APPENDIX 15-A

Vegetation Baseline Report

Coffee Gold Mine:
Vegetation Baseline Report
Version 1.2

Prepared For
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REVISION SUMMARY

Version No.	Date	Revision Notes	Revision Authors
1.0	31 March 2016	Draft report for review by Project team	Section authors
1.1	15 Sept 2016	Final baseline report for Project Proposal	MacLeod, Russell
1.2	1 Feb 2017	Final revisions to baseline report	Churchill, MacLeod, Pagacz, Robitaille,

EXECUTIVE SUMMARY

Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. (Kaminak; the Proponent) is proposing to develop an open pit, heap leach gold mine in west-central Yukon, known as the Coffee Gold Mine (Coffee Project; the Project). To receive authorization for the Project to proceed, it must be evaluated under the *Yukon Environmental and Socio-Economical Assessment Act* (YESAA) and obtain a Quartz Mining License, a Type A Water License, as well as other associated authorizations. During the environmental assessment process, potential Project effects on valued environmental and socio-economic components, including vegetation, are determined and mitigations are developed to reduce or eliminate potential adverse effects. To assess the potential effects of the proposed Project on vegetation, an understanding of baseline vegetation conditions in the Project area is required. In anticipation of this requirement, baseline vegetation surveys were conducted in the Project area in 2014, 2015, and 2016. Four different vegetation studies were completed, including: ecosystem mapping, rare plant surveys, exotic and invasive species surveys, and vegetation and soil trace metals sampling. The results of these surveys are presented in this vegetation baseline report, along with published and unpublished scientific data, and Traditional Knowledge (TK). The overall objective of this vegetation baseline report is to provide information and data on the current condition of vegetation species and communities associated with the Coffee Project.

The vegetation Local Study Area (LSA) is approximately 797 km² and encompasses the extent of baseline vegetation surveys for the Coffee Project. Around the mine site, the LSA is delineated based on the height of land while encompassing a minimum buffer of 1 km around the proposed development. Along the various road alignments, the LSA includes a 1 km buffer on either side of the road.

The Project falls within the Boreal Cordillera Ecozone and within that, is located in the Klondike Plateau Ecoregion. According to Yukon bioclimate zone mapping, the LSA encompasses four bioclimate zones: the Boreal Low, the Boreal High, the Subalpine, and Alpine zones. Overall, approximately 90% of the LSA occurs within the Boreal Bioclimate zones (Boreal Low and High), while the remaining area occurs predominantly in the Subalpine Bioclimate zone. The Alpine Bioclimate zone is found only in a small area (< 0.1% of the LSA) in the southeastern extent of the LSA, along a previously considered road alignment (proposed Casino Connecter) that has since been excluded from the Project.

Within the LSA, the subalpine landscape is dominated by shrub communities overlaying a well-developed feathermoss and lichen layer. Communities of scrub birch (*Betula glandulosa*), Labrador tea (*Rhododendron groenlandicum*), bog blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), and crowberry (*Empetrum nigrum*) are common. The widely-distributed dry, shallow hillcrests throughout the LSA commonly support communities of low-growing shrubs and/or ground shrubs, including scrub birch, mountain avens (*Dryas* spp.), crowberry, Arctic white heather (*Cassiope tetragona*), and lowbush cranberry. A sparse conifer canopy (~15% cover) develops over the shrub layer as the subalpine nears the treeline and the boreal transition.

Between the treeline of the Boreal High and the valley bottoms of the Boreal Low bioclimate zone, the vegetation patterns reflect the discontinuous distribution of permafrost throughout the region. Closed canopy pure or mixed stands of white spruce (*Picea glauca*), black spruce (*Picea mariana*), Alaska birch (*Betula neoalaskana*), and trembling aspen (*Populus tremuloides*) occur on neutral and warm, gentle-to-moderate slopes. Understory species typically include Labrador tea, prickly rose (*Rosa acicularis*), lowbush cranberry, tall bluebells (*Mertensia paniculata*), bastard toadflax (*Geocaulon lividum*), and feathermosses. Dry, moderate-to-steep, south-facing slopes support grasslands and aspen forests, overlaying kinnikinnick (*Arctostaphylos uva-ursi*), soapberry (*Shepherdia canadensis*), and grasses. In contrast, stunted black spruce forests occur on cold, north-facing slopes with imperfect-to-poor drainage due to near surface permafrost. Understory species typically include Labrador tea, sedges, cottongrass (*Eriophorum vaginatum*), and cloudberry (*Rubus chamaemorus*). On gentle toe-slopes underlain by permafrost, black spruce communities containing Labrador tea, sedges, red bearberry (*Arctous rubra*), and lichens predominate. Black spruce forests with high lichen cover also occur on better drained, coarser-textured upland, north-facing, lower-to-upper slopes. Wetland and floodplain ecosystems exist in valley bottoms throughout the LSA; however, they represent a small component of overall area. This region has frequent fires, therefore young, deciduous-dominated, and mixedwood stands are more common than mature conifer-dominated stands. Additionally, the region has a long history of placer gold mining; subsequently, many valley bottoms within the LSA include historic and/or active placer mines.

Combined, the baseline surveys documented 411 vegetation species including seven tree, 60 shrub, 188 forb, 63 grass, 18 fern/horsetail/clubmoss, two aquatic, 34 mosses, 2 liverworts, and 37 lichens. Many of these plant species are currently, or have been previously, used by local First Nations as a source of food, or for medicinal and spiritual use while others have more practical or decorative uses.

Ecosystem Mapping — Ecosystem mapping is typically used as a method of describing vegetation across a landscape. By grouping plant species into communities it facilitates describing possible effects such as loss of vegetation habitat. Ecosystems of the Coffee Project area were mapped at two levels: Ecological and Landscape Classification (ELC) and Broad Ecosystem Mapping (BEM). The more detailed ELC mapping was completed around the proposed mine site and along new sections of proposed road, including a proposed Casino Connector (no longer being considered) and sections of the proposed Northern Access Route (NAR). BEM was completed along the proposed NAR in sections with existing roads. Approximately 23,844 ha of the LSA were mapped following ELC methods and approximately 36,582 ha were mapped following BEM methods. The mapping extent identified 34 unique ELC ecosites (24 ecosites in boreal zones, 10 ecosites in the subalpine/alpine zones), 11 non-vegetative/anthropogenic units, and 13 vegetative BEM units. The ELC mapping identified seven unique wetland ecosites and the BEM identified four units (bog, fen, marsh and swamp). The area of each ecosite, non-vegetative/anthropogenic and BEM unit was summarized.

Rare Plants — No COSEWIC or SARA-listed plant species were observed during the rare plant surveys. Populations of four territorial Watch-list plant species were observed within the LSA. Species on the Watch-list require more information on their distribution and abundance before a conservation status can be determined. Watch-list plant species found during plant surveys include: spotted lady's-slipper (*Cypripedium guttatum*), Coffee Creek scorpionweed (*Phacelia mollis*), small enchanter's nightshade (*Circaea alpina* ssp. *alpina*), and dry-spike sedge (*Carex siccata*).

Coffee Creek scorpionweed is endemic to central and western Yukon and Alaska (AK). It was found at a total of six sites. Spotted lady's-slipper is known from western and northern Yukon, as well as Asia, AK, and the Northwest Territories (NWT). It was found at a total of six and all sites except one were located on south-facing, moderate slopes, dominated by open trembling aspen stands with a few scattered white spruce. Small enchanter's nightshade is known from Eurasia and is circumpolar from Newfoundland to AK south to northern United States. Prior to the rare plant survey, this plant was only known from southeast Yukon, near a hot spring. Small enchanter's nightshade was found at one site. This finding represents a large and impressive range extension for this species, not previously known in western Yukon. Dry-spike sedge is known from North America including Yukon, Northwest Territories, British Columbia (BC) east to southwestern Quebec, and the northern United States with occurrences reported as far south as Arizona and New Mexico. It was found at one site dominated by open trembling aspen and a few scattered white spruce which represents the fifth known location of this species in Yukon.

Exotic and Invasive Plant Species — Invasive plants in the LSA range in degree of invasiveness (*i.e.*, concern) from high priority (1) to least concern (7). Populations of 18 invasive plant species were found during the field surveys, including five rank 1 invasive species. The observed rank 1 invasive species are: smooth brome (*Bromus inermis*), narrow-leaved hawksbeard (*Crepis tectorum*), perennial sow-thistle (*Sonchus arvensis* spp. *uliginosus*), white sweetclover (*Melilotus albus*), and yellow sweetclover (*Melilotus officinalis*).

In general, concentrations of invasive plants were less frequent in the southern portion (Coffee Camp, Coffee airstrip, Java Road, and the proposed mine site) of the LSA compared to the northern portion (NAR). Along the NAR, southern sections with limited access had fewer invasive plants than northern areas easily accessed by truck. Smooth brome was found scattered along the NAR and around Coffee Camp. The density and distribution of smooth brome around Coffee Camp is described as being continuous dense occurrence of a species. Narrow-leaved hawksbeard was found scattered along the NAR and at a few locations along the Coffee airstrip and beginning and end of Java Road. Only one individual was found at the end of Java Road within the vicinity of the proposed mine site. This individual was pulled, bagged, and burned in the incinerated onsite. Four individuals of perennial sow-thistle were found at one site along the airstrip. The seed containing portion of these four plants were removed, bagged, and burned in the incinerator on site. White sweetclover was found in several sections along the NAR. The density distribution of this invasive species was moderate compared to other observed species. Yellow sweetclover was the only invasive species found along the NAR within approximately 6 km of the North Klondike highway. The density distribution was considered moderate where it was found.

Trace Metals in Vegetation — The monitoring of trace metal concentrations in soil and vegetation provides a baseline so that changes can be evaluated for potential Project effects. Trace metals sampling within the LSA was conducted in July 2014 and July to August, 2015 and 2016. Soil and four plant species were collected for trace metals analysis. The plant species collected include: willow (*Salix* spp.), reindeer lichens (*Cladina mitis* and *Cladina rangiferina*), horsetails (*Equisetum arvense, Equisetum pratense,* and *Equisetum sylvaticum*), and lowbush cranberry.

The total number of trace metals sites visited from 2014-2016 was 89. Seventy-seven soil sites where located in the Coffee Area including 68 willow, 61 lichen, 61 lowbush cranberry, and 22 horsetail sites. Twelve soil sites were located along the NAR including 10 willow, 5 lichen, 8 lowbush cranberry, and 9 horsetail sites.

Based on the existing studies, the nature of the trace metals, and site conditions, the analysis focused on the following trace metals: arsenic, cadmium, chromium, copper, lead, mercury, selenium, uranium, and zinc. The results were compared to the Canadian Council of Ministers of the Environment (CCME) soil quality guidelines. No CCME guidelines currently exist for trace metals in vegetation. Trace metal concentrations in soil were low with the exception of arsenic and chromium. Arsenic and chromium concentrations were above CCME soil quality guidelines in twenty-four (27%) and four (4%) samples, respectively. Arsenic samples above CCME guidelines were generally found within close proximity to the proposed mine site. Chromium samples above CCME guidelines were found close to the proposed mine site and at control sites ≥15 km relative to the proposed proposed Project footprint. Few soil samples reported mercury and selenium above the laboratory reportable detection limit (RDL).

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- EDI staff that helped with the final edits to maps for this report: Pablo Jost and Megan Sandford.

