9.80	57.3	6.06	0.10	7998740
Total Thallium (Tl)	mg/kg	0.0048	0.0050	<0.0020	<0.0020	0.0032	0.0020	7998740
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Titanium (Ti)	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	1.0	7998740
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998740
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998740
Total Zinc (Zn)	mg/kg	24.6	126	69.5	606	14.8	0.20	7998740

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6064	MV6065	MV6066	MV6067	MV6068		
Sampling Date		2015/08/01	2015/08/01	2015/08/02	2015/08/02	2015/08/02		
COC Number		08412627	08412627	08412626	08412626	08412626		
	UNITS	**WEST OF PA17 WILLOW**	**PA18 - WILLOW**	**PA19 - GRASS**	**PA19 - WILLOW**	**PA20 - GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	17.0	6.5	7.7	9.5	3.5	1.0	7998740
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	0.0180	<0.0050	0.0080	0.0050	7998740
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7998740
Total Barium (Ba)	mg/kg	18.6	6.90	31.0	28.6	8.92	0.10	7998740
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Boron (B)	mg/kg	4.6	2.5	3.2	4.4	2.5	2.0	7998740
Total Cadmium (Cd)	mg/kg	2.49	5.09	0.120	7.66	0.059	0.010	7998740
Total Calcium (Ca)	mg/kg	7940	7480	4560	20400	1920	10	7998740
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998740
Total Cobalt (Co)	mg/kg	1.14	0.596	<0.020	0.640	<0.020	0.020	7998740
Total Copper (Cu)	mg/kg	3.37	2.54	2.85	4.87	3.06	0.050	7998740
Total Iron (Fe)	mg/kg	54	35	39	51	38	10	7998740
Total Lead (Pb)	mg/kg	0.034	0.023	0.062	0.034	0.024	0.010	7998740
Total Magnesium (Mg)	mg/kg	1380	683	657	2680	619	10	7998740
Total Manganese (Mn)	mg/kg	703	809	188	179	81.9	0.10	7998740
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7998740
Total Molybdenum (Mo)	mg/kg	0.170	0.119	0.225	0.355	0.881	0.050	7998740
Total Nickel (Ni)	mg/kg	2.81	1.21	1.37	4.49	1.27	0.050	7998740
Total Phosphorus (P)	mg/kg	1420	828	2330	4070	1370	10	7998740
Total Potassium (K)	mg/kg	6520	8100	15400	13400	8070	10	7998740
Total Selenium (Se)	mg/kg	0.209	0.060	<0.050	<0.050	0.154	0.050	7998740
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7998740
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	7998740
Total Strontium (Sr)	mg/kg	23.2	23.2	12.9	61.0	5.89	0.10	7998740
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	0.0020	7998740
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7998740
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7998740
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7998740
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7998740
Total Zinc (Zn)	mg/kg	50.4	115	23.9	117	36.4	0.20	7998740

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6069	MV6070	MV6071		MV6072		
Sampling Date		2015/08/02	2015/08/02	2015/07/31		2015/08/01		
COC Number		08412626	08412626	08412626		08412626		
	UNITS	**PA20 - WILLOW**	**PA20 - HORSETAIL**	**PA21 - WILLOW**	**QC Batch**	**PA14 - GRASS ROOTS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	5.6	3.2	6.6	7998740	1420	1.0	8004812
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	7998740	0.453	0.0050	8004812
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	7998740	1.54	0.050	8004812
Total Barium (Ba)	mg/kg	80.6	42.0	131	7998740	76.3	0.10	8004812
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	7998740	<0.10	0.10	8004812
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	7998740	<0.10	0.10	8004812
Total Boron (B)	mg/kg	4.5	9.9	<2.0	7998740	2.0	2.0	8004812
Total Cadmium (Cd)	mg/kg	1.35	0.213	2.83	7998740	3.08	0.010	8004812
Total Calcium (Ca)	mg/kg	26800	24700	17700	7998740	6330	10	8004812
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	7998740	4.35	0.20	8004812
Total Cobalt (Co)	mg/kg	0.071	0.215	0.403	7998740	2.10	0.020	8004812
Total Copper (Cu)	mg/kg	2.70	3.64	3.45	7998740	9.14	0.050	8004812
Total Iron (Fe)	mg/kg	33	36	33	7998740	3330	10	8004812
Total Lead (Pb)	mg/kg	0.021	0.026	0.021	7998740	9.67	0.010	8004812
Total Magnesium (Mg)	mg/kg	4240	3260	2640	7998740	1430	10	8004812
Total Manganese (Mn)	mg/kg	65.0	82.8	158	7998740	452	0.10	8004812
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	7998740	0.058	0.010	8004812
Total Molybdenum (Mo)	mg/kg	0.408	0.318	0.265	7998740	0.486	0.050	8004812
Total Nickel (Ni)	mg/kg	0.583	0.452	7.92	7998740	4.31	0.050	8004812
Total Phosphorus (P)	mg/kg	810	1370	3400	7998740	583	10	8004812
Total Potassium (K)	mg/kg	12000	35700	12300	7998740	1590	10	8004812
Total Selenium (Se)	mg/kg	0.377	0.208	<0.050	7998740	0.441	0.050	8004812
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	7998740	0.234	0.020	8004812
Total Sodium (Na)	mg/kg	<10	16	<10	7998740	25	10	8004812
Total Strontium (Sr)	mg/kg	93.3	94.1	47.8	7998740	21.2	0.10	8004812
Total Thallium (Tl)	mg/kg	<0.0020	0.0032	<0.0020	7998740	0.0460	0.0020	8004812
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	7998740	0.20	0.10	8004812
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	7998740	66.6	1.0	8004812
Total Uranium (U)	mg/kg	0.0022	<0.0020	<0.0020	7998740	0.612	0.0020	8004812
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	7998740	3.43	0.20	8004812
Total Zinc (Zn)	mg/kg	509	45.6	83.8	7998740	266	0.20	8004812

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		MV6073	MV6074		
Sampling Date		2015/08/01	2015/08/02		
COC Number		08412626	08412626		
	UNITS	**PA15 - GRASS ROOTS**	**PA19 - GRASS ROOTS**	**RDL**	**QC Batch**
Total Metals by ICPMS					
Total Aluminum (Al)	mg/kg	367	75.0	1.0	8004812
Total Antimony (Sb)	mg/kg	0.0143	<0.0050	0.0050	8004812
Total Arsenic (As)	mg/kg	0.269	0.073	0.050	8004812
Total Barium (Ba)	mg/kg	42.3	53.1	0.10	8004812
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.10	8004812
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.10	8004812
Total Boron (B)	mg/kg	2.2	3.7	2.0	8004812
Total Cadmium (Cd)	mg/kg	0.596	3.42	0.010	8004812
Total Calcium (Ca)	mg/kg	6890	9410	10	8004812
Total Chromium (Cr)	mg/kg	0.91	0.42	0.20	8004812
Total Cobalt (Co)	mg/kg	0.371	0.217	0.020	8004812
Total Copper (Cu)	mg/kg	3.64	7.76	0.050	8004812
Total Iron (Fe)	mg/kg	939	122	10	8004812
Total Lead (Pb)	mg/kg	0.770	0.415	0.010	8004812
Total Magnesium (Mg)	mg/kg	691	809	10	8004812
Total Manganese (Mn)	mg/kg	311	489	0.10	8004812
Total Mercury (Hg)	mg/kg	0.056	0.054	0.010	8004812
Total Molybdenum (Mo)	mg/kg	0.773	0.262	0.050	8004812
Total Nickel (Ni)	mg/kg	1.11	2.27	0.050	8004812
Total Phosphorus (P)	mg/kg	568	905	10	8004812
Total Potassium (K)	mg/kg	2130	2280	10	8004812
Total Selenium (Se)	mg/kg	0.096	<0.050	0.050	8004812
Total Silver (Ag)	mg/kg	0.093	0.144	0.020	8004812
Total Sodium (Na)	mg/kg	17	13	10	8004812
Total Strontium (Sr)	mg/kg	22.1	31.8	0.10	8004812
Total Thallium (Tl)	mg/kg	0.237	0.0144	0.0020	8004812
Total Tin (Sn)	mg/kg	0.18	0.18	0.10	8004812
Total Titanium (Ti)	mg/kg	21.8	2.4	1.0	8004812
Total Uranium (U)	mg/kg	0.0170	0.0048	0.0020	8004812
Total Vanadium (V)	mg/kg	0.97	<0.20	0.20	8004812
Total Zinc (Zn)	mg/kg	37.2	79.7	0.20	8004812
RDL = Reportable Detection Limit					