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ACRONYMS AND ABBREVIATIONS

AB .... Alberta

AK .... Alaska

AKEPIC .... Alaska Exotic Plants Information Clearinghouse

ANHP .... Alaska Natural Heritage Program

ANOVA .... Analysis of Variance

ANPC .... Alberta Native Plant Council

ALP .... Alpine bioclimate zone

asl .... Above Sea Level

B.A.B.Y. .... B. A. Bennett Herbarium

BEM .... Broad Ecosystem Mapping

BOH .... Boreal High bioclimate zone

BOL .... Boreal Low bioclimate zone

BC .... British Columbia

CCME .... Canadian Council of Ministers of the Environment

CDC .... Conservation Data Centre

CNVC .... Canadian National Vegetation Classification

CoPC .... Chemical of Potential Concern

COSEWIC .... Committee on the Status of Endangered Wildlife in Canada

CYSIP .... Central Yukon Species Inventory Project

dbh .... Diameter at Breast Height

DEM .... Digital Elevation Model

E .... East

EDI .... Environmental Dynamics Inc.

ELC .... Ecological and Landscape Classification

ESIL....................Ecosystem Survey Intensity Level

ESOD.................... Earth Science Online Directory

ESRD.................... Environment and Sustainable Resource Development

FNA....................Flora of North America

FNNND .... First Nation of Na-cho Nyäk Dun

GPS.................... Global Positioning System

ha .... Hectares

hr .... Hour

IMT.................... Environment Yukon's Information Management Branch

IUCN.................... International Union for Conservation of Nature

Kaminak/the Proponent ....Kaminak Gold Corporation

km .... Kilometers

LSA ....Local Study Area

m....................metre

MoE.................... (BC) Ministry of Environment

MoFR.................... (BC) Ministry of Forests and Range

N....................North

NAR.................... Northern Access Route

NEF ....National Ecological Framework of Canada

NWT.................... Northwest Territories

pH .... Soil pH

Project/Coffee Project....................Coffee Gold Mine

QA/QC....................Quality Assurance/Quality Control

RDL .... Reportable Detection Limit

R.P.Bio.................... Registered Professional Biologist

RSA .... Regional Study Area

S .... South

SARA .... *Species at Risk Act*

SFN .... Selkirk First Nation

SIVI .... Site Visit Form

SUB .... Subalpine bioclimate zone

TEM .... Terrestrial Ecosystem Mapping

TH .... Tr'ondëk Hwëch'in

TK .... Traditional Knowledge

TSP .... Total Suspended Particulates

UTM .... Universal Transverse Mercator

UTV .... Utility Task Vehicle

W .... West

WRFN .... White River First Nation

YBF .... Yukon Bioclimate Framework

YBIS .... Yukon Biophysical Inventory System

YESAA .... *Yukon Environment and Socio-economic Assessment Act*

YESAB .... Yukon Environment and Socio-economic Assessment Board

YISC .... Yukon Invasive Species Council

YVI .... Yukon Vegetation Inventory

1 OVERVIEW

1.1 PROJECT OVERVIEW

Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. (Kaminak; the Proponent) is proposing to develop an open pit, heap leach gold mine in west-central Yukon, located approximately 130 kilometres (km) south of Dawson City, known as the Coffee Gold Mine (Coffee Project; the Project). The Project (including the proposed access corridor) is located on Crown Land and overlaps the asserted area or established traditional territories of Tr'ondëk Hwëch'in (TH), Selkirk First Nation (SFN), First Nation of Na-cho Nyäk Dun (FNNND) and White River First Nation (WRFN).

The proposed Project will consist of an open pit gold mine using a cyanide heap leach process to extract gold from the ore. The Project will have a mine life of 22 years, comprised of construction , operation, and reclamation and closure, followed by post closure monitoring. The Project will include four open pits (Latte, Double Double, Supremo, and Kona) mined by conventional shovel and truck methods with an average operation rate of five million tonnes per annum of heap leach feed. It will also include four Waste Rock Storage Facilities, a conventional Heap Leach Facility, a Processing Plant and associated support infrastructure. The Project will be accessed by road from Dawson via a 214 km single-lane, gravel road with pull outs referred to as the Northern Access Route (NAR). The majority of the access is along existing road which will be upgraded.

To determine the existing, current conditions of the vegetation at this site, a baseline study was commissioned. Kaminak retained EDI Environmental Dynamics Inc. (EDI) to perform the vegetation baseline investigation in support of the Project Proposal to be submitted to the Yukon Environment and Socio-economic Assessment Board (YESAB) Executive Committee for screening under the *Yukon Environment and Socio-Economic Assessment Act* (YESAA), and applications to be submitted for a Quartz Mining Licence and a Type A Water Licence from the Yukon Water Board, among other permits and licences. This report provides the approach used for the collection of baseline vegetation data, the results of that data collection, and a description of the baseline vegetation conditions within the proposed Project area.

1.2 OBJECTIVES

To receive authorization for the Coffee Project to proceed, the Project must be evaluated under YESAA. To assess potential Project effects, an understanding of baseline vegetation conditions in the Project area is required. Specific objectives, as identified in YESAB's Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submissions (2005), are to:

- Provide information on land cover types, forest cover and site quality;

- Document plant communities to the species level, on the sites that may be disturbed as a result of development;
- Describe vegetation and vegetation assemblages including any identified rare, sensitive, and/or endangered species and ecological reserves; and
- Identify any wetlands in the project area.

Building on these, the overall objective of the vegetation baseline report is to summarize information and data on the current condition of vegetation species and communities associated with the Coffee Project. Vegetation condition is described based on four components: ecological communities, rare plants, exotic and invasive plants, and vegetation trace metal analysis.

1.3 SPATIAL BOUNDARIES

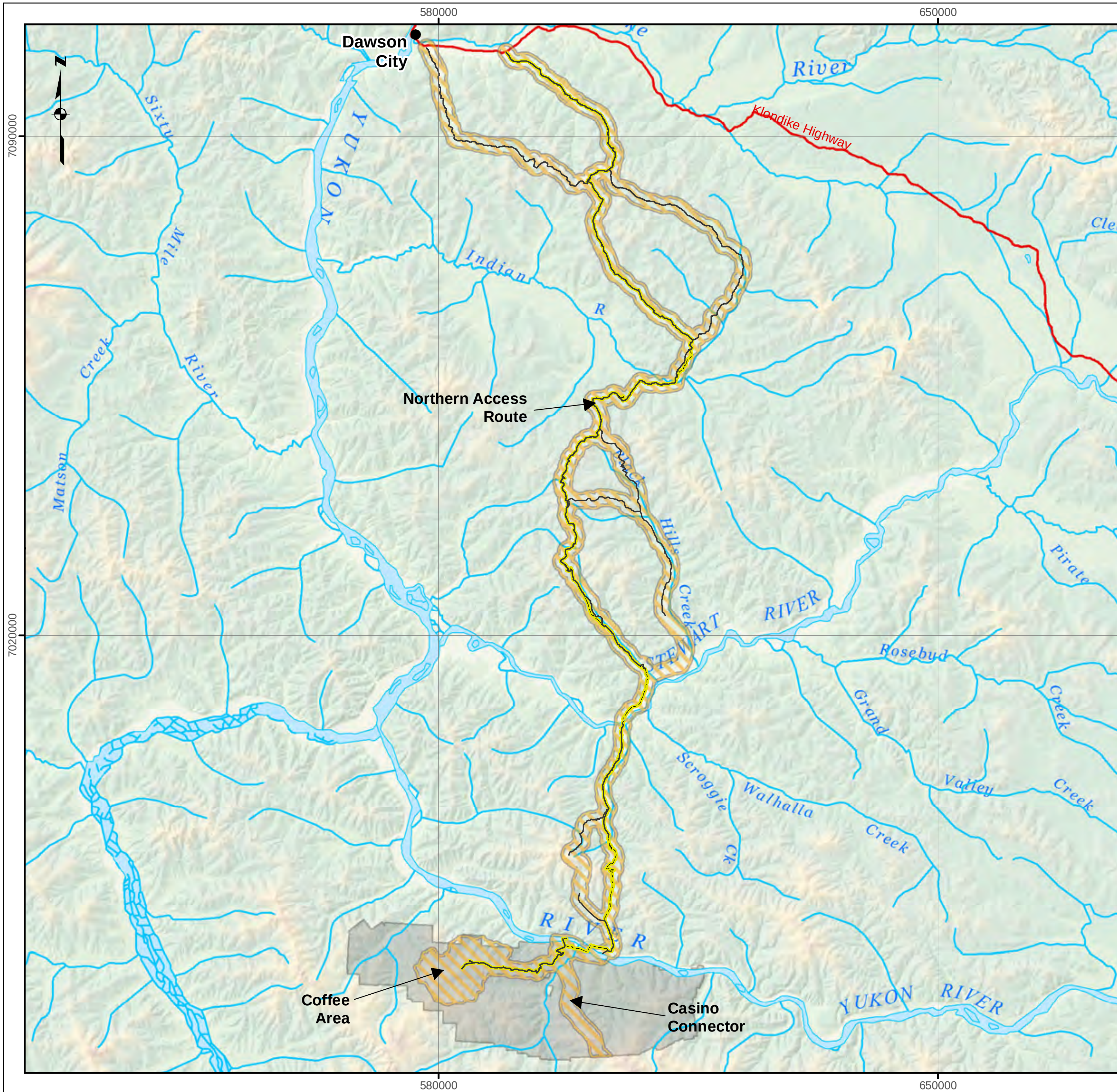
Baseline vegetation studies for the Coffee Project were initiated in 2014. Before the start of the 2015 vegetation field work, changes to the proposed access route were incorporated into the Project Area. Specifically:

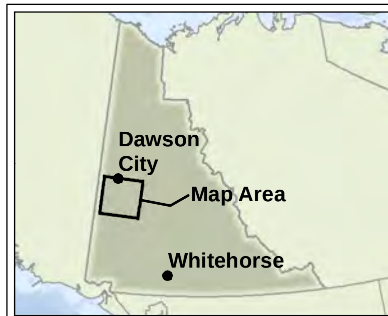
- In 2014, Kaminak was considering an access road connecting to the existing Freegold Road, which would provide access to the mine site via Carmacks, Yukon. This is similar to the access road proposed by Casino Mining Corporation for the Casino Project, located approximately 31 km southeast of the Coffee mine site. Consequently, the 2014 vegetation baseline surveys for the Coffee Project included a possible road alignment connecting to the Casino Project area. This potential access road (Casino Connector) was no longer being considered by Kaminak prior to the 2015 vegetation baseline surveys.
- In 2015, Kaminak considered an access road through the Dawson Goldfields which would provide access to the mine site via Dawson, Yukon. This is currently the proposed NAR; however, when vegetation baseline surveys commenced in 2015, the final alignment through the Goldfields was not yet determined. Thus, the 2015 vegetation baseline surveys included several road alignment options.

The final vegetation Local Study Area (LSA, Figure 1-1) is approximately 797 km² and encompasses the fullest extent of baseline vegetation surveys for the Coffee Project. It includes the proposed mine site area, the existing road between the Coffee Camp and the deposit (i.e., the Java Road), the current airstrip and Coffee Camp, the proposed NAR to the junction with the Klondike Highway, as well as several previous road alignment options including the previous Casino Connector option and alternate alignments through the Dawson Goldfields. Around the mine site, the LSA is delineated based on the height of land while encompassing a minimum buffer of 1 km around the proposed development. Along the various road alignments, the LSA includes a 1 km buffer on either side of the road.