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6013		MV6014		MV6015		MV6016		
Sampling Date		2015/07/30		2015/07/30		2015/07/30		2015/07/30		
COC Number		08412624		08412624		08412624		08412624		
	UNITS	**PA01- GRASS**	**RDL**	**PA01- WILLOW**	**RDL**	**PA02- WILLOW**	**RDL**	**PA03- WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	4.69	0.38	16.6	0.34	6.79	0.35	3.87	0.33	8490759
Total Antimony (Sb)	mg/kg	<0.0019	0.0019	<0.0017	0.0017	0.0046	0.0017	<0.0016	0.0016	8490759
Total Arsenic (As)	mg/kg	<0.019	0.019	<0.017	0.017	<0.017	0.017	<0.016	0.016	8490759
Total Barium (Ba)	mg/kg	17.7	0.038	11.5	0.034	17.7	0.035	31.1	0.033	8490759
Total Beryllium (Be)	mg/kg	<0.038	0.038	<0.034	0.034	<0.035	0.035	<0.033	0.033	8490759
Total Bismuth (Bi)	mg/kg	<0.038	0.038	<0.034	0.034	<0.035	0.035	<0.033	0.033	8490759
Total Boron (B)	mg/kg	0.88	0.76	1.70	0.68	1.28	0.70	<0.66	0.66	8490759
Total Cadmium (Cd)	mg/kg	0.0245	0.0038	1.51	0.0034	6.53	0.0035	0.723	0.0033	8490759
Total Calcium (Ca)	mg/kg	1100	3.8	1710	3.4	3930	3.5	4990	3.3	8490759
Total Chromium (Cr)	mg/kg	<0.076	0.076	<0.068	0.068	<0.070	0.070	<0.066	0.066	8490759
Total Cobalt (Co)	mg/kg	0.0142	0.0076	1.06	0.0068	0.282	0.0070	0.442	0.0066	8490759
Total Copper (Cu)	mg/kg	1.08	0.019	1.97	0.017	1.55	0.017	0.928	0.016	8490759
Total Iron (Fe)	mg/kg	16.9	3.8	14.0	3.4	13.7	3.5	12.5	3.3	8490759
Total Lead (Pb)	mg/kg	0.0215	0.0038	0.0092	0.0034	0.0201	0.0035	0.0103	0.0033	8490759
Total Magnesium (Mg)	mg/kg	334	3.8	896	3.4	2430	3.5	2360	3.3	8490759
Total Manganese (Mn)	mg/kg	119	0.038	120	0.034	139	0.035	137	0.033	8490759
Total Mercury (Hg)	mg/kg	<0.0038	0.0038	<0.0034	0.0034	<0.0035	0.0035	<0.0033	0.0033	8490759
Total Molybdenum (Mo)	mg/kg	0.765	0.019	0.087	0.017	0.128	0.017	0.048	0.016	8490759
Total Nickel (Ni)	mg/kg	1.26	0.019	3.45	0.017	3.46	0.017	2.47	0.016	8490759
Total Phosphorus (P)	mg/kg	864	3.8	1860	3.4	1900	3.5	874	3.3	8490759
Total Potassium (K)	mg/kg	2600	3.8	3010	3.4	3400	3.5	1870	3.3	8490759
Total Selenium (Se)	mg/kg	0.033	0.019	0.039	0.017	<0.017	0.017	<0.016	0.016	8490759
Total Silver (Ag)	mg/kg	<0.0076	0.0076	<0.0068	0.0068	<0.0070	0.0070	<0.0066	0.0066	8490759
Total Sodium (Na)	mg/kg	<3.8	3.8	<3.4	3.4	<3.5	3.5	<3.3	3.3	8490759
Total Strontium (Sr)	mg/kg	5.79	0.038	13.3	0.034	23.5	0.035	24.4	0.033	8490759
Total Thallium (Tl)	mg/kg	<0.00076	0.00076	<0.00068	0.00068	0.00110	0.00070	0.00570	0.00066	8490759
Total Tin (Sn)	mg/kg	0.072	0.038	<0.034	0.034	<0.035	0.035	<0.033	0.033	8490759
Total Titanium (Ti)	mg/kg	<0.38	0.38	<0.34	0.34	<0.35	0.35	<0.33	0.33	8490759
Total Uranium (U)	mg/kg	<0.00076	0.00076	<0.00068	0.00068	<0.00070	0.00070	<0.00066	0.00066	8490759
Total Vanadium (V)	mg/kg	<0.076	0.076	<0.068	0.068	<0.070	0.070	<0.066	0.066	8490759
Total Zinc (Zn)	mg/kg	11.7	0.076	117	0.068	55.9	0.070	13.1	0.066	8490759
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6017		MV6018		MV6019		MV6020		
Sampling Date		2015/07/31		2015/07/31		2015/07/31		2015/07/31		
COC Number		08412624		08412624		08412624		08412624		
	UNITS	**PA05- GRASS**	**RDL**	**PA05- WILLOW**	**RDL**	**PA06- GRASS**	**RDL**	**PA06- WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	1.26	0.34	4.45	0.30	4.83	0.38	40.7	0.33	8490759
Total Antimony (Sb)	mg/kg	0.0050	0.0017	0.0172	0.0015	0.0091	0.0019	<0.0017	0.0017	8490759
Total Arsenic (As)	mg/kg	<0.017	0.017	<0.015	0.015	<0.019	0.019	<0.017	0.017	8490759
Total Barium (Ba)	mg/kg	5.08	0.034	28.7	0.030	9.37	0.038	82.2	0.033	8490759
Total Beryllium (Be)	mg/kg	<0.034	0.034	<0.030	0.030	<0.038	0.038	<0.033	0.033	8490759
Total Bismuth (Bi)	mg/kg	<0.034	0.034	<0.030	0.030	<0.038	0.038	<0.033	0.033	8490759
Total Boron (B)	mg/kg	0.90	0.69	0.63	0.60	0.93	0.75	<0.66	0.66	8490759
Total Cadmium (Cd)	mg/kg	0.0144	0.0034	1.29	0.0030	0.0207	0.0038	0.829	0.0033	8490759
Total Calcium (Ca)	mg/kg	1130	3.4	8810	3.0	1400	3.8	5980	3.3	8490759
Total Chromium (Cr)	mg/kg	<0.069	0.069	<0.060	0.060	<0.075	0.075	<0.066	0.066	8490759
Total Cobalt (Co)	mg/kg	<0.0069	0.0069	0.0420	0.0060	0.0199	0.0075	0.410	0.0066	8490759
Total Copper (Cu)	mg/kg	1.24	0.017	1.48	0.015	0.896	0.019	1.34	0.017	8490759
Total Iron (Fe)	mg/kg	15.6	3.4	11.5	3.0	12.4	3.8	13.4	3.3	8490759
Total Lead (Pb)	mg/kg	0.0247	0.0034	0.0253	0.0030	0.0193	0.0038	0.0583	0.0033	8490759
Total Magnesium (Mg)	mg/kg	359	3.4	2730	3.0	298	3.8	2260	3.3	8490759
Total Manganese (Mn)	mg/kg	70.7	0.034	29.7	0.030	235	0.038	152	0.033	8490759
Total Mercury (Hg)	mg/kg	<0.0034	0.0034	<0.0030	0.0030	<0.0038	0.0038	<0.0033	0.0033	8490759
Total Molybdenum (Mo)	mg/kg	0.249	0.017	0.072	0.015	0.099	0.019	<0.017	0.017	8490759
Total Nickel (Ni)	mg/kg	2.82	0.017	1.71	0.015	0.739	0.019	5.61	0.017	8490759
Total Phosphorus (P)	mg/kg	518	3.4	576	3.0	755	3.8	700	3.3	8490759
Total Potassium (K)	mg/kg	3740	3.4	2130	3.0	4310	3.8	2100	3.3	8490759
Total Selenium (Se)	mg/kg	<0.017	0.017	<0.015	0.015	<0.019	0.019	<0.017	0.017	8490759
Total Silver (Ag)	mg/kg	<0.0069	0.0069	<0.0060	0.0060	<0.0075	0.0075	<0.0066	0.0066	8490759
Total Sodium (Na)	mg/kg	<3.4	3.4	<3.0	3.0	<3.8	3.8	<3.3	3.3	8490759
Total Strontium (Sr)	mg/kg	2.19	0.034	22.9	0.030	5.89	0.038	39.6	0.033	8490759
Total Thallium (Tl)	mg/kg	0.00280	0.00069	0.00190	0.00060	0.00190	0.00075	0.00070	0.00066	8490759
Total Tin (Sn)	mg/kg	<0.034	0.034	<0.030	0.030	<0.038	0.038	<0.033	0.033	8490759
Total Titanium (Ti)	mg/kg	<0.34	0.34	<0.30	0.30	<0.38	0.38	<0.33	0.33	8490759
Total Uranium (U)	mg/kg	<0.00069	0.00069	<0.00060	0.00060	<0.00075	0.00075	<0.00066	0.00066	8490759
Total Vanadium (V)	mg/kg	<0.069	0.069	<0.060	0.060	<0.075	0.075	<0.066	0.066	8490759
Total Zinc (Zn)	mg/kg	12.5	0.069	39.5	0.060	7.19	0.075	30.8	0.066	8490759
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6021		MV6022		MV6040		MV6041		
Sampling Date		2015/07/31		2015/07/31		2015/07/31		2015/07/31		
COC Number		08412624		08412624		08412625		08412625		
	UNITS	**PA07- WILLOW**	**RDL**	**PA08- WILLOW**	**RDL**	**PA09 - GRASS**	**RDL**	**PA09 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	2.48	0.34	2.37	0.38	1.88	0.40	1.99	0.36	8490759
Total Antimony (Sb)	mg/kg	0.0061	0.0017	0.0039	0.0019	<0.0020	0.0020	<0.0018	0.0018	8490759
Total Arsenic (As)	mg/kg	<0.017	0.017	<0.019	0.019	<0.020	0.020	<0.018	0.018	8490759
Total Barium (Ba)	mg/kg	7.51	0.034	11.0	0.038	15.4	0.040	7.19	0.036	8490759
Total Beryllium (Be)	mg/kg	<0.034	0.034	<0.038	0.038	<0.040	0.040	<0.036	0.036	8490759
Total Bismuth (Bi)	mg/kg	<0.034	0.034	<0.038	0.038	<0.040	0.040	<0.036	0.036	8490759
Total Boron (B)	mg/kg	4.95	0.69	3.12	0.77	1.47	0.81	<0.72	0.72	8490759
Total Cadmium (Cd)	mg/kg	1.35	0.0034	1.65	0.0038	0.0345	0.0040	0.757	0.0036	8490759
Total Calcium (Ca)	mg/kg	7760	3.4	3950	3.8	1550	4.0	3460	3.6	8490759
Total Chromium (Cr)	mg/kg	<0.069	0.069	<0.077	0.077	<0.081	0.081	<0.072	0.072	8490759
Total Cobalt (Co)	mg/kg	0.0191	0.0069	0.259	0.0077	0.0281	0.0081	0.240	0.0072	8490759
Total Copper (Cu)	mg/kg	1.78	0.017	1.89	0.019	0.909	0.020	1.09	0.018	8490759
Total Iron (Fe)	mg/kg	10.5	3.4	16.5	3.8	13.5	4.0	10.3	3.6	8490759
Total Lead (Pb)	mg/kg	0.0065	0.0034	0.0115	0.0038	0.0283	0.0040	0.0795	0.0036	8490759
Total Magnesium (Mg)	mg/kg	964	3.4	774	3.8	301	4.0	626	3.6	8490759
Total Manganese (Mn)	mg/kg	14.7	0.034	290	0.038	255	0.040	73.7	0.036	8490759
Total Mercury (Hg)	mg/kg	<0.0034	0.0034	<0.0038	0.0038	<0.0040	0.0040	<0.0036	0.0036	8490759
Total Molybdenum (Mo)	mg/kg	0.048	0.017	0.111	0.019	0.240	0.020	0.033	0.018	8490759
Total Nickel (Ni)	mg/kg	2.05	0.017	1.15	0.019	0.961	0.020	3.01	0.018	8490759
Total Phosphorus (P)	mg/kg	449	3.4	695	3.8	611	4.0	551	3.6	8490759
Total Potassium (K)	mg/kg	3270	3.4	3790	3.8	4590	4.0	2500	3.6	8490759
Total Selenium (Se)	mg/kg	<0.017	0.017	<0.019	0.019	<0.020	0.020	<0.018	0.018	8490759
Total Silver (Ag)	mg/kg	<0.0069	0.0069	<0.0077	0.0077	<0.0081	0.0081	<0.0072	0.0072	8490759
Total Sodium (Na)	mg/kg	<3.4	3.4	<3.8	3.8	<4.0	4.0	<3.6	3.6	8490759
Total Strontium (Sr)	mg/kg	21.2	0.034	9.10	0.038	4.83	0.040	10.5	0.036	8490759
Total Thallium (Tl)	mg/kg	<0.00069	0.00069	<0.00077	0.00077	<0.00081	0.00081	<0.00072	0.00072	8490759
Total Tin (Sn)	mg/kg	<0.034	0.034	<0.038	0.038	<0.040	0.040	<0.036	0.036	8490759
Total Titanium (Ti)	mg/kg	<0.34	0.34	<0.38	0.38	<0.40	0.40	<0.36	0.36	8490759
Total Uranium (U)	mg/kg	<0.00069	0.00069	<0.00077	0.00077	<0.00081	0.00081	<0.00072	0.00072	8490759
Total Vanadium (V)	mg/kg	<0.069	0.069	<0.077	0.077	<0.081	0.081	<0.072	0.072	8490759
Total Zinc (Zn)	mg/kg	240	0.069	49.9	0.077	8.98	0.081	15.3	0.072	8490759

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6043		MV6045		MV6047		
Sampling Date		2015/07/31		2015/07/31		2015/07/31		
COC Number		08412625		08412625		08412625		
	UNITS	**PA10 - WILLOW**	**RDL**	**PA11 - WILLOW**	**RDL**	**PA12 - GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	1.95	0.35	37.8	0.34	1.30	0.24	8490759
Total Antimony (Sb)	mg/kg	0.0086	0.0018	<0.0017	0.0017	<0.0012	0.0012	8490759
Total Arsenic (As)	mg/kg	<0.018	0.018	<0.017	0.017	<0.012	0.012	8490759
Total Barium (Ba)	mg/kg	3.46	0.035	13.3	0.034	15.6	0.024	8490759
Total Beryllium (Be)	mg/kg	<0.035	0.035	<0.034	0.034	<0.024	0.024	8490759
Total Bismuth (Bi)	mg/kg	<0.035	0.035	<0.034	0.034	<0.024	0.024	8490759
Total Boron (B)	mg/kg	2.68	0.70	3.30	0.67	0.87	0.49	8490759
Total Cadmium (Cd)	mg/kg	1.26	0.0035	1.77	0.0034	0.0146	0.0024	8490759
Total Calcium (Ca)	mg/kg	9430	3.5	2010	3.4	1270	2.4	8490759
Total Chromium (Cr)	mg/kg	<0.070	0.070	<0.067	0.067	<0.049	0.049	8490759
Total Cobalt (Co)	mg/kg	0.0603	0.0070	0.952	0.0067	<0.0049	0.0049	8490759
Total Copper (Cu)	mg/kg	1.47	0.018	1.23	0.017	0.967	0.012	8490759
Total Iron (Fe)	mg/kg	14.3	3.5	16.9	3.4	8.0	2.4	8490759
Total Lead (Pb)	mg/kg	0.0070	0.0035	0.0099	0.0034	0.0096	0.0024	8490759
Total Magnesium (Mg)	mg/kg	945	3.5	777	3.4	249	2.4	8490759
Total Manganese (Mn)	mg/kg	47.0	0.035	166	0.034	57.9	0.024	8490759
Total Mercury (Hg)	mg/kg	<0.0035	0.0035	<0.0034	0.0034	0.0026	0.0024	8490759
Total Molybdenum (Mo)	mg/kg	0.497	0.018	0.028	0.017	0.221	0.012	8490759
Total Nickel (Ni)	mg/kg	1.14	0.018	3.09	0.017	0.999	0.012	8490759
Total Phosphorus (P)	mg/kg	453	3.5	942	3.4	985	2.4	8490759
Total Potassium (K)	mg/kg	4760	3.5	4900	3.4	5500	2.4	8490759
Total Selenium (Se)	mg/kg	0.024	0.018	<0.017	0.017	<0.012	0.012	8490759
Total Silver (Ag)	mg/kg	<0.0070	0.0070	<0.0067	0.0067	<0.0049	0.0049	8490759
Total Sodium (Na)	mg/kg	<3.5	3.5	<3.4	3.4	<2.4	2.4	8490759
Total Strontium (Sr)	mg/kg	27.3	0.035	7.50	0.034	3.17	0.024	8490759
Total Thallium (Tl)	mg/kg	<0.00070	0.00070	<0.00067	0.00067	<0.00049	0.00049	8490759
Total Tin (Sn)	mg/kg	<0.035	0.035	<0.034	0.034	<0.024	0.024	8490759
Total Titanium (Ti)	mg/kg	<0.35	0.35	<0.34	0.34	<0.24	0.24	8490759
Total Uranium (U)	mg/kg	<0.00070	0.00070	<0.00067	0.00067	<0.00049	0.00049	8490759
Total Vanadium (V)	mg/kg	<0.070	0.070	<0.067	0.067	<0.049	0.049	8490759
Total Zinc (Zn)	mg/kg	56.4	0.070	39.3	0.067	5.94	0.049	8490759

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6048		MV6049		MV6050		
Sampling Date		2015/07/31		2015/07/31		2015/08/01		
COC Number		08412625		08412625		08412625		
	UNITS	**PA12 - WILLOW**	**RDL**	**PA13 - HORSETAIL**	**RDL**	**PA14 - GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	2.23	0.31	0.41	0.21	3.22	0.32	8490759
Total Antimony (Sb)	mg/kg	0.0033	0.0015	<0.0011	0.0011	0.0094	0.0016	8490759
Total Arsenic (As)	mg/kg	<0.015	0.015	<0.011	0.011	<0.016	0.016	8490759
Total Barium (Ba)	mg/kg	44.6	0.031	4.65	0.021	4.69	0.032	8490759
Total Beryllium (Be)	mg/kg	<0.031	0.031	<0.021	0.021	<0.032	0.032	8490759
Total Bismuth (Bi)	mg/kg	<0.031	0.031	<0.021	0.021	<0.032	0.032	8490759
Total Boron (B)	mg/kg	0.70	0.61	1.51	0.43	0.97	0.64	8490759
Total Cadmium (Cd)	mg/kg	1.01	0.0031	0.0072	0.0021	0.103	0.0032	8490759
Total Calcium (Ca)	mg/kg	6330	3.1	3270	2.1	1440	3.2	8490759
Total Chromium (Cr)	mg/kg	<0.061	0.061	0.044	0.043	0.069	0.064	8490759
Total Cobalt (Co)	mg/kg	0.145	0.0061	0.0139	0.0043	0.0092	0.0064	8490759
Total Copper (Cu)	mg/kg	1.35	0.015	0.560	0.011	1.13	0.016	8490759
Total Iron (Fe)	mg/kg	11.7	3.1	5.4	2.1	14.7	3.2	8490759
Total Lead (Pb)	mg/kg	0.0089	0.0031	0.0053	0.0021	0.0355	0.0032	8490759
Total Magnesium (Mg)	mg/kg	975	3.1	465	2.1	348	3.2	8490759
Total Manganese (Mn)	mg/kg	63.6	0.031	5.54	0.021	33.2	0.032	8490759
Total Mercury (Hg)	mg/kg	<0.0031	0.0031	<0.0021	0.0021	<0.0032	0.0032	8490759
Total Molybdenum (Mo)	mg/kg	0.098	0.015	0.027	0.011	0.048	0.016	8490759
Total Nickel (Ni)	mg/kg	3.06	0.015	0.020	0.011	0.487	0.016	8490759
Total Phosphorus (P)	mg/kg	1420	3.1	199	2.1	559	3.2	8490759
Total Potassium (K)	mg/kg	4710	3.1	6290	2.1	4580	3.2	8490759
Total Selenium (Se)	mg/kg	<0.015	0.015	0.026	0.011	<0.016	0.016	8490759
Total Silver (Ag)	mg/kg	<0.0061	0.0061	<0.0043	0.0043	<0.0064	0.0064	8490759
Total Sodium (Na)	mg/kg	<3.1	3.1	3.3	2.1	<3.2	3.2	8490759
Total Strontium (Sr)	mg/kg	17.3	0.031	9.30	0.021	3.69	0.032	8490759
Total Thallium (Tl)	mg/kg	<0.00061	0.00061	<0.00043	0.00043	<0.00064	0.00064	8490759
Total Tin (Sn)	mg/kg	<0.031	0.031	<0.021	0.021	<0.032	0.032	8490759
Total Titanium (Ti)	mg/kg	<0.31	0.31	<0.21	0.21	<0.32	0.32	8490759
Total Uranium (U)	mg/kg	<0.00061	0.00061	<0.00043	0.00043	<0.00064	0.00064	8490759
Total Vanadium (V)	mg/kg	<0.061	0.061	<0.043	0.043	<0.064	0.064	8490759
Total Zinc (Zn)	mg/kg	31.1	0.061	4.71	0.043	28.5	0.064	8490759
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6056		MV6057		MV6058		
Sampling Date		2015/08/01		2015/08/01		2015/08/01		
COC Number		08412627		08412627		08412627		
	UNITS	**PA14 - WILLOW**	**RDL**	**PA14 - HORSETAIL**	**RDL**	**PA15 - GRASS**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	1.57	0.28	1.00	0.19	4.82	0.35	8490759
Total Antimony (Sb)	mg/kg	0.0067	0.0014	0.00450	0.00096	0.0031	0.0018	8490759
Total Arsenic (As)	mg/kg	<0.014	0.014	<0.0096	0.0096	<0.018	0.018	8490759
Total Barium (Ba)	mg/kg	21.6	0.028	11.3	0.019	4.51	0.035	8490759
Total Beryllium (Be)	mg/kg	<0.028	0.028	<0.019	0.019	<0.035	0.035	8490759
Total Bismuth (Bi)	mg/kg	<0.028	0.028	<0.019	0.019	<0.035	0.035	8490759
Total Boron (B)	mg/kg	1.20	0.56	1.69	0.38	1.07	0.70	8490759
Total Cadmium (Cd)	mg/kg	0.439	0.0028	0.388	0.0019	0.0089	0.0035	8490759
Total Calcium (Ca)	mg/kg	6770	2.8	3850	1.9	1510	3.5	8490759
Total Chromium (Cr)	mg/kg	<0.056	0.056	<0.038	0.038	<0.070	0.070	8490759
Total Cobalt (Co)	mg/kg	0.0538	0.0056	0.0349	0.0038	<0.0070	0.0070	8490759
Total Copper (Cu)	mg/kg	1.40	0.014	1.40	0.0096	0.960	0.018	8490759
Total Iron (Fe)	mg/kg	11.7	2.8	12.5	1.9	14.8	3.5	8490759
Total Lead (Pb)	mg/kg	0.0145	0.0028	0.0373	0.0019	0.0190	0.0035	8490759
Total Magnesium (Mg)	mg/kg	1460	2.8	957	1.9	233	3.5	8490759
Total Manganese (Mn)	mg/kg	18.6	0.028	6.89	0.019	32.5	0.035	8490759
Total Mercury (Hg)	mg/kg	<0.0028	0.0028	<0.0019	0.0019	<0.0035	0.0035	8490759
Total Molybdenum (Mo)	mg/kg	0.059	0.014	0.0392	0.0096	0.371	0.018	8490759
Total Nickel (Ni)	mg/kg	1.12	0.014	0.519	0.0096	0.139	0.018	8490759
Total Phosphorus (P)	mg/kg	603	2.8	455	1.9	402	3.5	8490759
Total Potassium (K)	mg/kg	3720	2.8	7020	1.9	3980	3.5	8490759
Total Selenium (Se)	mg/kg	0.064	0.014	0.0740	0.0096	<0.018	0.018	8490759
Total Silver (Ag)	mg/kg	<0.0056	0.0056	0.0067	0.0038	<0.0070	0.0070	8490759
Total Sodium (Na)	mg/kg	<2.8	2.8	5.6	1.9	<3.5	3.5	8490759
Total Strontium (Sr)	mg/kg	18.6	0.028	12.0	0.019	3.27	0.035	8490759
Total Thallium (Tl)	mg/kg	<0.00056	0.00056	0.00120	0.00038	0.00170	0.00070	8490759
Total Tin (Sn)	mg/kg	<0.028	0.028	<0.019	0.019	<0.035	0.035	8490759
Total Titanium (Ti)	mg/kg	<0.28	0.28	<0.19	0.19	0.36	0.35	8490759
Total Uranium (U)	mg/kg	<0.00056	0.00056	<0.00038	0.00038	<0.00070	0.00070	8490759
Total Vanadium (V)	mg/kg	<0.056	0.056	<0.038	0.038	<0.070	0.070	8490759
Total Zinc (Zn)	mg/kg	79.9	0.056	21.5	0.038	8.62	0.070	8490759

RDL = Reportable Detection Limit

Maxxam Job #: B567723
Report Date: 2016/12/05

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

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6059		MV6061		MV6062		
Sampling Date		2015/08/01		2015/08/01		2015/08/01		
COC Number		08412627		08412627		08412627		
	UNITS	**PA15 - WILLOW**	**RDL**	**PA16 - GRASS**	**RDL**	**PA16 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	1.21	0.33	1.46	0.31	2.05	0.32	8490759
Total Antimony (Sb)	mg/kg	<0.0017	0.0017	<0.0015	0.0015	<0.0016	0.0016	8490759
Total Arsenic (As)	mg/kg	<0.017	0.017	<0.015	0.015	<0.016	0.016	8490759
Total Barium (Ba)	mg/kg	8.60	0.033	3.20	0.031	7.17	0.032	8490759
Total Beryllium (Be)	mg/kg	<0.033	0.033	<0.031	0.031	<0.032	0.032	8490759
Total Bismuth (Bi)	mg/kg	<0.033	0.033	<0.031	0.031	<0.032	0.032	8490759
Total Boron (B)	mg/kg	1.00	0.66	1.18	0.61	1.96	0.64	8490759
Total Cadmium (Cd)	mg/kg	0.519	0.0033	0.0398	0.0031	2.78	0.0032	8490759
Total Calcium (Ca)	mg/kg	9420	3.3	1710	3.1	8250	3.2	8490759
Total Chromium (Cr)	mg/kg	<0.066	0.066	<0.061	0.061	<0.064	0.064	8490759
Total Cobalt (Co)	mg/kg	0.0774	0.0066	<0.0061	0.0061	0.0093	0.0064	8490759
Total Copper (Cu)	mg/kg	1.31	0.017	1.41	0.015	1.20	0.016	8490759
Total Iron (Fe)	mg/kg	12.0	3.3	10.1	3.1	12.6	3.2	8490759
Total Lead (Pb)	mg/kg	0.0047	0.0033	0.0321	0.0031	0.0283	0.0032	8490759
Total Magnesium (Mg)	mg/kg	905	3.3	259	3.1	729	3.2	8490759
Total Manganese (Mn)	mg/kg	29.8	0.033	18.8	0.031	7.52	0.032	8490759
Total Mercury (Hg)	mg/kg	<0.0033	0.0033	<0.0031	0.0031	<0.0032	0.0032	8490759
Total Molybdenum (Mo)	mg/kg	0.124	0.017	0.097	0.015	0.088	0.016	8490759
Total Nickel (Ni)	mg/kg	0.422	0.017	0.090	0.015	0.101	0.016	8490759
Total Phosphorus (P)	mg/kg	344	3.3	459	3.1	359	3.2	8490759
Total Potassium (K)	mg/kg	2170	3.3	4820	3.1	4530	3.2	8490759
Total Selenium (Se)	mg/kg	0.025	0.017	<0.015	0.015	<0.016	0.016	8490759
Total Silver (Ag)	mg/kg	<0.0066	0.0066	<0.0061	0.0061	<0.0064	0.0064	8490759
Total Sodium (Na)	mg/kg	<3.3	3.3	<3.1	3.1	<3.2	3.2	8490759
Total Strontium (Sr)	mg/kg	24.7	0.033	2.99	0.031	18.4	0.032	8490759
Total Thallium (Tl)	mg/kg	0.00160	0.00066	<0.00061	0.00061	<0.00064	0.00064	8490759
Total Tin (Sn)	mg/kg	<0.033	0.033	<0.031	0.031	<0.032	0.032	8490759
Total Titanium (Ti)	mg/kg	<0.33	0.33	<0.31	0.31	<0.32	0.32	8490759
Total Uranium (U)	mg/kg	<0.00066	0.00066	<0.00061	0.00061	<0.00064	0.00064	8490759
Total Vanadium (V)	mg/kg	<0.066	0.066	<0.061	0.061	<0.064	0.064	8490759
Total Zinc (Zn)	mg/kg	41.6	0.066	21.2	0.061	195	0.064	8490759
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6063		MV6064		MV6065		
Sampling Date		2015/08/01		2015/08/01		2015/08/01		
COC Number		08412627		08412627		08412627		
	UNITS	**WEST OF PA17 GRASS**	**RDL**	**WEST OF PA17 WILLOW**	**RDL**	**PA18 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	1.47	0.36	5.88	0.35	2.15	0.33	8490759
Total Antimony (Sb)	mg/kg	<0.0018	0.0018	<0.0017	0.0017	<0.0017	0.0017	8490759
Total Arsenic (As)	mg/kg	<0.018	0.018	<0.017	0.017	<0.017	0.017	8490759
Total Barium (Ba)	mg/kg	10.2	0.036	6.42	0.035	2.28	0.033	8490759
Total Beryllium (Be)	mg/kg	<0.036	0.036	<0.035	0.035	<0.033	0.033	8490759
Total Bismuth (Bi)	mg/kg	<0.036	0.036	<0.035	0.035	<0.033	0.033	8490759
Total Boron (B)	mg/kg	<0.71	0.71	1.59	0.69	0.84	0.66	8490759
Total Cadmium (Cd)	mg/kg	0.0064	0.0036	0.862	0.0035	1.68	0.0033	8490759
Total Calcium (Ca)	mg/kg	429	3.6	2750	3.5	2470	3.3	8490759
Total Chromium (Cr)	mg/kg	<0.071	0.071	<0.069	0.069	<0.066	0.066	8490759
Total Cobalt (Co)	mg/kg	0.0232	0.0071	0.395	0.0069	0.197	0.0066	8490759
Total Copper (Cu)	mg/kg	0.751	0.018	1.17	0.017	0.837	0.017	8490759
Total Iron (Fe)	mg/kg	10.6	3.6	18.8	3.5	11.5	3.3	8490759
Total Lead (Pb)	mg/kg	0.0208	0.0036	0.0119	0.0035	0.0075	0.0033	8490759
Total Magnesium (Mg)	mg/kg	120	3.6	476	3.5	225	3.3	8490759
Total Manganese (Mn)	mg/kg	195	0.036	243	0.035	267	0.033	8490759
Total Mercury (Hg)	mg/kg	<0.0036	0.0036	<0.0035	0.0035	<0.0033	0.0033	8490759
Total Molybdenum (Mo)	mg/kg	0.072	0.018	0.059	0.017	0.039	0.017	8490759
Total Nickel (Ni)	mg/kg	0.269	0.018	0.972	0.017	0.399	0.017	8490759
Total Phosphorus (P)	mg/kg	350	3.6	491	3.5	273	3.3	8490759
Total Potassium (K)	mg/kg	3290	3.6	2260	3.5	2670	3.3	8490759
Total Selenium (Se)	mg/kg	<0.018	0.018	0.072	0.017	0.020	0.017	8490759
Total Silver (Ag)	mg/kg	<0.0071	0.0071	<0.0069	0.0069	<0.0066	0.0066	8490759
Total Sodium (Na)	mg/kg	<3.6	3.6	<3.5	3.5	<3.3	3.3	8490759
Total Strontium (Sr)	mg/kg	2.16	0.036	8.04	0.035	7.66	0.033	8490759
Total Thallium (Tl)	mg/kg	0.00110	0.00071	<0.00069	0.00069	<0.00066	0.00066	8490759
Total Tin (Sn)	mg/kg	<0.036	0.036	<0.035	0.035	<0.033	0.033	8490759
Total Titanium (Ti)	mg/kg	<0.36	0.36	<0.35	0.35	<0.33	0.33	8490759
Total Uranium (U)	mg/kg	<0.00071	0.00071	<0.00069	0.00069	<0.00066	0.00066	8490759
Total Vanadium (V)	mg/kg	<0.071	0.071	<0.069	0.069	<0.066	0.066	8490759
Total Zinc (Zn)	mg/kg	5.27	0.071	17.4	0.069	37.8	0.066	8490759
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6066		MV6067		MV6068		MV6069		
Sampling Date		2015/08/02		2015/08/02		2015/08/02		2015/08/02		
COC Number		08412626		08412626		08412626		08412626		
	UNITS	**PA19 - GRASS**	**RDL**	**PA19 - WILLOW**	**RDL**	**PA20 - GRASS**	**RDL**	**PA20 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	1.97	0.26	2.59	0.27	1.36	0.39	1.89	0.34	8490759
Total Antimony (Sb)	mg/kg	0.0046	0.0013	<0.0014	0.0014	0.0031	0.0019	<0.0017	0.0017	8490759
Total Arsenic (As)	mg/kg	<0.013	0.013	<0.014	0.014	<0.019	0.019	<0.017	0.017	8490759
Total Barium (Ba)	mg/kg	7.98	0.026	7.77	0.027	3.45	0.039	27.3	0.034	8490759
Total Beryllium (Be)	mg/kg	<0.026	0.026	<0.027	0.027	<0.039	0.039	<0.034	0.034	8490759
Total Bismuth (Bi)	mg/kg	<0.026	0.026	<0.027	0.027	<0.039	0.039	<0.034	0.034	8490759
Total Boron (B)	mg/kg	0.81	0.51	1.20	0.54	0.98	0.77	1.54	0.68	8490759
Total Cadmium (Cd)	mg/kg	0.0308	0.0026	2.08	0.0027	0.0229	0.0039	0.459	0.0034	8490759
Total Calcium (Ca)	mg/kg	1170	2.6	5550	2.7	741	3.9	9070	3.4	8490759
Total Chromium (Cr)	mg/kg	<0.051	0.051	<0.054	0.054	<0.077	0.077	<0.068	0.068	8490759
Total Cobalt (Co)	mg/kg	<0.0051	0.0051	0.174	0.0054	<0.0077	0.0077	0.0239	0.0068	8490759
Total Copper (Cu)	mg/kg	0.734	0.013	1.32	0.014	1.19	0.019	0.914	0.017	8490759
Total Iron (Fe)	mg/kg	10.0	2.6	14.0	2.7	14.7	3.9	11.0	3.4	8490759
Total Lead (Pb)	mg/kg	0.0160	0.0026	0.0091	0.0027	0.0094	0.0039	0.0070	0.0034	8490759
Total Magnesium (Mg)	mg/kg	169	2.6	729	2.7	240	3.9	1440	3.4	8490759
Total Manganese (Mn)	mg/kg	48.3	0.026	48.6	0.027	31.7	0.039	22.0	0.034	8490759
Total Mercury (Hg)	mg/kg	<0.0026	0.0026	<0.0027	0.0027	<0.0039	0.0039	<0.0034	0.0034	8490759
Total Molybdenum (Mo)	mg/kg	0.058	0.013	0.097	0.014	0.341	0.019	0.138	0.017	8490759
Total Nickel (Ni)	mg/kg	0.352	0.013	1.22	0.014	0.493	0.019	0.198	0.017	8490759
Total Phosphorus (P)	mg/kg	598	2.6	1110	2.7	531	3.9	275	3.4	8490759
Total Potassium (K)	mg/kg	3960	2.6	3650	2.7	3120	3.9	4080	3.4	8490759
Total Selenium (Se)	mg/kg	<0.013	0.013	<0.014	0.014	0.060	0.019	0.128	0.017	8490759
Total Silver (Ag)	mg/kg	<0.0051	0.0051	<0.0054	0.0054	<0.0077	0.0077	<0.0068	0.0068	8490759
Total Sodium (Na)	mg/kg	<2.6	2.6	<2.7	2.7	<3.9	3.9	<3.4	3.4	8490759
Total Strontium (Sr)	mg/kg	3.31	0.026	16.6	0.027	2.28	0.039	31.6	0.034	8490759
Total Thallium (Tl)	mg/kg	<0.00051	0.00051	0.00060	0.00054	<0.00077	0.00077	<0.00068	0.00068	8490759
Total Tin (Sn)	mg/kg	<0.026	0.026	<0.027	0.027	<0.039	0.039	<0.034	0.034	8490759
Total Titanium (Ti)	mg/kg	<0.26	0.26	<0.27	0.27	<0.39	0.39	<0.34	0.34	8490759
Total Uranium (U)	mg/kg	<0.00051	0.00051	<0.00054	0.00054	<0.00077	0.00077	0.00080	0.00068	8490759
Total Vanadium (V)	mg/kg	<0.051	0.051	<0.054	0.054	<0.077	0.077	<0.068	0.068	8490759
Total Zinc (Zn)	mg/kg	6.14	0.051	31.8	0.054	14.1	0.077	172	0.068	8490759
RDL = Reportable Detection Limit										