Four different vegetation baseline studies were completed: ecosystem mapping including Ecological and Landscape Classification (ELC) and Broad Ecosystem Mapping (BEM), rare plant surveys, exotic and invasive species surveys, and vegetation trace metal analysis. However, since many of the vegetation baseline surveys did not extend to the full boundaries of the LSA, the discussion of specific survey results in this report references the survey extent for each survey. The majority of trace metal sample sites were located within the LSA but the study area needed to be expanded into a regional study area (trace metal RSA).

The RSA for the trace metal surveys follows a buffer around the LSA (Far Sample Zone in Figure 5-1) excluding the NAR portion of the LSA and includes the Thistle Mountain Sample and Moose Mountain Sample zones (see figure 5-1).





Legend

- Settlement/Community
- Existing
- Proposed Route
- Highway
- Coffee Property
- Local Study

FIGURE: 1 - 1

Overview of Local Study Area

Data Sources
1:250,000/1,000,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Disclaimer
This document is not an official land survey and the spatial data presented is subject to change.

0 10 20
KM

Map Reference Scale: 1:750,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MS	Checked: MP/AM	Date: 02/09/2016

KAMINAK GOLD CORPORATION   EDI

Path: J:\Yukon\Projects\2014\14_Y_0306_Kaminak_CoffeeCk\Mapping\2016_Mapping\2016_Baseline\008_VegetationVeg_Baseline_mxd\Fig1_1_OverviewVeg.mxd

1.4 VEGETATION OVERVIEW

1.4.1 REGIONAL CONTEXT

The Project falls within the Boreal Cordillera Ecozone and within that, is located in the Klondike Plateau Ecoregion. The Boreal Cordillera Ecozone is associated with the mountainous southern Yukon and northern British Columbia (BC). The summers are cool and brief and the winters are cold and long. During the summer, moist Pacific air frequently causes sudden, often violent storms, while more stable air mass usually prevails in winter, with cold spells broken by warm chinook winds. Mountains and plateaus are the dominant features, which are separated by lowlands and valleys (YEWG 2004).

The Klondike Plateau Ecoregion is greater than 38,000 km². The Klondike Plateau Ecoregion is considered uniform in character with smooth topped ridges dissected by deep, narrow, V-shaped valleys that have not been glaciated in the recent past. The Dawson Range is the most distinct feature of the plateau. Major rivers have cut deeply into the plateau surface. The Yukon River crosses this ecoregion from just downstream of the mouth of the Pelly, past the mouth of the Stewart, Klondike, Chandindu, and Fortymile, to the Alaska (AK) border. The only significant lakes are found in the southeast corner with the largest being Wellesley Lake.

This ecoregion is largely unglaciated. Surface deposits over much of the ecoregion are composed of colluvium, with alluvium and glacial outwash terraces found along major river systems. Many of the tributary valleys are blanketed with thick colluvial deposits consisting of silts several metres thick covered by several metres of peat and mucky silt. Uplands are covered with colluvium rubble derived from underlying fractured bedrock. A veneer of wind-blown silt covers most of the ecoregion (YEWG 2004).

The climate of the ecoregion is strongly continental with warm summers and very cold winters. Precipitation amounts vary from 300 to 500 mm annually. Most summer precipitation is from convective rainshowers and thunderstorms.

Permafrost is widespread but discontinuous in this ecoregion. Typically permafrost is absent from well-drained, dry slopes of any aspect, while valley bottom deposits and upland soils usually contain ice-rich layers. Soil moisture content and organic-layer thickness are critical variables controlling the occurrence of permafrost. The dominant parent materials are stony residual materials along ridge tops and summits, coarse colluvium on upper slopes, and silty colluvium and loess, rich in organic matter on lower slopes.

A mosaic of soils exists in the permafrost-free areas. Eutric Brunisols develop on loamy colluvial materials dominate well-drained ridge crests, south-facing slopes and glaciofluvial terraces. Mesic Organic Cryosols are most common in undisturbed valley bottom settings. Even on upland positions, active cryoturbation may occur and be expressed as sorted patterned ground and Orthic Turbic Cryosol development. Along the Yukon River, warm summer climates and coarse alluvial or glaciofluvial materials on terraces limit organic matter accumulation and Orthic Eutric Brunisols are most common. Fluvial fans support wetlands composed of both fen and peat plateaus. Complexes of Cryosols, Regosols and Eutric or Dystric Brunisols compose these areas (YEWG 2004).

Much of the Klondike Plateau Ecoregion straddles the treeline with vegetation ranging from boreal forest in the valleys and on lower slopes, to alpine tundra on ridge crests. In general, the treeline is close to 1,000 m above sea level (asl) in the northern part of the ecoregion and around 1,200 m asl in the south. Below the treeline, the vegetation pattern reflects the discontinuous distribution of permafrost with stunted black spruce (*Picea mariana*) woodlands on cold, north facing slopes and mixed forests on warm south-facing slopes (YEWG 2004).

The Yukon Government defines bioclimate zones as areas with a similar climate that support reference ecological communities, known as a reference ecosite (Rowe and Sheard 1981). According to Yukon bioclimate zone mapping, the LSA encompasses four bioclimate zones: the Boreal Low (BOL), the Boreal High (BOH), the Subalpine (SUB) and the Alpine (ALP) zones. The Boreal Low zone is typically found from valley bottoms to middle elevations (less than 950 m). The BOL occupies broad to narrow valley bottoms along the Yukon River and its tributaries. This zone is the warmest and driest of the bioclimate zones. The Boreal Low is characterized by continuous, closed to open coniferous and mixed forest. The Boreal High zone is located at middle to upper elevations and characterized by steep slopes in the southern mountainous regions and gentle rolling plateaus in the central regions. Typically forests are dominated by white spruce (*Picea glauca*), subalpine fir (*Abies lasiocarpa*) and lodgepole pine (*Pinus contorta* var. *latifolia*). The Subalpine zone is located at moderate to higher elevations and considered a transitional area between the Boreal zones and the Alpine. It is composed of shrub communities with sparse tree cover. Tall shrub communities and open canopy coniferous forests with tree cover less than 20% are characteristics of this zone. Either subalpine fir or white spruce is the dominant tree species. The Alpine zone is found at high latitude areas. The predominant vegetation condition is characterized by dwarf shrubs, herb/cryptograms and low-growing and scattered krummholtz trees. Typically, the highest elevations are dominated by bare rock, colluvium or ice/snow.

1.4.2 VEGETATION WITHIN THE LSA

Overall, greater than 90% of the LSA occurs within the Boreal Bioclimate zones (Boreal Low and Boreal High), while the remaining area occurs predominantly in the Subalpine Bioclimate zone. The Alpine Bioclimate zone is found only in a small area in the southeastern extent of the LSA and makes up less than 0.1% of the LSA. The majority of the Subalpine occurs in the Coffee Area (i.e., the Coffee Property), where it accounts for 30% of the survey extent. Shrub communities overlaying a well-developed feathermoss and lichen layer dominate the subalpine landscape, which consists of smooth-topped ridges exposed to long periods of weathering. Communities of scrub birch (*Betula glandulosa*), Labrador tea (*Rhododendron groenlandicum*), bog blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), and crowberry (*Empetrum nigrum*) dominate gentle-to-moderate, mid-to-upper slopes across neutral and warm aspects. A sparse conifer canopy (~15% cover) develops over the shrub layer as the subalpine nears the treeline and the boreal transition. Moist scrub birch- and Labrador tea-dominated communities, underlain by permafrost, contain sedges (*Carex* spp.) in the understory, while small side slope creeks and drainages support willow (*Salix* spp.)-dominated communities. Stunted black spruce forests with scrub birch, Labrador tea, sedges, feathermosses and peat mosses (*Sphagnum* spp.) are common on moderate, north-facing slopes that are underlain by permafrost and have imperfect-to-poor drainage. The widely-distributed dry, shallow hillcrests throughout LSA commonly support communities of low-growing shrubs and/or ground shrubs, including scrub birch, mountain avens (*Dryas* spp.), crowberry, Arctic white heather (*Cassiope tetragona*), and lowbush cranberry.

Between the treeline of the Boreal High and the valley bottoms of the Boreal Low, the vegetation patterns reflect the discontinuous distribution of permafrost throughout the region. Closed canopy pure or mixed stands of white spruce, black spruce, Alaska birch (*Betula neoalaskana*) and trembling aspen (*Populus tremuloides*) occur on neutral and warm, gentle-to-moderate slopes, typically with unfrozen Brunisolic soils. Understory species typically include Labrador tea, prickly rose (*Rosa acicularis*), lowbush cranberry, tall bluebells (*Mertensia paniculata*), bastard toadflax (*Geocaulon lividum*), and feathermosses. This region has frequent fires, therefore young, deciduous-dominated, and mixedwood stands are more common than mature conifer-dominated stands. Dry, moderate-to-steep, south-facing slopes support grasslands and aspen forests, overlaying kinnikinnick (*Arctostaphylos uva-ursi*), soapberry (*Shepherdia canadensis*), and grasses. Contrastingly, stunted black spruce forests occur on cold, north-facing slopes with imperfect-to-poor drainage due to near surface permafrost. Understory species typically include Labrador tea, sedges, cottongrass (*Eriophorum vaginatum*), and cloudberry (*Rubus chamaemorus*). On gentle toe-slopes underlain by permafrost, black spruce communities containing Labrador tea, sedges, red bearberry (*Arctous rubra*), and lichens predominate. Black spruce forests with high lichen cover also occur on better drained, coarser-textured upland, north-facing, lower-to-upper slopes.

Wetland and floodplain ecosystem exist in valley bottoms throughout the LSA, however they represent a small component of overall area. Wet, tussocky, poor-treed fen communities with spruce, sedges, feathermosses, brown mosses, and peat mosses exist in poorly drained areas on valley floors and at the toe of slopes on Cyrosolic soils. Shrub-dominated fens with birch, leatherleaf (*Chamaedaphne calyculata*) and cottongrass can be closely associated with treed fens in broad valley bottoms. Willow-dominated riparian communities are common throughout the LSA, alongside slope creeks and drainages. Along major rivers, white spruce, horsetail (*Equisetum* spp.) and feathermoss communities are found on stable high bench floodplains. A balsam poplar (*Populus balsamifera*) canopy typically dominates mid bench floodplain sites with alder (*Alnus* spp.), willow and prickly rose overlaying a rich herb understory. These communities occupy smaller creeks and large river riparian sites subject to flooding. The region has a long history of placer gold mining; subsequently, many valley bottoms along the NAR include historic and/or active placer mines.

Combined, the baseline surveys documented 411 different vegetation species including 7 tree, 60 shrub, 188 forb, 63 grass, 18 fern/horsetail/clubmoss, two aquatic, 36 mosses/liverworts, and 37 lichen (a complete list of all species can be found in Appendix A). Many of these plant species are currently, or have been previously, used by local First Nations as a source of food, or for medicinal and spiritual use while others have more practical or decorative uses.

Both TH and WRFN members report harvesting berries and other edible plants from the Coffee Creek area which would supplement the meat and fish they also harvested from the land (Tr'ondëk Hwëch'in 2012b; Bates and DeRoy 2014). According to the Coffee Creek Traditional Knowledge Survey (Tr'ondëk Hwëch'in 2012b)

> "*Harvesting berries was also an important activity in the Coffee Creek area, where high bush and low bush cranberries could be found. Blueberries were picked in the flats and soap berries were plentiful. William also mentioned gooseberries, which Roland thought to be mossberries.*"

Similarly, WRFN members report picking blueberries, highbush cranberries and blackberries in the Project area (Bates and DeRoy 2014). These reports are consistent with observations from the vegetation baseline surveys which noted an abundance of berries in parts of the LSA.

Plants within the LSA have also been harvested for medicinal use such as the pitch from trees and the root or leaves of certain species (Popadynec 2007; InterGroup Consultants Ltd. 2009; Tr'ondëk Hwëch'in 2012b; Bates and DeRoy 2014).

> "*Some of the leaves are good, certain leaves are good for medicines…some you make salves. Some are plants. Some are the flowers and all that.*" (W01 18-Aug-2014 *in* Bates and DeRoy 2014).

As well as for other purposes:

> "*Plants also had many other uses, including for making tools, baskets, sleds and snowshoes. A WRFN study participant reported that his mother collected birch bark in the area around Coffee Creek, which she would use to make baskets.*" (Bates and DeRoy 2014).

2 ECOSYSTEM MAPPING

Ecosystem mapping is typically used as a method of describing vegetation across a landscape. By grouping plant species into communities it facilitates describing possible effects such as loss of habitat. Ecosystem mapping can also be used as a base for describing various habitats for wildlife species. The aim of ecosystem classification and mapping is to provide primary information on the biological and physical characteristics of various landscape components in order to facilitate a range of interpretations and assist in sustainable management (Rowe and Sheard 1981).

Yukon's ecological classification framework groups ecosystems at four levels: regional, broad, local, and phase. Resource mapping is typically completed at the local level but can also be completed at the broad level. Both local and broad level ecosystems are classified based on an approach where climate, vegetation, soils, and landscape position are considered (Flynn and Francis 2011). Broad level ecosystem mapping is where the landscape is classified into broad vegetation community units within bioclimate zones and typically these broad ecosystems are classified based on a combination of dominant and diagnostic growth forms. The local level represents ecosite mapping. Ecosites are organized along a toposequence of landscape positions, and within an edatopic grid to describe relative soil moisture and nutrient conditions (Flynn and Francis 2011).

In absence of a standard system for classifying vegetation in the Yukon, mapping and supporting vegetation sampling used the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC 1998) is a guideline (as recommended by Nadele Flynn from the ELC Program (pers. comm., 2015). This BC system provides a uniform method of describing vegetation, soil, and terrain characteristics based on orthophoto interpretation and field data collection. Some approaches, including the ecological classification framework; however, were adjusted to accommodate methods and requirements specific to the Yukon ELC Program. Following the ecological frameworks adopted for ELC work in the Yukon (National Ecological Framework of Canada (NEF) and the Yukon Bioclimate Framework (YBF)), the classification used for this Project was based on a hierarchical ecosystem classification framework, including Bioclimate zones (regional), broad ecosystems, ecosites (local), and vegetation associations within ecosites.

Within bioclimate zones, vegetation communities are described through ecosite and vegetation association designations. Ecosites are the site-level 'building blocks' and are interpreted within the context of the bioclimate zone in which they occur. They represent vegetation potential and are relatively stable and enduring features that are defined by landscape position and characteristic site conditions, including soil moisture and nutrient regimes (Environment Yukon 2015a, 2015b). Vegetation associations are ecosite subdivisions that incorporate the differences an ecosystem experiences through seral vegetation development. Vegetation associations provide a method of describing the current vegetation characteristics of an ecosite, which is beneficial for disturbance dominated landscapes like the Yukon's boreal forest (Environment Yukon 2015a, 2015b).

2.1 METHODS

The ecosystem mapping and survey extent includes the proposed mine site area, the existing road between Coffee Camp and the deposit (i.e., the Java Road), the current airstrip and Coffee Camp, the proposed NAR to the junction with the Klondike Highway, as well as a few previous road alignment options including the previous Casino road option and alternate alignments through the Dawson Goldfields. Around the mine site, the mapping and survey extent is delineated based on the height of land while encompassing a minimum buffer of 1 km around the proposed development. Along the various road alignments, the mapping and survey extent includes a 1 km buffer on either side of the road (Figure 2-1).

Ecosystems of the Coffee Project area were mapped at two levels: Ecological and Landscape Classification (Ecosite, ELC) and BEM. The more detailed ELC mapping was completed around the proposed mine site and along new sections of proposed roads, including a proposed Casino Connector (no longer being considered) and sections of the proposed NAR. Broad Ecosystem Mapping was completed along the proposed NAR in sections with existing roads (Figure 2-1) to supplement the ELC mapping. Table 2-1 outlines the breakdown of the ecosystem mapping by area.

Table 2-1. Breakdown of ecosystem mapping by area

Ecosystem Mapping Level	Survey Extent Component	Total Area Mapped (ha)
ELC Mapping	Coffee Area	11,391.4
	Proposed Casino Road	2,920.6
	NAR (new road only)	9,531.7
	Total ELC Mapped Area	**23,843.7**
BEM	NAR (existing road)	36,581.8
	Total BEM Mapped Area	**36,581.8**
Combined ELC and BEM		**60,425.5**

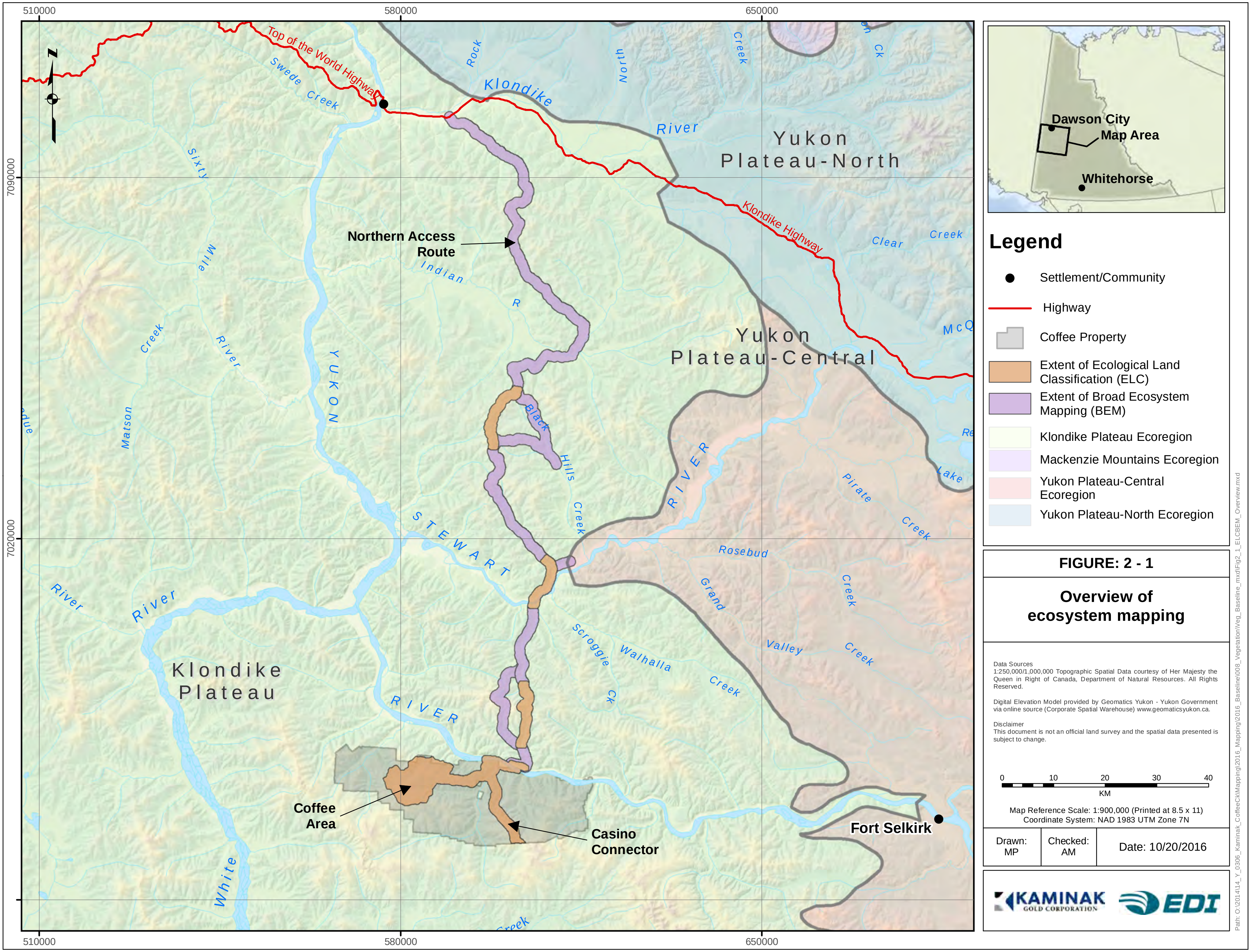


FIGURE: 2 - 1

Overview of ecosystem mapping

2.1.1 ELC MAPPING AND CLASSIFICATION METHODS

ELC mapping was completed by EDI ecologists between 2014 and 2016. Territorial and provincial standards were used as reference material for the mapping protocol, field data collection, plant species and ecosystem nomenclature. The standards and guidelines included the following:

- Yukon Ecological and Landscape Classification Guidelines, Version 1.0 (Environment Yukon 2015a);
- Field Manual for Describing Terrestrial Ecosystems, 2^{nd} Edition (BC Ministry of Forests and Range and BC Ministry of Environment 2010);
- Ecoregions of the Yukon Territory: Biophysical Properties of Yukon Landscapes (Smith *et al.* 2004);
- Flora of the Yukon Territory, 2^{nd} Edition (Cody 2000);
- Yukon Biophysical Inventory System (YBIS). Data management system and government used vegetation codes database. Environment Yukon's Information Management Branch (IMT);
- Field Manual for Describing Yukon Ecosystems, draft document (Environment Yukon 2014); and
- A Field Guide to the Ecosite Identification for the Boreal Low Subzone of Yukon (Environment Yukon 2015b).

A discussion with the ELC Coordinator for Environment Yukon confirmed that no previous ELC projects or freely available vegetation data exist within the LSA (N. Flynn, pers. comm., 2015).

2.1.1.1 Data Preparation

Spatial Data — A variety of digital data were acquired, for use in ArcMap (ArcGIS 10.1), in preparation for ELC mapping. High resolution orthoimagery (2013, 2015) for the LSA was provided by Kaminak. Other data sources acquired or prepared in this phase include:

- Coffee Creek Mine Terrain Mapping (AECOM 2011a);
- Proposed Access Road Terrain Mapping (Palmer Environmental Consulting Group 2016);
- LiDAR 2m Contours (AECOM 2011b; McElhanney Consulting Services Ltd. 2015);
- Digital Elevation Model (DEM; AECOM 2011c);
- 1:50,000 Yukon Stream and Waterbodies mapping (Natural Resources Canada 2012);
- 1:50,000 Yukon Vegetation Inventory (YVI; Government of Yukon 2014);
- Yukon Bioclimate Zone Boundaries (Environment Yukon 2012);
- Bing Maps data available through ArcGIS for small sections along the outer reaches of the LSA were orthoimagery was not provided (Bing Maps);
- The Earth Observation for Sustainable Development of Forests (ESOD) Land Cover map (25 m pixel; Wulder *et al.* 2008);

- User-defined spatial slope (flat, gentle, moderate, and steep) and aspect (neutral, warm and cool) layers (refer to Appendix B for slope and aspect class values);
- Information from the 2014–2015 field sampling efforts, including field data forms and spatial coordinates; and
- ELC mapping database populated with the working legend information (see Ecological Classification Data).

Data sources such as YVI, ESOD and Yukon Stream and Waterbodies mapping, which are generated at a smaller scale, were used as reference material to assist ELC mapping. However the data were used with appropriate caution given the differences in scale.