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (VEGETATION)

Maxxam ID		MV6070		MV6071		
Sampling Date		2015/08/02		2015/07/31		
COC Number		08412626		08412626		
	UNITS	**PA20 - HORSETAIL**	**RDL**	**PA21 - WILLOW**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	0.59	0.19	2.08	0.32	8490759
Total Antimony (Sb)	mg/kg	<0.00093	0.00093	<0.0016	0.0016	8490759
Total Arsenic (As)	mg/kg	<0.0093	0.0093	<0.016	0.016	8490759
Total Barium (Ba)	mg/kg	7.81	0.019	41.6	0.032	8490759
Total Beryllium (Be)	mg/kg	<0.019	0.019	<0.032	0.032	8490759
Total Bismuth (Bi)	mg/kg	<0.019	0.019	<0.032	0.032	8490759
Total Boron (B)	mg/kg	1.84	0.37	<0.63	0.63	8490759
Total Cadmium (Cd)	mg/kg	0.0397	0.0019	0.896	0.0032	8490759
Total Calcium (Ca)	mg/kg	4590	1.9	5600	3.2	8490759
Total Chromium (Cr)	mg/kg	<0.037	0.037	<0.063	0.063	8490759
Total Cobalt (Co)	mg/kg	0.0400	0.0037	0.128	0.0063	8490759
Total Copper (Cu)	mg/kg	0.677	0.0093	1.09	0.016	8490759
Total Iron (Fe)	mg/kg	6.7	1.9	10.4	3.2	8490759
Total Lead (Pb)	mg/kg	0.0048	0.0019	0.0067	0.0032	8490759
Total Magnesium (Mg)	mg/kg	606	1.9	835	3.2	8490759
Total Manganese (Mn)	mg/kg	15.4	0.019	50.2	0.032	8490759
Total Mercury (Hg)	mg/kg	<0.0019	0.0019	<0.0032	0.0032	8490759
Total Molybdenum (Mo)	mg/kg	0.0591	0.0093	0.084	0.016	8490759
Total Nickel (Ni)	mg/kg	0.0841	0.0093	2.51	0.016	8490759
Total Phosphorus (P)	mg/kg	255	1.9	1080	3.2	8490759
Total Potassium (K)	mg/kg	6640	1.9	3890	3.2	8490759
Total Selenium (Se)	mg/kg	0.0388	0.0093	<0.016	0.016	8490759
Total Silver (Ag)	mg/kg	<0.0037	0.0037	<0.0063	0.0063	8490759
Total Sodium (Na)	mg/kg	3.0	1.9	<3.2	3.2	8490759
Total Strontium (Sr)	mg/kg	17.5	0.019	15.2	0.032	8490759
Total Thallium (Tl)	mg/kg	0.00060	0.00037	<0.00063	0.00063	8490759
Total Tin (Sn)	mg/kg	<0.019	0.019	<0.032	0.032	8490759
Total Titanium (Ti)	mg/kg	<0.19	0.19	<0.32	0.32	8490759
Total Uranium (U)	mg/kg	<0.00037	0.00037	<0.00063	0.00063	8490759
Total Vanadium (V)	mg/kg	<0.037	0.037	<0.063	0.063	8490759
Total Zinc (Zn)	mg/kg	8.48	0.037	26.6	0.063	8490759
RDL = Reportable Detection Limit						

PHYSICAL TESTING (VEGETATION)

Maxxam ID		MV6013	MV6014	MV6015	MV6016	MV6017	MV6018		
Sampling Date		2015/07/30	2015/07/30	2015/07/30	2015/07/30	2015/07/31	2015/07/31		
COC Number		08412624	08412624	08412624	08412624	08412624	08412624		
	UNITS	**PA01- GRASS**	**PA01- WILLOW**	**PA02- WILLOW**	**PA03- WILLOW**	**PA05- GRASS**	**PA05- WILLOW**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	62	66	65	67	66	70	0.30	8013452

RDL = Reportable Detection Limit

Maxxam ID		MV6019	MV6020	MV6021	MV6022	MV6040	MV6041		
Sampling Date		2015/07/31	2015/07/31	2015/07/31	2015/07/31	2015/07/31	2015/07/31		
COC Number		08412624	08412624	08412624	08412624	08412625	08412625		
	UNITS	**PA06- GRASS**	**PA06- WILLOW**	**PA07- WILLOW**	**PA08- WILLOW**	**PA09 - GRASS**	**PA09 - WILLOW**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	62	67	66	62	60	64	0.30	8013452

RDL = Reportable Detection Limit

Maxxam ID		MV6043		MV6045	MV6047	MV6048	MV6049		
Sampling Date		2015/07/31		2015/07/31	2015/07/31	2015/07/31	2015/07/31		
COC Number		08412625		08412625	08412625	08412625	08412625		
	UNITS	**PA10 - WILLOW**	**QC Batch**	**PA11 - WILLOW**	**PA12 - GRASS**	**PA12 - WILLOW**	**PA13 - HORSETAIL**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	65	8013452	66	76	69	79	0.30	8013281

RDL = Reportable Detection Limit

Maxxam ID		MV6050	MV6056	MV6057	MV6058	MV6059		
Sampling Date		2015/08/01	2015/08/01	2015/08/01	2015/08/01	2015/08/01		
COC Number		08412625	08412627	08412627	08412627	08412627		
	UNITS	**PA14 - GRASS**	**PA14 - WILLOW**	**PA14 - HORSETAIL**	**PA15 - GRASS**	**PA15 - WILLOW**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	68	72	81	65	67	0.30	8013281

RDL = Reportable Detection Limit

Maxxam ID		MV6061	MV6062	MV6063	MV6064		
Sampling Date		2015/08/01	2015/08/01	2015/08/01	2015/08/01		
COC Number		08412627	08412627	08412627	08412627		
	UNITS	**PA16 - GRASS**	**PA16 - WILLOW**	**WEST OF PA17 GRASS**	**WEST OF PA17 WILLOW**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	70	68	64	65	0.30	8013281

RDL = Reportable Detection Limit

PHYSICAL TESTING (VEGETATION)

Maxxam ID		MV6065	MV6066	MV6067	MV6068	MV6069		
Sampling Date		2015/08/01	2015/08/02	2015/08/02	2015/08/02	2015/08/02		
COC Number		08412627	08412626	08412626	08412626	08412626		
	UNITS	**PA18 - WILLOW**	**PA19 - GRASS**	**PA19 - WILLOW**	**PA20 - GRASS**	**PA20 - WILLOW**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	67	74	73	61	66	0.30	8013281

RDL = Reportable Detection Limit

Maxxam ID		MV6070	MV6071		
Sampling Date		2015/08/02	2015/07/31		
COC Number		08412626	08412626		
	UNITS	**PA20 - HORSETAIL**	**PA21 - WILLOW**	**RDL**	**QC Batch**
Physical Properties					
Moisture	%	81	68	0.30	8013281

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		MV6042		MV6044		MV6046		
Sampling Date		2015/07/31		2015/07/31		2015/07/31		
COC Number		08412625		08412625		08412625		
	UNITS	**PA09 - LOWBUSH CRANBERRY**	**RDL**	**PA10 - BOG BLUEBERRY**	**RDL**	**PA11 - LOW BUSH CRANBERRY**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	7.2	1.6	2.7	1.8	35.4	1.5	7995074
Total Antimony (Sb)	mg/kg	<0.0078	0.0078	<0.0089	0.0089	<0.0076	0.0076	7995074
Total Arsenic (As)	mg/kg	<0.039	0.039	<0.045	0.045	<0.038	0.038	7995074
Total Barium (Ba)	mg/kg	23.9	0.16	11.5	0.18	17.7	0.15	7995074
Total Beryllium (Be)	mg/kg	<0.016	0.016	<0.018	0.018	<0.015	0.015	7995074
Total Bismuth (Bi)	mg/kg	<0.16	0.16	<0.18	0.18	<0.15	0.15	7995074
Total Boron (B)	mg/kg	<3.1	3.1	13.9	3.6	5.9	3.0	7995074
Total Cadmium (Cd)	mg/kg	0.026	0.016	0.343	0.018	0.035	0.015	7995074
Total Calcium (Ca)	mg/kg	2300	16	1930	18	2110	15	7995074
Total Chromium (Cr)	mg/kg	<0.31	0.31	<0.36	0.36	<0.30	0.30	7995074
Total Cobalt (Co)	mg/kg	<0.031	0.031	<0.036	0.036	<0.030	0.030	7995074
Total Copper (Cu)	mg/kg	7.09	0.078	4.46	0.089	13.9	0.076	7995074
Total Iron (Fe)	mg/kg	20	16	<18	18	26	15	7995074
Total Lead (Pb)	mg/kg	<0.016	0.016	<0.018	0.018	<0.015	0.015	7995074
Total Magnesium (Mg)	mg/kg	693	16	642	18	941	15	7995074
Total Manganese (Mn)	mg/kg	496	0.16	99.6	0.18	615	0.15	7995074
Total Mercury (Hg)	mg/kg	<0.016	0.016	<0.018	0.018	<0.015	0.015	7995074
Total Molybdenum (Mo)	mg/kg	0.525	0.078	0.781	0.089	<0.076	0.076	7995074
Total Nickel (Ni)	mg/kg	0.985	0.078	0.693	0.089	1.26	0.076	7995074
Total Phosphorus (P)	mg/kg	1280	16	1480	18	1630	15	7995074
Total Potassium (K)	mg/kg	7010	16	8300	18	8460	15	7995074
Total Selenium (Se)	mg/kg	<0.078	0.078	<0.089	0.089	<0.076	0.076	7995074
Total Silver (Ag)	mg/kg	<0.031	0.031	<0.036	0.036	<0.030	0.030	7995074
Total Sodium (Na)	mg/kg	<16	16	<18	18	<15	15	7995074
Total Strontium (Sr)	mg/kg	4.02	0.16	7.91	0.18	2.93	0.15	7995074
Total Thallium (Tl)	mg/kg	<0.0031	0.0031	<0.0036	0.0036	<0.0030	0.0030	7995074
Total Tin (Sn)	mg/kg	0.43	0.16	<0.18	0.18	1.28	0.15	7995074
Total Titanium (Ti)	mg/kg	<0.39	0.39	<0.45	0.45	<0.38	0.38	7995074
Total Uranium (U)	mg/kg	<0.0031	0.0031	<0.0036	0.0036	<0.0030	0.0030	7995074
Total Vanadium (V)	mg/kg	<0.31	0.31	<0.36	0.36	<0.30	0.30	7995074
Total Zinc (Zn)	mg/kg	13.3	0.31	24.8	0.36	16.3	0.30	7995074
RDL = Reportable Detection Limit								

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		MV6060		
Sampling Date		2015/08/01		
COC Number		08412627		
	UNITS	**PA15 - BOG BLUEBERRY**	**RDL**	**QC Batch**
Total Metals by ICPMS				
Total Aluminum (Al)	mg/kg	<1.7	1.7	7995074
Total Antimony (Sb)	mg/kg	<0.0086	0.0086	7995074
Total Arsenic (As)	mg/kg	<0.043	0.043	7995074
Total Barium (Ba)	mg/kg	10.5	0.17	7995074
Total Beryllium (Be)	mg/kg	<0.017	0.017	7995074
Total Bismuth (Bi)	mg/kg	<0.17	0.17	7995074
Total Boron (B)	mg/kg	6.3	3.4	7995074
Total Cadmium (Cd)	mg/kg	0.341	0.017	7995074
Total Calcium (Ca)	mg/kg	1940	17	7995074
Total Chromium (Cr)	mg/kg	<0.34	0.34	7995074
Total Cobalt (Co)	mg/kg	<0.034	0.034	7995074
Total Copper (Cu)	mg/kg	5.92	0.086	7995074
Total Iron (Fe)	mg/kg	<17	17	7995074
Total Lead (Pb)	mg/kg	<0.017	0.017	7995074
Total Magnesium (Mg)	mg/kg	547	17	7995074
Total Manganese (Mn)	mg/kg	39.7	0.17	7995074
Total Mercury (Hg)	mg/kg	<0.017	0.017	7995074
Total Molybdenum (Mo)	mg/kg	0.250	0.086	7995074
Total Nickel (Ni)	mg/kg	0.466	0.086	7995074
Total Phosphorus (P)	mg/kg	1110	17	7995074
Total Potassium (K)	mg/kg	6080	17	7995074
Total Selenium (Se)	mg/kg	<0.086	0.086	7995074
Total Silver (Ag)	mg/kg	<0.034	0.034	7995074
Total Sodium (Na)	mg/kg	<17	17	7995074
Total Strontium (Sr)	mg/kg	6.64	0.17	7995074
Total Thallium (Tl)	mg/kg	<0.0034	0.0034	7995074
Total Tin (Sn)	mg/kg	1.05	0.17	7995074
Total Titanium (Ti)	mg/kg	<0.43	0.43	7995074
Total Uranium (U)	mg/kg	<0.0034	0.0034	7995074
Total Vanadium (V)	mg/kg	<0.34	0.34	7995074
Total Zinc (Zn)	mg/kg	22.3	0.34	7995074
RDL = Reportable Detection Limit				