2.1.1.2 Ecosystem Polygon Delineation

Upon completion of spatial data acquisition and database formation, ecosystem polygon delineation was completed in two dimensions with a direct to digital system using ArcMap in ArcGIS 10.1. Ecosystem polygon delineation was completed at a scale of 1:10,000, with a targeted average polygon size of 10 hectares (ha). In general, polygons were no greater than 20 ha, unless obviously the case, and no smaller than 2 ha, unless delineating a small waterbody or wetland feature.

Terrain mapping, completed by AECOM (2011) and Palmer (2015–2016), was used as the base data for polygon delineation in the ELC. As described in the BC TEM Standards (RIC 1998), terrain features and soil drainage are important in describing ecosystem characteristics and informing ecosystem delineation. Therefore, to retain terrain information, ELC polygons were delineated within existing terrain polygons based upon discernable differences among the following criteria, as described in the TEM Standards (RIC 1998):

- Vegetation (species composition, canopy characteristics, stand age and height);
- Topography (landscape position, aspect, slope, drainage patterns);
- Soils (depth and drainage); and
- Gradients and patterns (relationship patterns between ecosystem units, polygon shape and orientation).

Although terrain polygons were used as an initial building block for ELC polygon delineation, the terrain data is not retained within the ELC polygon database as this information was independently submitted.

Initial ecosystem polygons were delineated without consideration of bioclimate zone boundaries as they were not incorporated into the terrain polygons. Following the completion of field sampling, a combination of aerial interpretation and plot data were used to incorporate bioclimate boundaries (alpine, subalpine and boreal) within the mapping extent. In some instances, alterations to the terrain polygons were necessary to accommodate the delineation of bioclimate zone boundaries.

Forest fires are an important and relatively frequent disturbance in the Yukon (YEWG 2004). A number of areas within the ELC mapping extent were burned within the last 35 years and are currently in an herb- or shrub-dominated state. These areas were mapped based on landscape position, aspect, environmental conditions, and pre-fire Vegetation Resource Inventory data when available.

2.1.1.3 Preliminary Ecosite Descriptions

Preliminary ecosystem entities for the Coffee Project, including ecosite codes and descriptions, were obtained from the Casino Project: Vegetation Baseline Report (EDI 2013). Given the proximity of the Casino Project, it was assumed that similar ecosystem types would be found within the LSA. Additionally, at the time of the initial field survey, it was thought that the Casino and Coffee Projects would eventually share an access road; therefore sharing similar ecosystem classification schemes would be beneficial. In 2015, with the change in the proposed access road alignment, the ecosystem entities for the Coffee Project were further developed based on field sampling to best represent the ecosystems within the LSA.

Designations used to define vegetation characteristics, including structural stage and vegetation strata, were obtained from the Field Manual for Describing Yukon Ecosystems (Environment Yukon 2014). Structural stage and vegetation strata codes and descriptions differ between Yukon and BC, therefore an effort was made to use Yukon specific designations wherever possible.

Site modifier codes were adapted from Terrestrial Ecosystem Mapping in BC (RIC 1998) and the Field Manual for Describing Terrestrial Ecosystems, 2nd Edition (BC MoFR and MoE 2010). The compensating effects of different environmental characteristics can result in some ecosites having a range of physical site conditions. This variation was dealt with by defining the "typical" conditions for an ecosite and then using site modifiers, which are a set of descriptive terms for certain site conditions, such as aspect and soil depth, to describe conditions outside those considered typical. Typical site modifiers (also called assumed modifiers) were determined for each preliminary ecosite prior to the 2014 field surveys and ELC mapping. Assigned assumed modifiers were updated in 2015 based on field sampling.

2.1.1.4 Field Sampling and Data Entry

The ELC field surveys were completed over four weeks during the summers of 2014 and 2015 (July 30–August 12, 2014; July 22–29 and August 19–25, 2015). The first week of surveys in 2014 was completed by a two-person crew (vegetation and soil personnel) while a second two-person crew was added for the second week of sampling. In 2015, each week-long survey was completed by a two-person crew. Kaminak environmental monitors assisted the EDI field crews whenever available. The field surveys were timed to ensure that most vegetation species would be developed and readily identifiable. Field sampling was conducted in an effort to ground-check the site and soil conditions and vegetation communities in as many of the ELC polygons as possible. With the exception of areas accessible from the existing roads, the majority of the ELC survey extent was accessed by helicopter.

The objective of field sampling was to assess a diversity of vegetation communities (ecosites and vegetation associations) within each bioclimate zone to ensure an understanding of the ecosystems occurring throughout the LSA, including areas that may be subject to direct impacts. Although a preliminary ecosystem classification was available at the time of the 2014 survey, ELC sampling had not been completed for the Coffee Project; therefore sufficient data needed to be gathered to corroborate or amend the ecosystem classification system used for the nearby Casino Project. Field sampling was completed with a targeted minimum intensity of approximately 1 plot per 100 ha of the ELC survey extent, which would achieve an Ecosystem Survey Intensity Level (ESIL) 4, as per the BC TEM Standards (RIC 1998), and ESIL 2, as per the Draft Yukon Bioclimate Framework Mapping Guidelines (Environment Yukon 2015a).

Field crews collected ecological and vegetation information typical of ecosystem mapping projects (BC MoFR and MoE 2010) and ensured that plot locations expressed representative and homogenous site, soil and vegetation characteristics whenever possible. Three standard types of field plots were established with the initial target ratios below:

- Full Plots (5%) — recorded on Yukon Standard Site, Vegetation and Soil Forms;
- Ground Plots (30%) — recorded on BC Site Visit Forms (SIVIs); and
- Visual Plots (65%) — recorded on SIVIs or field note paper.

The aim of the field survey was to complete a full plot in as many ecosites as possible to aid with ecosite identification and description. The locations of full plots were often pre-selected during field planning using orthoimagery to assist in ensuring that the desired distribution of plots was completed. Ground plots are abbreviated plots from which data are recorded to confirm the identification of the ecosite or determine polygon boundaries. They also provide data for characterizing ecosystem attributes, including site modifiers and structural stage. Visual plots typically contain brief observations on any number of the ecological attributes to help define the ecosite in the field. They are intended to be quick field estimates of the site, soil and/or vegetation conditions. The information collected during most visual plots for this Project was more extensive than described in the BC TEM Standards (RIC 1998) because the information collected was to contribute to ecosite development and classification (unlike ecosystem mapping projects that use published provincial ecosystem classifications). The information collected at each plot type is presented in Appendix B.

Although SIVI forms, used by the BC Ministry of Environment, were used to collect information for ground and visual plots, Yukon specific information, such as structural stage and vegetation strata designations, were recorded to ensure that the data could be entered into the Yukon Biophysical Inventory System (YBIS; Environment Yukon). Visual plots recorded on note paper were entered in a spreadsheet database. The digital data for all field plots is presented in Appendix B.

Field sampling locations were accessed by either truck or helicopter and specific plot locations were accessed on foot. Often field plots were completed along an environmental gradient to gain a better understanding of how environmental variables influenced vegetation communities across the landscape. Digital photographs of plot conditions and GPS coordinates were taken at all plot locations.

Upon completion of field sampling, the plot cards and field notes were reviewed for completeness and accuracy during an internal data quality assurance (QA) process. All associated digital photographs were reviewed to ensure that they correspond to, and were named for, the appropriate field plots. The plant species recorded at all plots were reviewed during data entry to ensure that they conformed to the most recent nomenclature provided through the YBIS data management system. A final review of the YBIS and spreadsheet plot databases was also completed.

Plots completed along the proposed potential access routes that were subsequently discarded were still used to identify and develop the ecosite classification. An overview of the field plot locations, colour coded by year of collection, within the ELC survey extent, are presented in Figures 2-2 to 2-7.

Limitation: The ecosystem mapping in the ELC survey extent is based entirely on the field plot data collected. Field plot coverage is quite widespread in the Coffee area, however some sections of the proposed access roads (the NAR and Casino Connector Road) were not extensively sampled. As the ELC mapping is concentrated in areas where no current road exists, accessing some areas proved challenging due to limited helicopter landing locations. In addition, the most northern ELC segment along the NAR (Figure 2-5) was incorporated after field sampling was complete therefore no field plots were completed in this area.

2.1.1.5 Classification and Database Development

Using the field sampling results, all ecosystem polygons were assessed individually (in 2-dimensions using supporting spatial data files in ArcMap) and ecological attributes were estimated and entered in the ELC database (refer to Table 2-2). The attributes were assessed and entered taking care to be sure that: 1) no more than three map entities per polygon were entered, 2) defined ecosite codes and modifier codes were used, and 3) all information was completed for every polygon.

Yukon Vegetation Inventory data were used in addition to orthoimagery and plot data in estimating the structural stage attributes for forested areas during ecosystem classification, as it provides information pertaining to stand age.

Refer to Section 2.1.1.6 for a description of the classification system and ecosystem codes used in classifying polygons. The descriptions and codes of assumed and atypical site modifiers, structural stages and stand modifiers are presented in Appendix B.

Following the completion of the ELC database, all of the mapped supporting ecosystem information was reviewed through an internal QA process for completeness and correctness, including the correct application of site modifiers (for assumed and atypical modifiers), structural stages and canopy composition modifiers. Finally, the spatial attributes of the ELC database were reviewed to ensure that all deciles sum to 100 percent, that no sliver polygons (typically less than 1 ha) or polygon overlaps remained, and that there were no errors in the assignment of ecosites and vegetation associations. A finalized seamless polygon spatial coverage was prepared following database review.

Table 2-2. ELC database fields and descriptions

ELC Database Field	Field Description
UniqueID	Unique Polygon Identifier
Eco_Reg	Ecoregion
Bio_Zon	Bioclimate Zone
Sdec_1	Decile 1 (percentage of the polygon from 4 – 10)
EcositeS1	Ecosite for Decile 1
SiteAM_S1a	Assumed Modifier 1 for Ecosite 1
SiteAM_S1b	Assumed Modifier 2 (if applicable)
SiteM_1a	Atypical Site Modifier 1 (if applicable)
SiteM_1b	Atypical Site Modifier 2 (if applicable)
Strct_S1	Structural Stage for Decile 1
Strct_M1	Structural Stage modifier
Stand_A1	Stand Composition Modifier: B (Broadleaf), C (Coniferous) or M (Mixedwood)
Distcls_1	Disturbance Modifier: F (Fire)
Dec_1_Area	Area of Decile 1 (ha)
Sdec_2	Decile 2 (percentage of the polygon from 0 – 5)
EcositeS2	Same sequence as above for Decile 2; ends at Dec_2_Area
Sdec_3	Decile 3 (percentage of the polygon from 0 – 3)
EcositeS3	Same sequence as above for Decile 3; ends at Dec_3_Area
Poly_Area	Total Polygon Area (ha)
Interpreter	Initials of ecosystem mapper
Source	Source of Estimate: P (Photo estimate), F (Full Plot), G (Ground Plot), V (Visual Plot)

2.1.1.6 Final Ecosite Descriptions

Following the completion of the 2014 field survey, the preliminary ecosite classification framework based on the Casino Project was amended to conform more closely to the YBF (Environment Yukon 2015a). The ecological classification framework used for this Project was based on the newly proposed YBF methodology, combined with aspects of the ecosystem classification systems used in BC and Alberta (AB).

The primary goal was to identify and describe ecosites and vegetation associations as delineated communities with defined floristic composition, physiognomy and habitat that cover the range of variation on the landscape (CNVC 2013). The standards used by the Canadian National Vegetation Classification (CNVC) define a vegetation association as "a plant community type with consistency of species dominance and overall floristic composition, having a clearly interpretable ecological context in terms of site-scale climate, substrate and/or hydrology conditions, moisture/nutrient factors or disturbance regimes, as expressed by diagnostic indicator species" (Jennings *et al.* 2004). Where diagnostic species refer to any species or group of species whose relative constancy or abundance can be used to differentiate one association from another (Jennings *et al.* 2004). Ecosites and vegetation associations were identified for the Coffee Project using a combination of the CNVC approach (CNVC 2013) and Environment Yukon (2015a, 2015b).

Ordination (non-metric multidimensional scaling) was used to identify and document vegetation patterns for plots completed in the Boreal and Subalpine/Alpine Bioclimate zones. Ordination techniques were used to arrange plots in terms of similarity in floristic composition, which allowed discontinuities in plot compositions to be recognized, or continuous variation to be partitioned into logical segments. A number of environmental variables, including elevation, slope position, aspect, soil characteristics, soil moisture and nutrient regime were related to the ordinations, as they influence the vegetation communities that exist across the landscape. Plot tabling was completed that initially sorted plots based on environmental variables, such as slope, moisture and nutrient regime, and then developed ecosites and vegetation associations through detailed plot-by-plot comparisons of plant species presence and percent cover.

The final ecosites and vegetation associations were constructed, incorporating all available environmental variables and floristic composition information. Although four Bioclimate zones are encountered with the survey extent (Alpine, Subalpine, Boreal High and Boreal Low), the ecosystem classification for the Alpine and Subalpine Bioclimate zones were combined because the Alpine Bioclimate zone only comprises a very small portion of the overall mapping extent and there is overlap in some ecosites. Similarly the classification system for the Boreal High and Boreal Low Bioclimate zones have been combined due to the small proportion of Boreal Low in the mapping extent and overlap in some ecosites.

This Project followed the ecosite organization and coding system used in the draft Field Guide to Ecosite Identification for the Boreal Low Southern Lakes Subzone of the Yukon (Environment Yukon 2015b). Ecosites were coded with a two-digit number that indicates, by its number series, a certain range of soil moisture and nutrient conditions:

a. 01 was used as the reference ecosite (medium in moisture and nutrients, typical for area)
b. The 10s and 20s were used for ecosites drier or the same moisture regime as the ‘01’
    i. 10s are nutrient poor to medium
    ii. 20s are nutrient rich to very rich
c. The 30s and 40s were used for ecosites moister than the ‘01’
    i. 30s are nutrient poor to medium
    ii. 40s are nutrient rich to very rich.

Vegetation associations within ecosites were then coded by one or more dominant and/or indicator species (e.g., 01-A represents a community with an aspen dominated canopy, whereas 01-Sw represents a community with a white spruce dominated canopy). Wetlands are designated with a two-character alphanumeric code, where the first character is a letter referring to the wetland class (e.g., F=fen, M=marsh, S=swamp) and the second character is a number used to differentiate between wetlands within a class (e.g., F1, F2, F3). Ecosite names use plant species that are important indicators of the vegetation found on the ecosite.

A list and description of the created ecosites for the Coffee Project can be found in Appendix C. The final ecosites are presented using a series of ecosite factsheets. The ecosite and vegetation association names and codes are displayed at the top of each factsheet page. The factsheets can be used as a field guide that describes ecosites within the Coffee LSA and in adjacent areas. This will assist in possible future ecological field work.

2.1.2 BROAD ECOSYSTEM MAPPING AND CLASSIFICATION METHODS

BEM was completed along the proposed NAR in sections with existing roads (Figure 2-1) to supplement the ELC mapping. Broad Ecosystem Mapping was conducted to identify wetland locations and provide additional high-level ecosystem information for road enhancements and for use in supporting wildlife assessments along the NAR. A cross-walk table identifying the BEM category for each ecosite and vegetation association (ELC) was created to assist any wildlife habitat mapping efforts to ensure ecosite and vegetation associations can be merged into forming a broad ecosystem map for the complete mapping extent. This cross-walk table can be found in Appendix B.

2.1.2.1 Data Preparation

The same suite of guidelines, standards and spatial layers used in support of ELC mapping were also used for BEM. Broad Ecosystem Mapping categories were developed by the EDI vegetation and wildlife subject matter experts. Categories had to provide broad distinctions between ecosystems that are useful for both vegetation and wildlife assessments. This involved separating categories based on elevation (e.g., high vs. low), dominant vegetation type (e.g., shrub vs. treed), canopy composition (e.g., coniferous vs. deciduous) and moisture and nutrient regimes (e.g., upland vs. riparian vs. wetland). Wetland ecosystems, which are infrequent on the landscape and could have high wildlife value, were of particular interest in the BEM; therefore all wetland classes (bog, fen, swamp and marsh) were mapped separately. To ensure that a seamless broad ecosystem level mapping coverage could be generated for the entire LSA, including the ELC mapping extent, all ecosites and vegetation associations described in the ELC were also assigned to broad ecosystem categories. As with ELC mapping, structural stage and canopy composition modifiers were mapped for all BEM categories.

2.1.2.2 Field Sampling and Data Entry

The majority of the BEM was completed via orthophoto interpretation. Plot data in this portion of the LSA, aside from wetland plot data, is minimal (36 vegetation plots). A wetland specific survey was completed from August 23–25, 2015, along the proposed NAR on existing roads from the Klondike Highway near Dawson through to Maisy May Creek, where the northern most ELC plots were completed. The objective of field sampling was to identify vegetation communities, particularly wetlands along the proposed NAR through a combination of Ground and Visual Plots. Additional wetland specific sampling in the BEM survey extent was completed concurrent with ELC sampling from July 22–29, 2015. Wetland plots were concentrated in areas where wetland ecosystems are quite abundant including the junctions of Ballarat Creek with the Yukon River and, the junctions of Barker Creek and Maisy May Creek with the Stewart River. Many of these wetland rich areas were initially included in the BEM extent due to existing roads; however following the completion of field sampling these areas were instead included in the ELC mapping extent (Figures 2-2 to 2-7).

Upon survey completion, wetland Ground Plots were entered into YBIS and wetland Visual Plots, which had been recorded on field note paper, were entered into an excel database.

2.1.2.3 Polygon (Ecosystem) Delineation and Attribution

Upon completion of the BEM database formation, ecosystem delineation was completed in two dimensions with a direct to digital system using ArcMap in ArcGIS 10.1. Ecosystem delineation was completed at a scale of 1:20,000, with an overall targeted average polygon range of 20 to 25 ha. Polygons in areas with wetland ecosystems and ponds were delineated to a minimum of 1 ha to ensure wetland ecosystems were adequately captured. Unlike the more detailed ELC mapping, terrain mapping was not used as a base layer in ecosystem polygon delineation and Bioclimate zones were not incorporated. BEM polygons were delineated by an EDI ecologist based upon discernable differences among the following criteria, as described in the BC TEM Standards (RIC 1998):

- Vegetation (species composition, canopy characteristics, stand age and height);
- Topography (landscape position, aspect, slope, drainage patterns);
- Soils (depth and drainage);
- Terrain (parent material); and
- Gradients and patterns (relationship patterns between ecosystem units, polygon shape and orientation).

Upon completion of delineation, all ecosystem polygons were assessed individually (in 2-dimensions using supporting spatial data files in ArcMap) and ecological attributes were estimated and entered in the BEM database (refer to Table 2-3).

Yukon Vegetation Inventory data was used in addition to orthoimagery and plot data in estimating the structural stage attributes for forested areas during ecosystem classification, as it provides information pertaining to stand age.

Forest fires are an important and relatively frequent disturbance in the Yukon (YEWG 2004). Approximately 28% of the BEM extent has been burned within the last 35 years and is currently in an herb- or shrub-dominated structural stage. Broad ecosystems in these areas were mapped based on landscape position, aspect, environmental conditions, and pre-fire Vegetation Resource Inventory data where available. Additionally, to remain consistent throughout the BEM extent, vegetation that has very recently been burned is mapped as structural stage 3 (herb dominated) because herbs and dwarf shrubs are likely to be the first plants revegetating these areas. Shrubby areas, including areas with burned standing snags (without crowns) are mapped as structural stage 4. In areas of light fire where stands of dead trees remain, complete with crowns, structural stages 6 to 8 is mapped, along with a fire modifier. A fire modifier was no longer used for regenerating stands once they reached a pole/sapling structural stage (Appendix B).

Following the completion of the BEM database, all entered ecosystem information was reviewed for completeness and correctness during an internal QA process, including the correct application of structural stages and canopy composition modifiers. The spatial attributes of the BEM database were reviewed to ensure that all deciles summed to 100 percent, that no sliver polygons or polygon overlaps remained, and that there were no errors in the assignment of BEM categories.

Table 2-3. BEM database fields and descriptions

BEM Database Field	Field Description
UniqueID	Unique Polygon Identifier
Sdec_1	Decile 1 (percentage of the polygon from 4 – 10)
MapCode_S1	Ecosite for Decile 1
Strct_S1	Structural Stage for Decile 1
Strct_M1	Structural Stage modifier
Stand_A1	Stand Composition Modifier: B (Broadleaf), C (Coniferous) or M (Mixedwood)
Distcls_1	Disturbance Modifier: F (Fire)
Dec_1_Area	Area of Decile 1 (ha)
Sdec_2	Decile 2 (percentage of the polygon from 0 – 5)
MapCode_S2	Same sequence as above for Decile 2; ends at Dec_2_Area
Sdec_3	Decile 3 (percentage of the polygon from 0 – 3)
MapCode_S3	Same sequence as above for Decile 3; ends at Dec_3_Area
Poly_Area	Total Polygon Area (ha)
Interpreter	Initials of ecosystem mapper
Source	Source of Estimate: P (Photo estimate), F (Full Plot), G (Ground Plot), V (Visual Plot)

2.2 RESULTS

The ecosystem mapping identified 34 ELC ecosites (24 ecosites in boreal zone, 10 ecosites in subalpine/alpine zone), 11 non-vegetative/anthropogenic units and 13 BEM units. The ELC mapping identified 7 unique wetland ecosites and the BEM identified 4 wetland units (bog, fen, marsh and swamp).