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Maxxam ID		MV6042	MV6044	MV6046		
Sampling Date		2015/07/31	2015/07/31	2015/07/31		
COC Number		08412625	08412625	08412625		
	UNITS	**PA09 - LOWBUSH CRANBERRY**	**PA10 - BOG BLUEBERRY**	**PA11 - LOW BUSH CRANBERRY**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	0.93	0.31	4.68	0.20	7999449
Total Antimony (Sb)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	7999449
Total Arsenic (As)	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	7999449
Total Barium (Ba)	mg/kg	3.06	1.28	2.34	0.020	7999449
Total Beryllium (Be)	mg/kg	<0.0020	<0.0020	<0.0020	0.0020	7999449
Total Bismuth (Bi)	mg/kg	<0.020	<0.020	<0.020	0.020	7999449
Total Boron (B)	mg/kg	<0.40	1.56	0.78	0.40	7999449
Total Cadmium (Cd)	mg/kg	0.0034	0.0384	0.0047	0.0020	7999449
Total Calcium (Ca)	mg/kg	295	217	278	2.0	7999449
Total Chromium (Cr)	mg/kg	<0.040	<0.040	<0.040	0.040	7999449
Total Cobalt (Co)	mg/kg	<0.0040	<0.0040	<0.0040	0.0040	7999449
Total Copper (Cu)	mg/kg	0.907	0.500	1.83	0.010	7999449
Total Iron (Fe)	mg/kg	2.5	<2.0	3.4	2.0	7999449
Total Lead (Pb)	mg/kg	<0.0020	<0.0020	<0.0020	0.0020	7999449
Total Magnesium (Mg)	mg/kg	88.7	71.9	124	2.0	7999449
Total Manganese (Mn)	mg/kg	63.5	11.2	81.2	0.020	7999449
Total Mercury (Hg)	mg/kg	<0.0020	<0.0020	<0.0020	0.0020	7999449
Total Molybdenum (Mo)	mg/kg	0.067	0.087	<0.010	0.010	7999449
Total Nickel (Ni)	mg/kg	0.126	0.078	0.166	0.010	7999449
Total Phosphorus (P)	mg/kg	163	166	215	2.0	7999449
Total Potassium (K)	mg/kg	898	929	1120	2.0	7999449
Total Selenium (Se)	mg/kg	<0.010	<0.010	<0.010	0.010	7999449
Total Silver (Ag)	mg/kg	<0.0040	<0.0040	<0.0040	0.0040	7999449
Total Sodium (Na)	mg/kg	<2.0	<2.0	<2.0	2.0	7999449
Total Strontium (Sr)	mg/kg	0.514	0.886	0.386	0.020	7999449
Total Thallium (Tl)	mg/kg	<0.00040	<0.00040	<0.00040	0.00040	7999449
Total Tin (Sn)	mg/kg	0.056	<0.020	0.168	0.020	7999449
Total Titanium (Ti)	mg/kg	<0.050	<0.050	<0.050	0.050	7999449
Total Uranium (U)	mg/kg	<0.00040	<0.00040	<0.00040	0.00040	7999449
Total Vanadium (V)	mg/kg	<0.040	<0.040	<0.040	0.040	7999449
Total Zinc (Zn)	mg/kg	1.71	2.77	2.15	0.040	7999449

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Maxxam ID		MV6060		
Sampling Date		2015/08/01		
COC Number		08412627		
	UNITS	**PA15 - BOG BLUEBERRY**	**RDL**	**QC Batch**
Total Metals by ICPMS				
Total Aluminum (Al)	mg/kg	<0.20	0.20	7999449
Total Antimony (Sb)	mg/kg	<0.0010	0.0010	7999449
Total Arsenic (As)	mg/kg	<0.0050	0.0050	7999449
Total Barium (Ba)	mg/kg	1.21	0.020	7999449
Total Beryllium (Be)	mg/kg	<0.0020	0.0020	7999449
Total Bismuth (Bi)	mg/kg	<0.020	0.020	7999449
Total Boron (B)	mg/kg	0.74	0.40	7999449
Total Cadmium (Cd)	mg/kg	0.0396	0.0020	7999449
Total Calcium (Ca)	mg/kg	225	2.0	7999449
Total Chromium (Cr)	mg/kg	<0.040	0.040	7999449
Total Cobalt (Co)	mg/kg	<0.0040	0.0040	7999449
Total Copper (Cu)	mg/kg	0.687	0.010	7999449
Total Iron (Fe)	mg/kg	<2.0	2.0	7999449
Total Lead (Pb)	mg/kg	<0.0020	0.0020	7999449
Total Magnesium (Mg)	mg/kg	63.5	2.0	7999449
Total Manganese (Mn)	mg/kg	4.61	0.020	7999449
Total Mercury (Hg)	mg/kg	<0.0020	0.0020	7999449
Total Molybdenum (Mo)	mg/kg	0.029	0.010	7999449
Total Nickel (Ni)	mg/kg	0.054	0.010	7999449
Total Phosphorus (P)	mg/kg	129	2.0	7999449
Total Potassium (K)	mg/kg	706	2.0	7999449
Total Selenium (Se)	mg/kg	<0.010	0.010	7999449
Total Silver (Ag)	mg/kg	<0.0040	0.0040	7999449
Total Sodium (Na)	mg/kg	<2.0	2.0	7999449
Total Strontium (Sr)	mg/kg	0.771	0.020	7999449
Total Thallium (Tl)	mg/kg	<0.00040	0.00040	7999449
Total Tin (Sn)	mg/kg	0.122	0.020	7999449
Total Titanium (Ti)	mg/kg	<0.050	0.050	7999449
Total Uranium (U)	mg/kg	<0.00040	0.00040	7999449
Total Vanadium (V)	mg/kg	<0.040	0.040	7999449
Total Zinc (Zn)	mg/kg	2.58	0.040	7999449
RDL = Reportable Detection Limit				

PHYSICAL TESTING (TISSUE)

Maxxam ID		MV6042	MV6044	MV6046	MV6060		
Sampling Date		2015/07/31	2015/07/31	2015/07/31	2015/08/01		
COC Number		08412625	08412625	08412625	08412627		
	UNITS	**PA09 - LOWBUSH CRANBERRY**	**PA10 - BOG BLUEBERRY**	**PA11 - LOW BUSH CRANBERRY**	**PA15 - BOG BLUEBERRY**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	87	89	87	88	0.30	7999822
RDL = Reportable Detection Limit							

TEST SUMMARY

Maxxam ID: MV6013
Sample ID: PA01- GRASS
Matrix: VEGETATION

Collected: 2015/07/30
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6014
Sample ID: PA01- WILLOW
Matrix: VEGETATION

Collected: 2015/07/30
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6015
Sample ID: PA02- WILLOW
Matrix: VEGETATION

Collected: 2015/07/30
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6016
Sample ID: PA03- WILLOW
Matrix: VEGETATION

Collected: 2015/07/30
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6017
Sample ID: PA05- GRASS
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6018
Sample ID: PA05- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic

TEST SUMMARY

Maxxam ID: MV6018
Sample ID: PA05- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6019
Sample ID: PA06- GRASS
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6020
Sample ID: PA06- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6020 Dup
Sample ID: PA06- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6021
Sample ID: PA07- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6022
Sample ID: PA08- WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

TEST SUMMARY

Maxxam ID: MV6040
Sample ID: PA09 - GRASS
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6041
Sample ID: PA09 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6042
Sample ID: PA09 - LOWBUSH CRANBERRY
Matrix: TISSUE

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	7995074	2015/08/17	2015/08/17	Automated Statchk
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	7999449	2015/08/12	2015/08/14	Adnan Dzebic
Moisture in Tissue	BAL/BAL	7999822	N/A	2015/08/13	Lolita Obusan

Maxxam ID: MV6042 Dup
Sample ID: PA09 - LOWBUSH CRANBERRY
Matrix: TISSUE

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture in Tissue	BAL/BAL	7999822	N/A	2015/08/13	Lolita Obusan

Maxxam ID: MV6043
Sample ID: PA10 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013452	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6044
Sample ID: PA10 - BOG BLUEBERRY
Matrix: TISSUE

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	7995074	2015/08/17	2015/08/17	Automated Statchk
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	7999449	2015/08/12	2015/08/14	Adnan Dzebic
Moisture in Tissue	BAL/BAL	7999822	N/A	2015/08/13	Lolita Obusan

TEST SUMMARY

Maxxam ID: MV6045
Sample ID: PA11 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6046
Sample ID: PA11 - LOW BUSH CRANBERRY
Matrix: TISSUE

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	7995074	2015/08/17	2015/08/17	Automated Statchk
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	7999449	2015/08/12	2015/08/14	Adnan Dzebic
Moisture in Tissue	BAL/BAL	7999822	N/A	2015/08/13	Lolita Obusan

Maxxam ID: MV6046 Dup
Sample ID: PA11 - LOW BUSH CRANBERRY
Matrix: TISSUE

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	7999449	2015/08/12	2015/08/14	Adnan Dzebic

Maxxam ID: MV6047
Sample ID: PA12 - GRASS
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6048
Sample ID: PA12 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6048 Dup
Sample ID: PA12 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic

TEST SUMMARY

Maxxam ID: MV6049
Sample ID: PA13 - HORSETAIL
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6050
Sample ID: PA14 - GRASS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6056
Sample ID: PA14 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6057
Sample ID: PA14 - HORSETAIL
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998735	2015/08/11	2015/08/17	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6058
Sample ID: PA15 - GRASS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6058 Dup
Sample ID: PA15 - GRASS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

TEST SUMMARY

Maxxam ID: MV6059
Sample ID: PA15 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6060
Sample ID: PA15 - BOG BLUEBERRY
Matrix: TISSUE

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Dry Wt	ICP/CRCM	7995074	2015/08/17	2015/08/17	Automated Statchk
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	7999449	2015/08/12	2015/08/14	Adnan Dzebic
Moisture in Tissue	BAL/BAL	7999822	N/A	2015/08/13	Lolita Obusan

Maxxam ID: MV6061
Sample ID: PA16 - GRASS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6062
Sample ID: PA16 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6063
Sample ID: WEST OF PA17 GRASS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6064
Sample ID: WEST OF PA17 WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic

TEST SUMMARY

Maxxam ID: MV6064
Sample ID: WEST OF PA17 WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6064 Dup
Sample ID: WEST OF PA17 WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic

Maxxam ID: MV6065
Sample ID: PA18 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6066
Sample ID: PA19 - GRASS
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6067
Sample ID: PA19 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6068
Sample ID: PA20 - GRASS
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

TEST SUMMARY

Maxxam ID: MV6069
Sample ID: PA20 - WILLOW
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6070
Sample ID: PA20 - HORSETAIL
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6071
Sample ID: PA21 - WILLOW
Matrix: VEGETATION

Collected: 2015/07/31
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	7998740	2015/08/11	2015/08/14	Adnan Dzebic
Elements by CRC ICPMS - Tissue Wet Wt	ICP/CRCM	8490759	2015/08/10	2015/08/17	David Huang
Moisture in Tissue	BAL/BAL	8013281	N/A	2015/08/25	Lolita Obusan

Maxxam ID: MV6072
Sample ID: PA14 - GRASS ROOTS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8004812	2015/08/11	2015/08/20	Gary Smith

Maxxam ID: MV6072 Dup
Sample ID: PA14 - GRASS ROOTS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8004812	2015/08/17	2015/08/20	Gary Smith

Maxxam ID: MV6073
Sample ID: PA15 - GRASS ROOTS
Matrix: VEGETATION

Collected: 2015/08/01
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8004812	2015/08/11	2015/08/20	Gary Smith

TEST SUMMARY

Maxxam ID: MV6074
Sample ID: PA19 - GRASS ROOTS
Matrix: VEGETATION

Collected: 2015/08/02
Shipped:
Received: 2015/08/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements in Tissue by CRC ICPMS - Dry Wt	ICP/CRCM	8004812	2015/08/11	2015/08/20	Gary Smith

GENERAL COMMENTS

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

Package 1	14.3°C

Revised Report V2 (M_S, 2016/12/05): Revised reportable parameters as per client request.

Results relate only to the items tested.

Maxxam Job #: B567723
Report Date: 2016/12/05

QUALITY ASSURANCE REPORT

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

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**% Recovery**	**QC Limits**
7998735	Total Aluminum (Al)	2015/08/17					<1.0	mg/kg	3.6	35	68	17 - 93
7998735	Total Antimony (Sb)	2015/08/17	107	75 - 125	110	75 - 125	<0.0050	mg/kg	NC	35		
7998735	Total Arsenic (As)	2015/08/17	101	75 - 125	105	75 - 125	<0.050	mg/kg	NC	35	112	42 - 199
7998735	Total Barium (Ba)	2015/08/17	NC	75 - 125	120	75 - 125	<0.10	mg/kg	5.6	35		
7998735	Total Beryllium (Be)	2015/08/17	109	75 - 125	107	75 - 125	<0.10	mg/kg	NC	35		
7998735	Total Bismuth (Bi)	2015/08/17					<0.10	mg/kg	NC	35		
7998735	Total Boron (B)	2015/08/17					<2.0	mg/kg	NC	35	122	75 - 125
7998735	Total Cadmium (Cd)	2015/08/17	NC	75 - 125	104	75 - 125	<0.010	mg/kg	0.22	35	97	75 - 125
7998735	Total Calcium (Ca)	2015/08/17					<10	mg/kg	2.1	35	94	75 - 125
7998735	Total Chromium (Cr)	2015/08/17	101	75 - 125	101	75 - 125	<0.20	mg/kg	NC	35		
7998735	Total Cobalt (Co)	2015/08/17	98	75 - 125	102	75 - 125	<0.020	mg/kg	0.18	35	87	75 - 125
7998735	Total Copper (Cu)	2015/08/17	NC	75 - 125	97	75 - 125	<0.050	mg/kg	1.7	35	91	75 - 125
7998735	Total Iron (Fe)	2015/08/17					<10	mg/kg	NC	35		
7998735	Total Lead (Pb)	2015/08/17	102	75 - 125	105	75 - 125	<0.010	mg/kg	NC	35		
7998735	Total Magnesium (Mg)	2015/08/17					<10	mg/kg	1.2	35		
7998735	Total Manganese (Mn)	2015/08/17	NC	75 - 125	103	75 - 125	<0.10	mg/kg	0.022	35	99	75 - 125
7998735	Total Mercury (Hg)	2015/08/17	111	75 - 125	114	75 - 125	<0.010	mg/kg	NC	35	90	75 - 125
7998735	Total Molybdenum (Mo)	2015/08/17	115	75 - 125	109	75 - 125	<0.050	mg/kg	1.9	35		
7998735	Total Nickel (Ni)	2015/08/17	NC	75 - 125	102	75 - 125	<0.050	mg/kg	0.53	35	85	75 - 125
7998735	Total Phosphorus (P)	2015/08/17					<10	mg/kg	0.62	35	108	75 - 125
7998735	Total Potassium (K)	2015/08/17					<10	mg/kg	1.7	35	94	75 - 125
7998735	Total Selenium (Se)	2015/08/17	91	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35	97	75 - 125
7998735	Total Silver (Ag)	2015/08/17	107	75 - 125	97	75 - 125	<0.020	mg/kg	NC	35		
7998735	Total Sodium (Na)	2015/08/17					<10	mg/kg	NC	35	92	75 - 125
7998735	Total Strontium (Sr)	2015/08/17	NC	75 - 125	100	75 - 125	<0.10	mg/kg	3.5	35	98	75 - 125
7998735	Total Thallium (Tl)	2015/08/17	113	75 - 125	101	75 - 125	<0.0020	mg/kg	NC	35		
7998735	Total Tin (Sn)	2015/08/17	106	75 - 125	109	75 - 125	<0.10	mg/kg	NC	35		
7998735	Total Titanium (Ti)	2015/08/17	109	75 - 125	103	75 - 125	<1.0	mg/kg	NC	35		
7998735	Total Uranium (U)	2015/08/17	102	75 - 125	104	75 - 125	<0.0020	mg/kg	NC	35		
7998735	Total Vanadium (V)	2015/08/17	99	75 - 125	99	75 - 125	<0.20	mg/kg	NC	35		
7998735	Total Zinc (Zn)	2015/08/17	NC	75 - 125	105	75 - 125	<0.20	mg/kg	2.7	35	95	75 - 125

Maxxam Job #: B567723
Report Date: 2016/12/05

QUALITY ASSURANCE REPORT(CONT'D)

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

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**% Recovery**	**QC Limits**
7998740	Total Aluminum (Al)	2015/08/14					<1.0	mg/kg	15	35	35	17 - 93
7998740	Total Antimony (Sb)	2015/08/14	96	75 - 125	101	75 - 125	<0.0050	mg/kg	NC	35		
7998740	Total Arsenic (As)	2015/08/14	99	75 - 125	95	75 - 125	<0.050	mg/kg	NC	35	88	42 - 199
7998740	Total Barium (Ba)	2015/08/14	NC	75 - 125	111	75 - 125	<0.10	mg/kg	13	35		
7998740	Total Beryllium (Be)	2015/08/14	93	75 - 125	93	75 - 125	<0.10	mg/kg	NC	35		
7998740	Total Bismuth (Bi)	2015/08/14					<0.10	mg/kg	NC	35		
7998740	Total Boron (B)	2015/08/14					<2.0	mg/kg	NC	35	86	75 - 125
7998740	Total Cadmium (Cd)	2015/08/14	92	75 - 125	92	75 - 125	<0.010	mg/kg	9.9	35	87	75 - 125
7998740	Total Calcium (Ca)	2015/08/14					<10	mg/kg	1.1	35	93	75 - 125
7998740	Total Chromium (Cr)	2015/08/14	93	75 - 125	96	75 - 125	<0.20	mg/kg	NC	35		
7998740	Total Cobalt (Co)	2015/08/14	92	75 - 125	94	75 - 125	<0.020	mg/kg	9.8	35	75	75 - 125
7998740	Total Copper (Cu)	2015/08/14	NC	75 - 125	94	75 - 125	<0.050	mg/kg	8.4	35	81	75 - 125
7998740	Total Iron (Fe)	2015/08/14					<10	mg/kg	6.0	35		
7998740	Total Lead (Pb)	2015/08/14	92	75 - 125	99	75 - 125	<0.010	mg/kg	NC	35		
7998740	Total Magnesium (Mg)	2015/08/14					<10	mg/kg	8.7	35		
7998740	Total Manganese (Mn)	2015/08/14	NC	75 - 125	96	75 - 125	<0.10	mg/kg	13	35	85	75 - 125
7998740	Total Mercury (Hg)	2015/08/14	96	75 - 125	99	75 - 125	<0.010	mg/kg	NC	35	87	75 - 125
7998740	Total Molybdenum (Mo)	2015/08/14	98	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35		
7998740	Total Nickel (Ni)	2015/08/14	NC	75 - 125	96	75 - 125	<0.050	mg/kg	9.2	35	71 (1)	75 - 125
7998740	Total Phosphorus (P)	2015/08/14					<10	mg/kg	6.3	35	102	75 - 125
7998740	Total Potassium (K)	2015/08/14					<10	mg/kg	12	35	86	75 - 125
7998740	Total Selenium (Se)	2015/08/14	95	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	102	75 - 125
7998740	Total Silver (Ag)	2015/08/14	85	75 - 125	84	75 - 125	<0.020	mg/kg	NC	35		
7998740	Total Sodium (Na)	2015/08/14					<10	mg/kg	NC	35	87	75 - 125
7998740	Total Strontium (Sr)	2015/08/14	NC	75 - 125	96	75 - 125	<0.10	mg/kg	14	35	96	75 - 125
7998740	Total Thallium (Tl)	2015/08/14	98	75 - 125	102	75 - 125	<0.0020	mg/kg	NC	35		
7998740	Total Tin (Sn)	2015/08/14	99	75 - 125	101	75 - 125	<0.10	mg/kg	NC	35		
7998740	Total Titanium (Ti)	2015/08/14	98	75 - 125	96	75 - 125	<1.0	mg/kg	NC	35		
7998740	Total Uranium (U)	2015/08/14	92	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
7998740	Total Vanadium (V)	2015/08/14	96	75 - 125	96	75 - 125	<0.20	mg/kg	NC	35		
7998740	Total Zinc (Zn)	2015/08/14	NC	75 - 125	94	75 - 125	<0.20	mg/kg	6.0	35	83	75 - 125

			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**
7999449	Total Aluminum (Al)	2015/08/14					0.26, RDL=0.20	mg/kg	12	35	36	17 - 93
7999449	Total Antimony (Sb)	2015/08/14	109	75 - 125	101	75 - 125	<0.0010	mg/kg	NC	35		
7999449	Total Arsenic (As)	2015/08/14	106	75 - 125	97	75 - 125	<0.0050	mg/kg	NC	35	92	42 - 199
7999449	Total Barium (Ba)	2015/08/14	NC	75 - 125	111	75 - 125	<0.020	mg/kg	25	35		
7999449	Total Beryllium (Be)	2015/08/14	107	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
7999449	Total Bismuth (Bi)	2015/08/14					<0.020	mg/kg	NC	35		
7999449	Total Boron (B)	2015/08/14					<0.40	mg/kg	NC	35	85	75 - 125
7999449	Total Cadmium (Cd)	2015/08/14	106	75 - 125	93	75 - 125	<0.0020	mg/kg	NC	35	87	75 - 125
7999449	Total Calcium (Ca)	2015/08/14					<2.0	mg/kg	10	35	94	75 - 125
7999449	Total Chromium (Cr)	2015/08/14	106	75 - 125	96	75 - 125	<0.040	mg/kg	NC	35		
7999449	Total Cobalt (Co)	2015/08/14	102	75 - 125	96	75 - 125	<0.0040	mg/kg	NC	35	78	75 - 125
7999449	Total Copper (Cu)	2015/08/14	NC	75 - 125	97	75 - 125	<0.010	mg/kg	3.9	35	84	75 - 125
7999449	Total Iron (Fe)	2015/08/14					<2.0	mg/kg	NC	35		
7999449	Total Lead (Pb)	2015/08/14	103	75 - 125	99	75 - 125	<0.0020	mg/kg	NC	35		
7999449	Total Magnesium (Mg)	2015/08/14					<2.0	mg/kg	12	35		
7999449	Total Manganese (Mn)	2015/08/14	NC	75 - 125	99	75 - 125	<0.020	mg/kg	8.8	35	87	75 - 125
7999449	Total Mercury (Hg)	2015/08/14	113	75 - 125	99	75 - 125	<0.0020	mg/kg	NC	35	77	75 - 125
7999449	Total Molybdenum (Mo)	2015/08/14	112	75 - 125	100	75 - 125	<0.010	mg/kg	NC	35		
7999449	Total Nickel (Ni)	2015/08/14	102	75 - 125	96	75 - 125	<0.010	mg/kg	6.0	35	71 (1)	75 - 125
7999449	Total Phosphorus (P)	2015/08/14					<2.0	mg/kg	9.4	35	103	75 - 125
7999449	Total Potassium (K)	2015/08/14					<2.0	mg/kg	5.5	35	90	75 - 125
7999449	Total Selenium (Se)	2015/08/14	97	75 - 125	89	75 - 125	<0.010	mg/kg	NC	35	103	75 - 125
7999449	Total Silver (Ag)	2015/08/14	99	75 - 125	79	75 - 125	<0.0040	mg/kg	NC	35		
7999449	Total Sodium (Na)	2015/08/14					<2.0	mg/kg	NC	35	92	75 - 125
7999449	Total Strontium (Sr)	2015/08/14	99	75 - 125	96	75 - 125	<0.020	mg/kg	27	35	93	75 - 125
7999449	Total Thallium (Tl)	2015/08/14	105	75 - 125	104	75 - 125	<0.00040	mg/kg	NC	35		
7999449	Total Tin (Sn)	2015/08/14	118	75 - 125	100	75 - 125	<0.020	mg/kg	10	35		
7999449	Total Titanium (Ti)	2015/08/14	113	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35		
7999449	Total Uranium (U)	2015/08/14	102	75 - 125	96	75 - 125	<0.00040	mg/kg	NC	35		
7999449	Total Vanadium (V)	2015/08/14	103	75 - 125	97	75 - 125	<0.040	mg/kg	NC	35		

			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
7999449	Total Zinc (Zn)	2015/08/14	NC	75 - 125	92	75 - 125	0.072, RDL=0.040	mg/kg	11	35	82	75 - 125
7999822	Moisture	2015/08/13					<0.30	%	0.34	20		
8004812	Total Aluminum (Al)	2015/08/20					2.0, RDL=1.0	mg/kg	16	35	38	17 - 93
8004812	Total Antimony (Sb)	2015/08/20	85	75 - 125	111	75 - 125	<0.0050	mg/kg	18	35		
8004812	Total Arsenic (As)	2015/08/20	99	75 - 125	100	75 - 125	<0.050	mg/kg	22	35	90	42 - 199
8004812	Total Barium (Ba)	2015/08/20	NC	75 - 125	121	75 - 125	0.11, RDL=0.10	mg/kg	12	35		
8004812	Total Beryllium (Be)	2015/08/20	99	75 - 125	107	75 - 125	<0.10	mg/kg	NC	35		
8004812	Total Bismuth (Bi)	2015/08/20					<0.10	mg/kg	NC	35		
8004812	Total Boron (B)	2015/08/20					<2.0	mg/kg	NC	35	96	75 - 125
8004812	Total Cadmium (Cd)	2015/08/20	NC	75 - 125	106	75 - 125	<0.010	mg/kg	13	35	93	75 - 125
8004812	Total Calcium (Ca)	2015/08/20					<10	mg/kg	9.5	35	86	75 - 125
8004812	Total Chromium (Cr)	2015/08/20	NC	75 - 125	103	75 - 125	<0.20	mg/kg	6.0	35		
8004812	Total Cobalt (Co)	2015/08/20	90	75 - 125	103	75 - 125	<0.020	mg/kg	15	35	81	75 - 125
8004812	Total Copper (Cu)	2015/08/20	NC	75 - 125	104	75 - 125	<0.050	mg/kg	14	35	88	75 - 125
8004812	Total Iron (Fe)	2015/08/20					<10	mg/kg	11	35		
8004812	Total Lead (Pb)	2015/08/20	NC	75 - 125	104	75 - 125	0.012, RDL=0.010	mg/kg	15	35		
8004812	Total Magnesium (Mg)	2015/08/20					<10	mg/kg	13	35		
8004812	Total Manganese (Mn)	2015/08/20	NC	75 - 125	103	75 - 125	<0.10	mg/kg	11	35	88	75 - 125
8004812	Total Mercury (Hg)	2015/08/20	106	75 - 125	117	75 - 125	<0.010	mg/kg	13	35	119	75 - 125
8004812	Total Molybdenum (Mo)	2015/08/20	104	75 - 125	114	75 - 125	<0.050	mg/kg	14	35		
8004812	Total Nickel (Ni)	2015/08/20	NC	75 - 125	104	75 - 125	<0.050	mg/kg	9.9	35	75	75 - 125
8004812	Total Phosphorus (P)	2015/08/20					<10	mg/kg	10	35	97	75 - 125
8004812	Total Potassium (K)	2015/08/20					<10	mg/kg	9.3	35	91	75 - 125
8004812	Total Selenium (Se)	2015/08/20	97	75 - 125	94	75 - 125	<0.050	mg/kg	23	35	103	75 - 125
8004812	Total Silver (Ag)	2015/08/20	93	75 - 125	85	75 - 125	<0.020	mg/kg	13	35		
8004812	Total Sodium (Na)	2015/08/20					<10	mg/kg	NC	35	92	75 - 125
8004812	Total Strontium (Sr)	2015/08/20	NC	75 - 125	105	75 - 125	<0.10	mg/kg	11	35	103	75 - 125
8004812	Total Thallium (Tl)	2015/08/20	102	75 - 125	93	75 - 125	<0.0020	mg/kg	11	35		
8004812	Total Tin (Sn)	2015/08/20	93	75 - 125	106	75 - 125	<0.10	mg/kg	NC	35		

QUALITY ASSURANCE REPORT(CONT'D)

			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**
8004812	Total Titanium (Ti)	2015/08/20	NC	75 - 125	111	75 - 125	<1.0	mg/kg	16	35		
8004812	Total Uranium (U)	2015/08/20	95	75 - 125	102	75 - 125	0.0020, RDL=0.0020	mg/kg	19	35		
8004812	Total Vanadium (V)	2015/08/20	NC	75 - 125	105	75 - 125	<0.20	mg/kg	17	35		
8004812	Total Zinc (Zn)	2015/08/20	NC	75 - 125	99	75 - 125	<0.20	mg/kg	8.1	35	80	75 - 125
8013281	Moisture	2015/08/25					<0.30	%	2.0	20		
8013452	Moisture	2015/08/25					<0.30	%	1.1	20		

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) Reference Material for (Nickel) exceeds acceptance criteria. 10% of analytes failure in multi-element scan is allowed.