2.2.1 ELC MAPPING AND FIELD RESULTS

2.2.1.1 Field work

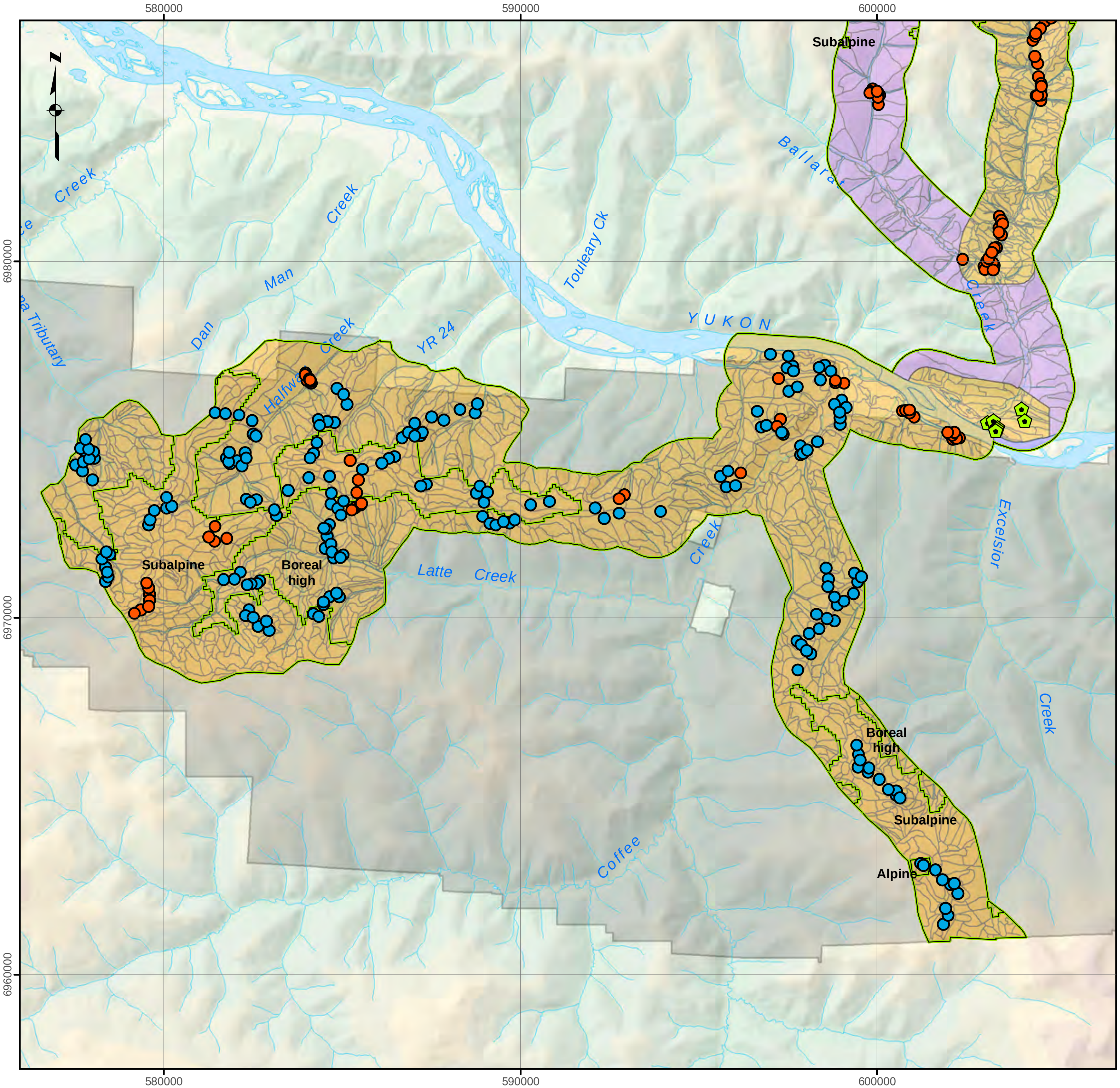
Field sampling within the ELC survey extent was initiated in 2014 (July 31 – August 12, 2014) and subsequently completed in 2015 (July 22–29th and August 19–25th, 2015). The 2014 field survey was completed near the proposed mining footprint, along existing infrastructure within the Coffee Property, and along a conceptual road connecting to Casino (Casino Connector). The 2015 plots were completed throughout the ELC and BEM survey extent with emphasis on the proposed route options for the NAR.

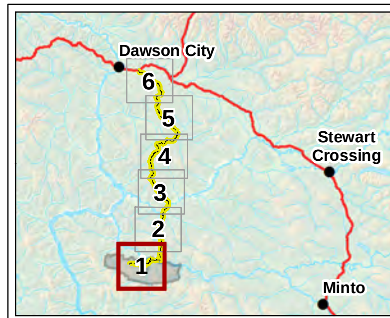
A total of 354 ELC field plots were completed, consisting of 23 Full Plots, 137 Ground Plots and 194 Visual Plots. Of the plots surveyed, 311 were within the final ELC mapping extent for the Project. Plots completed along the potential access routes that were subsequently discarded were still used to identify and develop the ecosite classification. An overview of the field plot locations, colour coded by year of collection, within the ELC survey extent, are presented in Figures 2-2 to 2-7. A total of 91 and 263 field plots were completed in the Subalpine/Alpine and Boreal Bioclimate zones, respectively.

2.2.1.2 ELC Mapping

A total of 2,937 ELC polygons were mapped within the 23,844 ha ELC mapping extent, with an average ELC polygon size of approximately 8 ha (close to the 10 ha target for this project; Figures 2-1 to 2-5). An average of 1 plot per 85 ha was completed within the ELC mapping extent, achieving an ESIL of 4, as per the BC TEM Standards (RIC 1998), and ESIL 2, as per the Yukon Bioclimate Framework Mapping Guidelines (Environment Yukon 2015a).

The area of each ecosystem (ecosite) mapped within the Boreal Bioclimate zone (18,593.1 ha) is summarized in Table 2-3. The area of each ecosystem (ecosite) mapped within the Subalpine/Alpine Bioclimate zone (5,250.6 ha), is summarized in Table 2-4. The divisions of the ELC survey extent into the Coffee Area, the proposed NAR and the Casino Connector are illustrated in Figure 2-1.





Legend

- Settlement/Community
- 2014 ELC/BEM Plots
- 2015 ELC/BEM Plots
- Wetland Plots (2015)
- Highway
- Coffee Property
- Ecosystem Land Classification (ELC)
- Broad Ecosystem Mapping (BEM)
- Bioclimate Zone

FIGURE: 2-2

ELC/BEM polygons and field plots Map 1 of 6

Data Sources
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Project data is site specific. Survey data was collected by EDI Environmental Dynamics Inc. (2014/2015).

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0 1 2 3 4 5
KM

Map Reference Scale: 1:150,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MP	Checked: AM	Date: 10/20/2016

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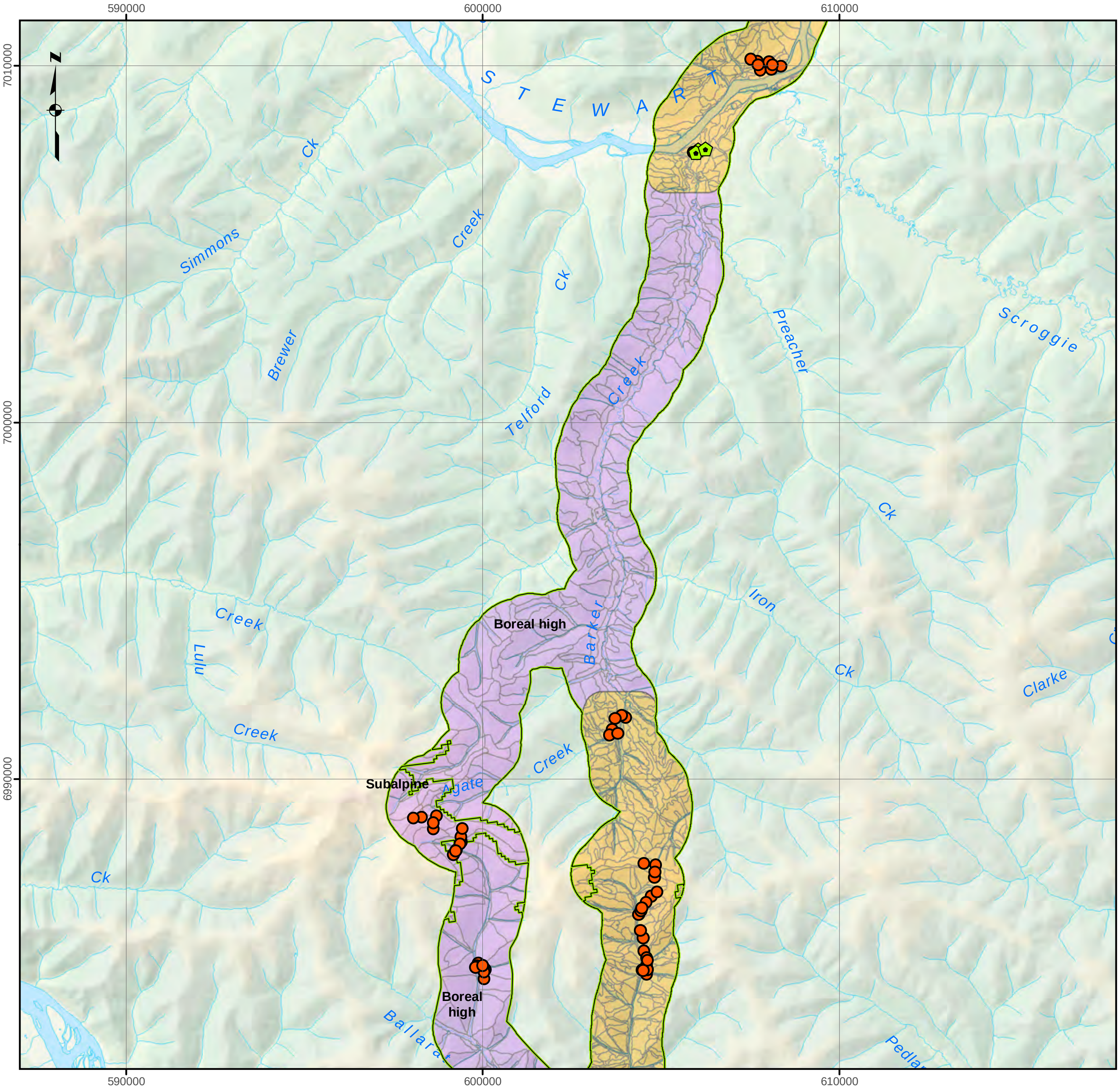