VALIDATION SIGNATURE PAGE

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

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Rob Reinert, B.Sc., Scientific Specialist

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
A Bureau Veritas Group Company

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

CHAIN OF CUSTODY RECORD

08412624

BBY FCD-00077/05
Page 1 4

Invoice Information		**Report Information (if differs from invoice)**		**Project Informat**	
Company Name:	BMC MINERALS LTD.	Company Name:	ALEXCO ENVIRONMENTAL	Quotation #:	B50743
Contact Name:		Contact Name:	KAI WOLOSHYN	P.O. #/ AFE#:	
Address:	530-1130 WEST PENDER ST	Address:	UNIT 3 151 INDUCSTRIAL RD	Project #:	BMC-15-01 ###
	Vancouver, BC PC: V6E 4A4		Whitehorse, YK PC: V1A 2V3	Site Location:	Kudz Ze Kayah
Phone:		Phone:	(867) 668-6463	Site #:	
Email:		Email:	kwoloshyn@alexcoresource.com	Sampled By:	Lisa Knight

Turnaround Time (TAT) Required

☒ Regular TAT 5 days (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:

Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☒ CCME (Specify) ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☒ 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

LABORATORY USE ONLY

CUSTODY SEAL Y / [✓ N]		COOLER TEMPERATURES
Present	Intact	
NA		16, 14, 13

COOLING MEDIA PRESENT [✓ Y] / N

Analysis Requested

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	MET-WET-CCMS-N-VA	MET-DRY-CCMS-N-VA	PREP-TISS-DIGEST-VA	CEC	NPKS (Soil Nutrients) Avlable	TEXTURE	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL				# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	PA01- grass	MV6013	2015-07-30			x	x	x																1 (thawed ice pack
2	PA01- willow	MV6014	2015-07-30			x	x	x																
3	PA02- willow	MV6015	2015-07-30			x	x	x																
4	PA03- willow	MV6016	2015-07-30			x	x	x																
5	PA05- grass	MV6017	2015-07-31			x	x	x																
6	PA05- willow	MV6018	2015-07-31			x	x	x																
7	PA06- grass	MV6019	2015-07-31			x	x	x																
8	PA06- willow	MV6020	2015-07-31			x	x	x																
9	PA07- willow	MV6021	2015-07-31			x	x	x																
10	PA08- willow	MV6022	2015-07-31			x	x	x																

B567723

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Kirsten Scott	2015/08/06	16:30	Laurel Berthier	2015/08/07	13:45	B567723

Maxxam
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CHAIN OF CUSTODY RECORD

08412625

BBY FCD-00077/05

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Invoice Information		Report Information (if differs from invoice)		Project Informa		Turnaround Time (TAT) Required
Company Name:	BMC MINERALS LTD.	Company Name:	ALEXCO ENVIRONMENTAL	Quotation #:	B50743	☒ Regular TAT 5 days (Most analyses)
Contact Name:		Contact Name:	KAI WOLOSHYN	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	530-1130 WEST PENDER ST	Address:	UNIT 3 151 INDUCSTRIAL RD	Project #:	BMC-15-01	Rush TAT (Surcharges will be applied)
	Vancouver, BC PC: V6E 4A4		Whitehorse, YK PC: V1A 2V3	Site Location:	Kudz Ze Kayah	☐ Same Day ☐ 2 Days
Phone:		Phone:	(867) 668-6463	Site #:		☐ 1 Day ☐ 3 Days
Email:		Email:	kwoloshyn@alexcoresource.com	Sampled By:		Date Required:
						Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water

☐ CCME (Specify) ☐ Other (Specify)

☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ 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

LABORATORY USE ONLY

CUSTODY SEAL Y / [✓ N]		COOLER TEMPERATURES
Present	Intact	
NA		16,14,13

COOLING MEDIA PRESENT [✓ Y] / N

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	MET-WET-CCMS-N-VA	MET-DRY-CCMS-N-VA	PREP-TISS-DIGEST-VA	ANIONS (Cl, F, SO4, NO2, NO3)	AMMONIA	CYANIDE (SAD & WAD)	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL				# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
11	PA09 - grass	MV6040	2015-07-31			x	x	x																1 (thawed ice
12	PA09 - willow	MV6041	2015-07-31			x	x	x																pack
13	PA09 - lowbush cranberry	MV6042	2015-07-31			x	x	x																
14	PA10 - willow	MV6043	2015-07-31			x	x	x																
15	PA10 - bog blueberry	MV6044	2015-07-31			x	x	x																
16	PA11 - willow	MV6045	2015-07-31			x	x	x																
17	PA11 - low bush cranberry	MV6046	2015-07-31			x	x	x																
18	PA12 - grass	MV6047	2015-07-31			x	x	x																
19	PA12 - willow	MV6048	2015-07-31			x	x	x																
20	PA13 - Horsetail	MV6049	2015-07-31			x	x	x																
21	PA14 - grass	MV6050	2015-08-01			x	x	x																

B567723

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Kirsten Scott	2015/08/06	16:30	Laurel Berthier	2015/08/07	13:45	B567723

Maxxam
A Bureau Veritas Group Company

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

CHAIN OF CUSTODY RECORD

08412627

BBY FCD-00077/05
Page 3 4

Invoice Information		Report Information (if differs from invoice)		Project Informat	
Company Name:	BMC MINERALS LTD.	Company Name:	ALEXCO ENVIRONMENTAL	Quotation #:	B50743
Contact Name:		Contact Name:	KAI WOLOSHYN	P.O. #/ AFE#:	
Address:	530-1130 WEST PENDER ST	Address:	UNIT 3 151 INDUCSTRIAL RD	Project #:	BMC-15-01
	Vancouver, BC PC: V6E 4A4		Whitehorse, YK PC: V1A 2V3	Site Location:	Kudz Ze Kayah
Phone:		Phone:	(867) 668-6463	Site #:	
Email:		Email:	kwoloshyn@alexcoresource.com	Sampled By:	

Turnaround Time (TAT) Required

☒ Regular TAT 5 days (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:

Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☐ CCME (Specify) ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ 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

LABORATORY USE ONLY

CUSTODY SEAL Y [✓ N]

Present	Intact	COOLER TEMPERATURES
NA		11/14/13

COOLING MEDIA PRESENT [✓ Y] / N

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	MET-WET-CCMS-N-VA	MET-DRY-CCMS-N-VA	PREP-TISS-DIGEST-VA	ANIONS (Cl, F, SO4, NO2, NO3)	AMMONIA	CYANIDE (SAD & WAD)	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL				# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
21	PA14 - willow	MV6056	2015-08-01			x	x	x																1 thawed ice pack
22	PA14 - horsetail	MV6057	2015-08-01			x	x	x																
23	PA15 - grass	MV6058	2015-08-01			x	x	x																
24	PA15 - willow	MV6059	2015-08-01			x	x	x																
25	PA15 - bog blueberry	MV6060	2015-08-01			x	x	x																
26	PA16 - grass	MV6061	2015-08-01			x	x	x																
27	PA16 - willow	MV6062	2015-08-01			x	x	x																
28	West of PA17 grass	MV6063	2015-08-01			x	x	x																
29	West of PA17 willow	MV6064	2015-08-01			x	x	x																
30	PA18 - willow	MV6065	2015-08-01			x	x	x																

B567723

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Kriste Scott	2015/08/06	16:30	Laurel Berthier	2015/08/07	13:45

MAXXAM JOB #
B567723

Maxxam
A Bureau Veritas Group Company

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

CHAIN OF CUSTOD

08412626

BBY FCD-00077/05
Page 4 4

Invoice Information
Company Name: BMC MINERALS LTD.
Contact Name:
Address: 530-1130 WEST PENDER ST
Vancouver, BC PC: V6E 4A4
Phone:
Email:

Report Information (if differs from invoice)
Company Name: ALEXCO ENVIRONMENTAL
Contact Name: KAI WOLOSHYN
Address: UNIT 3 151 INDUCSTRIAL RD
Whitehorse, YK PC: V1A 2V3
Phone: (867) 668-6463
Email: kwoloshyn@alexcoresource.com

Project Information (where applicable)
Quotation #: B50743
P.O. #/ AFE#:
Project #: BMC-15-01
Site Location: Kudz Ze Kayah
Site #:
Sampled By:

urnaround Time (TAT) Required
☒ Regular TAT 5 days (Most analyses)
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days
Date Required:
Rush Confirmation #:

Regulatory Criteria
☐ BC CSR Soil ☐ BC CSR Water
☐ CCME (Specify) ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions
☐ Return Cooler
☐ Ship Sample Bottles (Please Specify)
USE SCENARIO # 12485

LABORATORY USE ONLY
CUSTODY SEAL Y / [✓ N]
Present: NA
Intact:
COOLER TEMPERATURES: 16/14/13
COOLING MEDIA PRESENT [✓ Y] / N

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

Analysis Requested

	Sample Identification	Lab Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	MET-WET-CCMS-N-VA	MET-DRY-CCMS-N-VA	PREP-TISS-DIGEST-VA	ANIONS (Cl, F, SO4, NO2, NO3)	AMMONIA	CYANIDE (SAD & WAD)	CONDUCTIVITY	pH	ALKALINITY & ACIDITY	TRUE COLOR	DOC	TOTAL PHOSPHORUS - LOW LEVEL	DISSOLVED PHOSPHORUS - LOW LEVEL				# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
21	PA19 - grass	MV6066	2015-08-02			x	x	x														1		1 thawed ice
22	PA19 - willow	MV6067	2015-08-02			x	x	x														1		pack
23	PA20 - grass	MV6068	2015-08-02			x	x	x														1		
24	PA20 - willow	MV6069	2015-08-02			x	x	x														1		
25	PA20 - horsetail	MV6070	2015-08-02			x	x	x														1		
26	PA21 - willow	MV6071	2015-07-31			x	x	x														1		
27	PA14 - grass roots	MV6072	2015-08-01			x	x	x														1		
28	PA15 - grass roots	MV6073	2015-08-01			x	x	x														1		
29	PA19 - grass roots	MV6074	2015-08-02			x	x	x														1		
		2015/08/07.																						

B567723

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Kirsten Scott	2015/08/06	16:30	Laurel Berthier	2015/08/07	13:45	B567723

APPENDIX E:

TIMBER SURVEY EXAMPLE DATA SHEET

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BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — TREE DETAILS (TD)

8

Data ID		PL	PLOT TYPE
Project ID	Plot Sample #		
hZK	kz96	I	TE

Measurement Date		
YEAR	MON	DD
2015	Jun	25

PLOT TYPE (VARIABLE OR FIXED)

VARIABLE					
B.A.F. (m²/ha)	Plot FULL	Plot HALF	Plot QRTR	Plot BDRY	Plot SPLIT
5.00	✓				

PRF$_c$ = . m / cm DBH

OR

Diopter .

Azimuth ° Bdry/Split 0 - 359°

FIXED					
Plot Radius (m)	Plot FULL	Plot HALF	Plot QRTR	Plot BDRY	Plot SPLIT
.					

PAGE 1 OF 1

TREE MEASUREMENTS											LOG GRADES, LENGTHS, % SOUND												WILDLIFE CODES						BROKEN TOPS		S1	S2
											LOG 1 / 5			LOG 2 / 6			LOG 3 / 7			LOG 4 / 8												
TREE NUMBER	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 4 cm	M or E	REM Bark %	Tree Length m ~~≥1.3~~ m Total	M or E	CR. CL. DCIS	HEIGHT TO LIVE CROWN	GRADE	LENGTH m	% SOUND	GRADE	LENGTH m	% SOUND	GRADE	LENGTH m	% SOUND	GRADE	LENGTH m	% SOUND	APPEARANCE	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE	Broken Top Diameter (cm)	Proj. Height (m)		
1 2 3	4 5 6	7	8	9 10 11 12	13	14 15	16 17 18	19	20	21 22	23	24 25	26 27	28	29 30	31 32	33	34 35	36 37	38	39 40	41 42	43	44	45	46	47	48 49	50 51 52	53 54	55	56
01	Sw	L	S	28.1	M	/		M				21																	7	4		
02	Bp	L	S	34.9	M	/		M				20																				
03	Sw	L	S	32.0	M	/		M				20																				
04	Sw	L	S	24.6	M	/		M				18																				
05	Sw	L	S	18.7	M	/		M				10																				

Comments 03 - Splits into 4 trees 6 m up / 05 broken / Tree 01 ~ 230yr
Timber plot in climax Sw Forest ~ 30m from Finlayson Cr. on West side

FS 505K HRI 99/3

Plot located along W bank of Finlayson creek nutrient C
not accessable by Road steep bank ~35% Ravine. moisture 5

Data ID		PL	PLOT TYPE
Project ID	Plot Sample #		
KZK	6	I	TS

WORKSHEET

Data Will not Be Keypunched

BORDERLINE TREE & TREE LENGTH CALCULATIONS

IN/OUT Trees For Audit Are Measured To Tree Face

BAF	5.00	
P.R.F.		
DIOP.		

CARD TD

* Center or Face

TREE NO.	DBH (cm)	1/2 DBH (cm)	SLOPE DISTANCE (m)	C/F*	% SLOPE	HORIZ. DIST. (m)	CRITICAL DIST. OR DIAMETER	C/F	I/O	+/–	TOP %	+/–	BTM %	TOTAL %	COR	LENGTH (m)
1			22		+1	22					92		+1	91		21.32
2			22		+2	22					85		+2	83		19.56
3			22		+1	22					89		+1	88		20.66
4			22		0	22					76		0	76		18.[illegible]
5			11		-3	11					80		-3	83		10.43

Diagrams / Notes

LEADING SPECIES CALCULATION (Live trees only).

PLOT	SPECIES						
I							
N							
E							
S							
W							
Total **							

** Note: 1/2 and 1/4 plots multiple by 2 or 4 respectively

APPENDIX F:

QUALITY ASSURANCE / QUALITY CONTROL

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Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2015 Soil Samples

Analyte	Units	PA12	PA21	RDL	RPD	Meets PQL
Nutrients						
Available (NH4F) Nitrogen (N)	mg/kg	<2.0	<2.0	2.0	-	
Available (NH4F) Phosphorus (P)	mg/kg	3.4	2.7	1.0	23%	
Available (NH4OAc) Potassium (K)	mg/kg	19	18	2.0	5%	
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	<2.0	2.0	-	
Soluble Parameters						
Soluble Conductivity	dS/m	0.074	0.069	0.020	7%	
Soluble (CaCl2) pH	pH	4.55	4.59	N/A	1%	
Saturation %	%	38	39	N/A	3%	
Physical Properties						
% sand by hydrometer	%	63	67	2.0	6%	
% silt by hydrometer	%	29	27	2.0	7%	
Clay Content	%	8.1	5.7	2.0	35%	No
Texture	N/A	SANDY LOAM	SANDY LOAM	N/A	-	
Elements						
Cation exchange capacity	cmol+/Kg	<10	<10	10	-	
Misc. Inorganics						
Total Carbon	%	0.65	0.62	0.020	5%	
Soluble (2:1) pH	pH	5.37	5.45	N/A	1%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	14500	14300	100	1%	
Total Antimony (Sb)	mg/kg	0.45	0.46	0.10	2%	
Total Arsenic (As)	mg/kg	9.76	10.5	0.50	7%	
Total Barium (Ba)	mg/kg	211	211	0.10	0%	
Total Beryllium (Be)	mg/kg	0.51	0.46	0.40	10%	
Total Bismuth (Bi)	mg/kg	0.41	0.41	0.10	0%	
Total Cadmium (Cd)	mg/kg	0.324	0.310	0.050	4%	
Total Calcium (Ca)	mg/kg	4070	3820	100	6%	
Total Chromium (Cr)	mg/kg	48.0	50.5	1.0	5%	
Total Cobalt (Co)	mg/kg	10.6	10.9	0.30	3%	
Total Copper (Cu)	mg/kg	32.0	31.6	0.50	1%	
Total Iron (Fe)	mg/kg	28100	28800	100	2%	
Total Lead (Pb)	mg/kg	13.8	14.3	0.10	4%	
Total Lithium (Li)	mg/kg	16.5	15.5	5.0	6%	
Total Magnesium (Mg)	mg/kg	7990	7950	100	1%	
Total Manganese (Mn)	mg/kg	310	331	0.20	7%	
Total Mercury (Hg)	mg/kg	<0.050	<0.050	0.050	-	
Total Molybdenum (Mo)	mg/kg	2.10	1.97	0.10	6%	
Total Nickel (Ni)	mg/kg	39.9	41.9	0.80	5%	
Total Phosphorus (P)	mg/kg	1210	1140	10	6%	
Total Potassium (K)	mg/kg	1180	1120	100	5%	
Total Selenium (Se)	mg/kg	<0.50	<0.50	0.50	-	
Total Silver (Ag)	mg/kg	0.101	0.115	0.050	13%	
Total Sodium (Na)	mg/kg	<100	<100	100	-	
Total Strontium (Sr)	mg/kg	17.7	17.4	0.10	2%	
Total Thallium (Tl)	mg/kg	0.116	0.114	0.050	2%	
Total Tin (Sn)	mg/kg	0.62	0.63	0.10	2%	
Total Titanium (Ti)	mg/kg	621	613	1.0	1%	
Total Uranium (U)	mg/kg	1.10	1.23	0.050	11%	
Total Vanadium (V)	mg/kg	61.3	62.0	2.0	1%	
Total Zinc (Zn)	mg/kg	134	131	1.0	2%	
Total Zirconium (Zr)	mg/kg	0.58	0.59	0.50	2%	

Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2016 Soil Samples

Analyte	Units	PA42	PA72	RDL	RPD	Meets PQL
Nutrients						
Available (NH4F) Nitrogen (N)	mg/kg	3.8	<2.0	2.0	-	
Available (NH4F) Phosphorus (P)	mg/kg	45	40	1.0	12%	
Available (NH4OAc) Potassium (K)	mg/kg	13	13	2.0	0%	
Available (CaCl2) Sulphur (S)	mg/kg	<2.0	<2.0	2.0	-	
Soluble Parameters						
Soluble Conductivity	dS/m	0.075	0.082	0.020	9%	
Soluble (CaCl2) pH	pH	4.96	4.94	N/A	0%	
Saturation %	%	55	59	N/A	7%	
Physical Properties						
% sand by hydrometer	%	73	73	2.0	0%	
% silt by hydrometer	%	25	25	2.0	0%	
Clay Content	%	<2.0	<2.0	2.0	-	
Texture	N/A	LOAMY SAND	LOAMY SAND	N/A	-	
Elements						
Cation exchange capacity	cmol+/Kg	16	15	10	6%	
Misc. Inorganics						
Total Carbon	%			0.020		
Soluble (2:1) pH	pH	5.81	7.02	N/A	17%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	12100	11600	100	4%	
Total Antimony (Sb)	mg/kg	0.16	0.42	0.10	90%	No
Total Arsenic (As)	mg/kg	9.51	40.0	0.50	123%	Yes
Total Barium (Ba)	mg/kg	111	200	0.10	57%	Yes
Total Beryllium (Be)	mg/kg	<0.40	0.45	0.40	-	
Total Bismuth (Bi)	mg/kg	0.21	0.17	0.10	21%	
Total Cadmium (Cd)	mg/kg	0.523	1.43	0.050	93%	Yes
Total Calcium (Ca)	mg/kg	3800	7590	100	67%	Yes
Total Chromium (Cr)	mg/kg	29.1	40.0	1.0	32%	Yes
Total Cobalt (Co)	mg/kg	9.30	14.2	0.30	42%	Yes
Total Copper (Cu)	mg/kg	12.5	32.9	0.50	90%	Yes
Total Iron (Fe)	mg/kg	21600	29800	100	32%	Yes
Total Lead (Pb)	mg/kg	18.9	17.8	0.10	6%	
Total Lithium (Li)	mg/kg	11.0	14.0	5.0	24%	
Total Magnesium (Mg)	mg/kg	5560	7730	100	33%	Yes
Total Manganese (Mn)	mg/kg	473	773	0.20	48%	Yes
Total Mercury (Hg)	mg/kg	<0.050	0.062	0.050	-	
Total Molybdenum (Mo)	mg/kg	1.14	1.60	0.10	34%	Yes
Total Nickel (Ni)	mg/kg	14.8	38.9	0.80	90%	Yes
Total Phosphorus (P)	mg/kg	761	1200	10	45%	Yes
Total Potassium (K)	mg/kg	745	598	100	22%	
Total Selenium (Se)	mg/kg	<0.50	1.10	0.50	-	
Total Silver (Ag)	mg/kg	<0.050	0.240	0.050	-	
Total Sodium (Na)	mg/kg	<100	<100	100	-	
Total Strontium (Sr)	mg/kg	14.7	25.8	0.10	55%	Yes
Total Thallium (Tl)	mg/kg	0.088	0.102	0.050	15%	
Total Tin (Sn)	mg/kg	0.59	0.42	0.10	34%	Yes
Total Titanium (Ti)	mg/kg	468	573	1.0	20%	
Total Uranium (U)	mg/kg	1.20	1.41	0.050	16%	
Total Vanadium (V)	mg/kg	34.9	44.6	2.0	24%	
Total Zinc (Zn)	mg/kg	147	130	1.0	12%	
Total Zirconium (Zr)	mg/kg	<0.50	2.39	0.50	-	

Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2015 Vegetation Samples

Analyte	Units	PA12 -WILLOW	PA21 -WILLOW	RDL	RPD	Meets PQL
Physical Properties						
Moisture	%	69	68	0.30	1%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	7.3	6.6	1.0	10%	
Total Antimony (Sb)	mg/kg	0.0106	<0.0050	0.0050	-	
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.050	-	
Total Barium (Ba)	mg/kg	145	131	0.10	10%	
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.10	-	
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.10	-	
Total Boron (B)	mg/kg	2.3	<2.0	2.0	-	
Total Cadmium (Cd)	mg/kg	3.29	2.83	0.010	15%	
Total Calcium (Ca)	mg/kg	20600	17700	10	15%	
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.20	-	
Total Cobalt (Co)	mg/kg	0.471	0.403	0.020	16%	
Total Copper (Cu)	mg/kg	4.38	3.45	0.050	24%	
Total Iron (Fe)	mg/kg	38	33	10	14%	
Total Lead (Pb)	mg/kg	0.029	0.021	0.010	32%	No
Total Magnesium (Mg)	mg/kg	3170	2640	10	18%	
Total Manganese (Mn)	mg/kg	207	158	0.10	27%	Yes
Total Mercury (Hg)	mg/kg	<0.010	<0.010	0.010	-	
Total Molybdenum (Mo)	mg/kg	0.320	0.265	0.050	19%	
Total Nickel (Ni)	mg/kg	9.95	7.92	0.050	23%	
Total Phosphorus (P)	mg/kg	4620	3400	10	30%	Yes
Total Potassium (K)	mg/kg	15400	12300	10	22%	
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.050	-	
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.020	-	
Total Sodium (Na)	mg/kg	<10	<10	10	-	
Total Strontium (Sr)	mg/kg	56.3	47.8	0.10	16%	
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.10	-	
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.0	-	
Total Uranium (U)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.20	-	
Total Zinc (Zn)	mg/kg	101	83.8	0.20	19%	

Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2016 Vegetation Samples

Analyte	Units	PA54 - HORSETAIL	PA74 - HORSETAIL	RDL	RPD	Meets PQL
Physical Properties						
Moisture	%	82	81	0.30	1%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	6.1	5.4	1.0	12%	
Total Antimony (Sb)	mg/kg	<0.0050	0.0072	0.0050	-	
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.050	-	
Total Barium (Ba)	mg/kg	31.4	31.1	0.10	1%	
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.10	-	
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.10	-	
Total Boron (B)	mg/kg	16.1	17.4	2.0	8%	
Total Cadmium (Cd)	mg/kg	0.373	0.243	0.010	42%	Yes
Total Calcium (Ca)	mg/kg	23400	23800	10	2%	
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.20	-	
Total Cobalt (Co)	mg/kg	<0.020	<0.020	0.020	-	
Total Copper (Cu)	mg/kg	4.77	7.41	0.050	43%	Yes
Total Iron (Fe)	mg/kg	46	43	10	7%	
Total Lead (Pb)	mg/kg	0.071	0.21	0.010	99%	Yes
Total Magnesium (Mg)	mg/kg	3840	4480	10	15%	
Total Manganese (Mn)	mg/kg	41.1	30.1	0.10	31%	Yes
Total Mercury (Hg)	mg/kg	0.011	<0.010	0.010	-	
Total Molybdenum (Mo)	mg/kg	0.341	0.374	0.050	9%	
Total Nickel (Ni)	mg/kg	0.27	0.235	0.050	14%	
Total Phosphorus (P)	mg/kg	1290	1440	10	11%	
Total Potassium (K)	mg/kg	49900	48800	10	2%	
Total Selenium (Se)	mg/kg	0.052	0.111	0.050	72%	
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.020	-	
Total Sodium (Na)	mg/kg	61	36	10	52%	Yes
Total Strontium (Sr)	mg/kg	56.3	51.4	0.10	9%	
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Tin (Sn)	mg/kg	<0.10	0.1	0.10	-	
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.0	-	
Total Uranium (U)	mg/kg	<0.0020	0.0024	0.0020	-	
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.20	-	
Total Zinc (Zn)	mg/kg	33.9	31	0.20	9%	

Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2016 Vegetation Samples

Analyte	Units	PA55 - SALIX	PA75 - SALIX	RDL	RPD	Meets PQL
Physical Properties						
Moisture	%	62	67	0.30	8%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	7	10.3	1.0	38%	Yes
Total Antimony (Sb)	mg/kg	<0.0050	0.0057	0.0050	-	
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.050	-	
Total Barium (Ba)	mg/kg	15.4	12.1	0.10	24%	
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.10	-	
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.10	-	
Total Boron (B)	mg/kg	6.7	4.7	2.0	35%	No
Total Cadmium (Cd)	mg/kg	2.55	2.3	0.010	10%	
Total Calcium (Ca)	mg/kg	9130	9320	10	2%	
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.20	-	
Total Cobalt (Co)	mg/kg	0.486	0.473	0.020	3%	
Total Copper (Cu)	mg/kg	3.04	3.28	0.050	8%	
Total Iron (Fe)	mg/kg	55	61	10	10%	
Total Lead (Pb)	mg/kg	0.039	0.052	0.010	29%	Yes
Total Magnesium (Mg)	mg/kg	2040	2080	10	2%	
Total Manganese (Mn)	mg/kg	53.1	56.9	0.10	7%	
Total Mercury (Hg)	mg/kg	<0.010	<0.010	0.010	-	
Total Molybdenum (Mo)	mg/kg	0.276	0.25	0.050	10%	
Total Nickel (Ni)	mg/kg	3.13	2.81	0.050	11%	
Total Phosphorus (P)	mg/kg	1060	1130	10	6%	
Total Potassium (K)	mg/kg	16000	17100	10	7%	
Total Selenium (Se)	mg/kg	1.76	1.56	0.050	12%	
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.020	-	
Total Sodium (Na)	mg/kg	<10	<10	10	-	
Total Strontium (Sr)	mg/kg	20.4	19.3	0.10	6%	
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.10	-	
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.0	-	
Total Uranium (U)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.20	-	
Total Zinc (Zn)	mg/kg	119	80.7	0.20	38%	Yes

Appendix C – Quality Assurance / Quality Control

Quality Assurance / Quality Control for 2016 Vegetation Samples

Analyte	Units	PA55 - LICHEN	PA75 - LICHEN	RDL	RPD	Meets PQL
Physical Properties						
Moisture	%	70	65	0.30	7%	
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	20.9	23.5	1.0	12%	
Total Antimony (Sb)	mg/kg	0.007	0.0086	0.0050	21%	
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.050	-	
Total Barium (Ba)	mg/kg	6.18	5.2	0.10	17%	
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.10	-	
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.10	-	
Total Boron (B)	mg/kg	4.3	4.2	2.0	2%	
Total Cadmium (Cd)	mg/kg	0.141	0.123	0.010	14%	
Total Calcium (Ca)	mg/kg	1410	1290	10	9%	
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.20	-	
Total Cobalt (Co)	mg/kg	0.037	0.032	0.020	14%	
Total Copper (Cu)	mg/kg	1.38	0.781	0.050	55%	yes
Total Iron (Fe)	mg/kg	45	42	10	7%	
Total Lead (Pb)	mg/kg	0.165	0.131	0.010	23%	
Total Magnesium (Mg)	mg/kg	332	335	10	1%	
Total Manganese (Mn)	mg/kg	18.9	19	0.10	1%	
Total Mercury (Hg)	mg/kg	0.013	0.013	0.010	0%	
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	0.050	-	
Total Nickel (Ni)	mg/kg	0.214	0.172	0.050	22%	
Total Phosphorus (P)	mg/kg	573	509	10	12%	
Total Potassium (K)	mg/kg	1650	1340	10	21%	
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.050	-	
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.020	-	
Total Sodium (Na)	mg/kg	17	<10	10	-	
Total Strontium (Sr)	mg/kg	2.96	2.74	0.10	8%	
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0020	-	
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.10	-	
Total Titanium (Ti)	mg/kg	<1.0	1	1.0	-	
Total Uranium (U)	mg/kg	0.002	<0.0020	0.0020	-	
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.20	-	
Total Zinc (Zn)	mg/kg	27.1	24.2	0.20	11%	