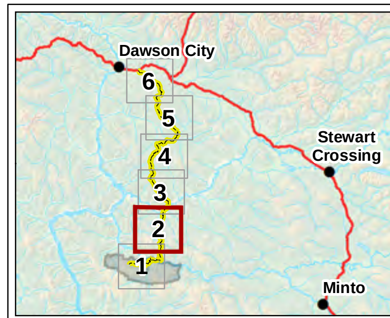

Legend

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FIGURE: 2-3

ELC/BEM polygons and field plots Map 2 of 6

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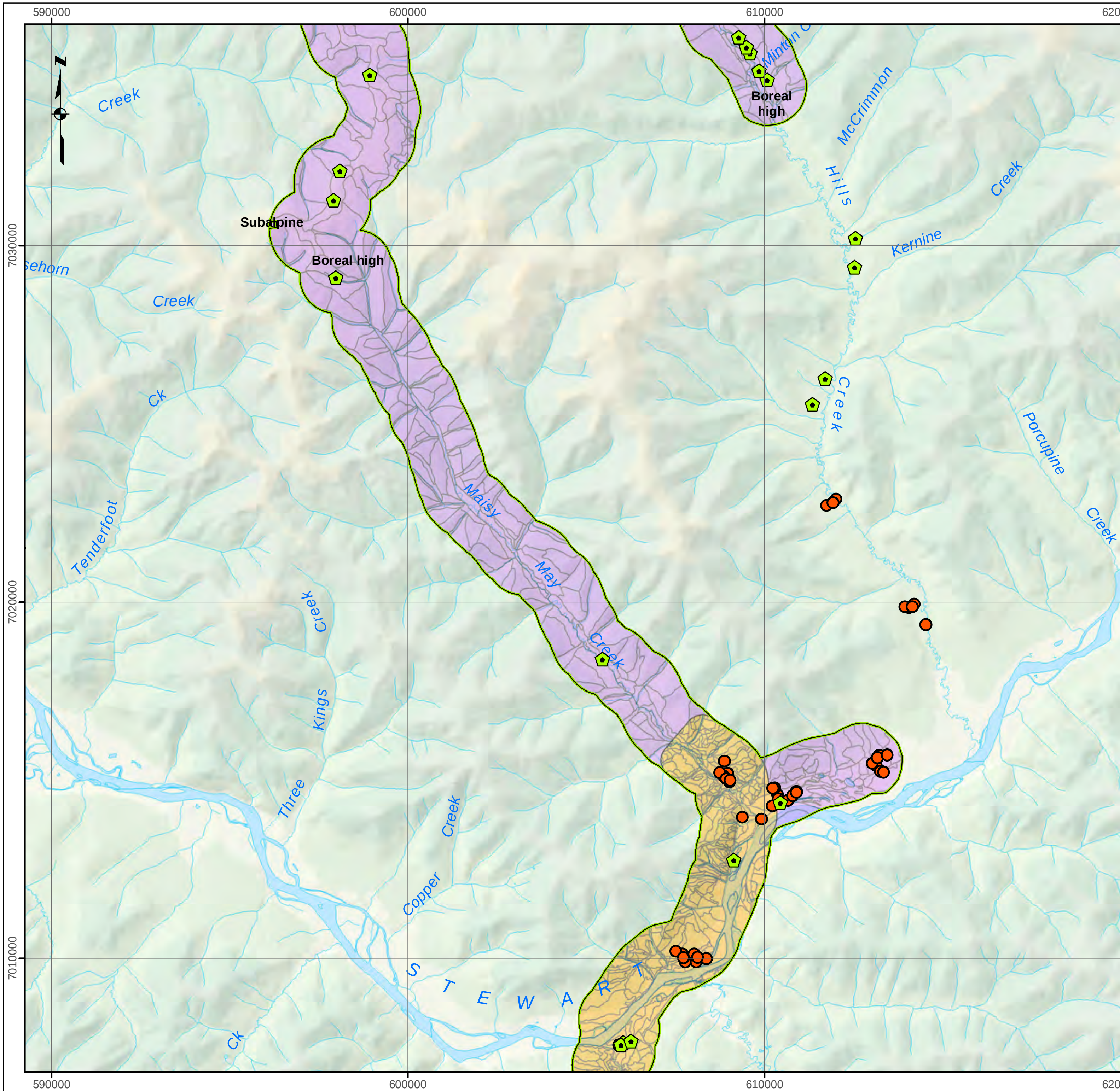

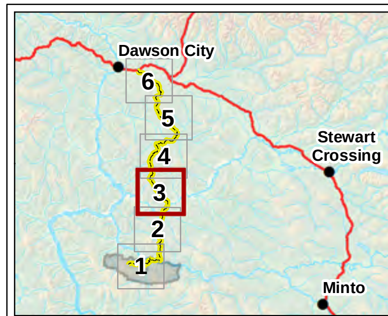

Legend

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FIGURE: 2-4

ELC/BEM polygons and field plots Map 3 of 6

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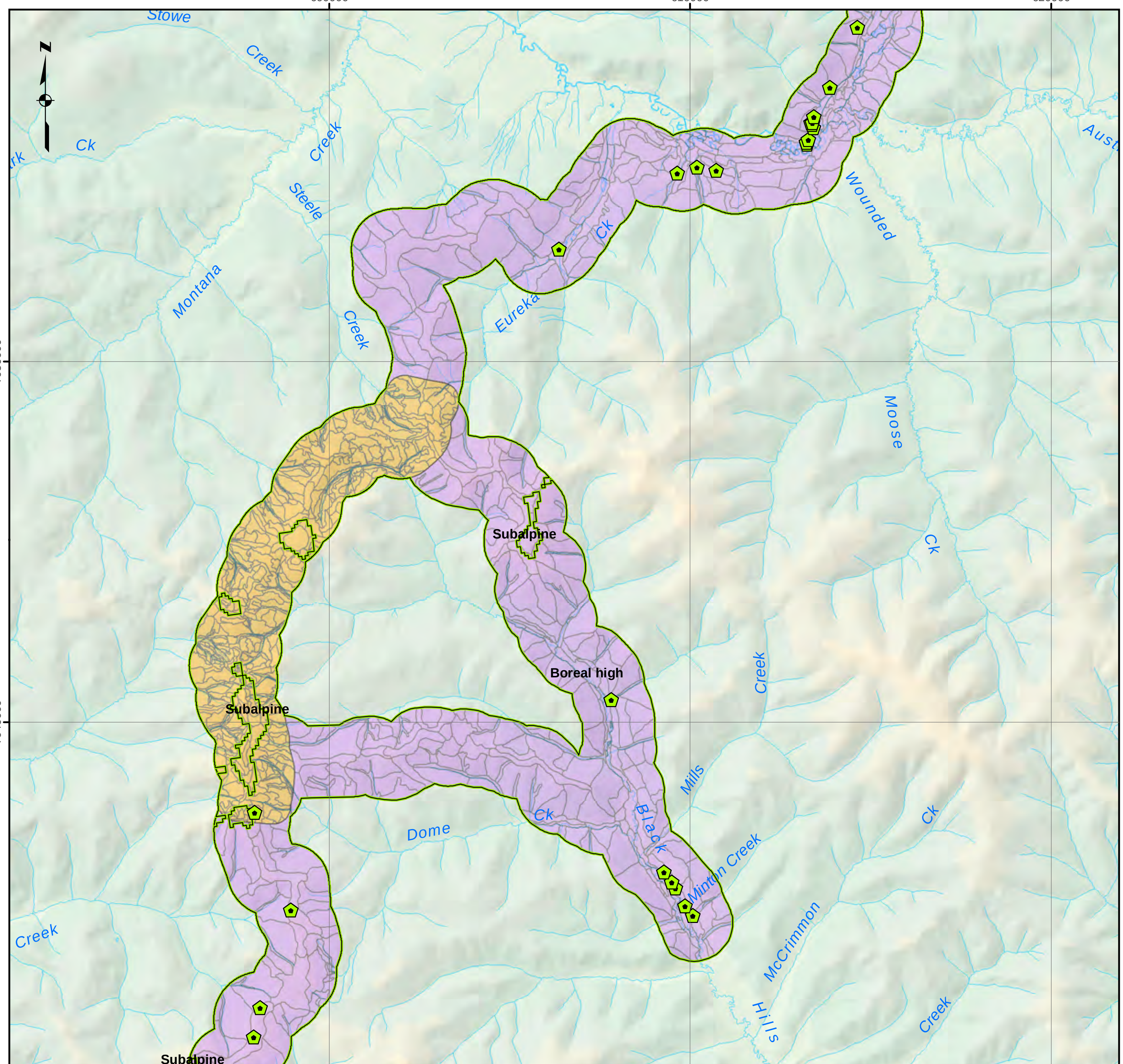

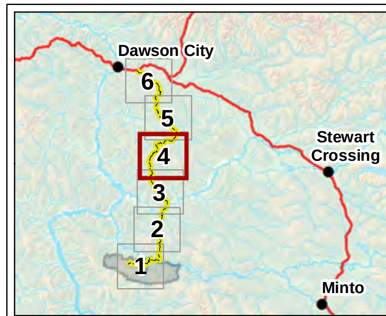

Legend

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- Highway
- Coffee Property
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- Bioclimate Zone

FIGURE: 2-5

ELC/BEM polygons and field plots Map 4 of 6

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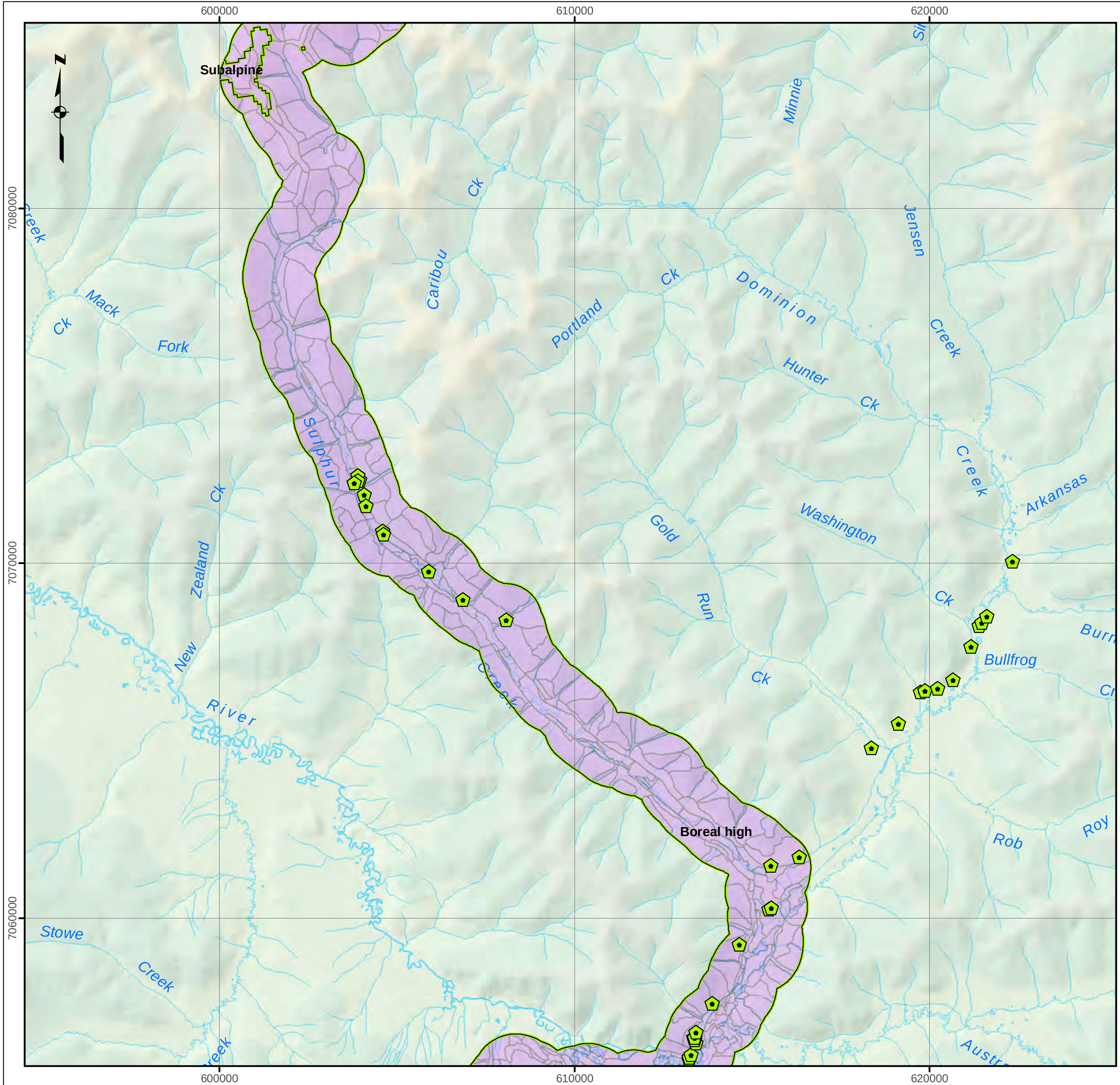

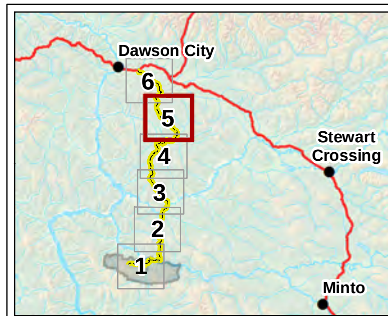

Legend

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FIGURE: 2-6

ELC/BEM polygons and field plots Map 5 of 6

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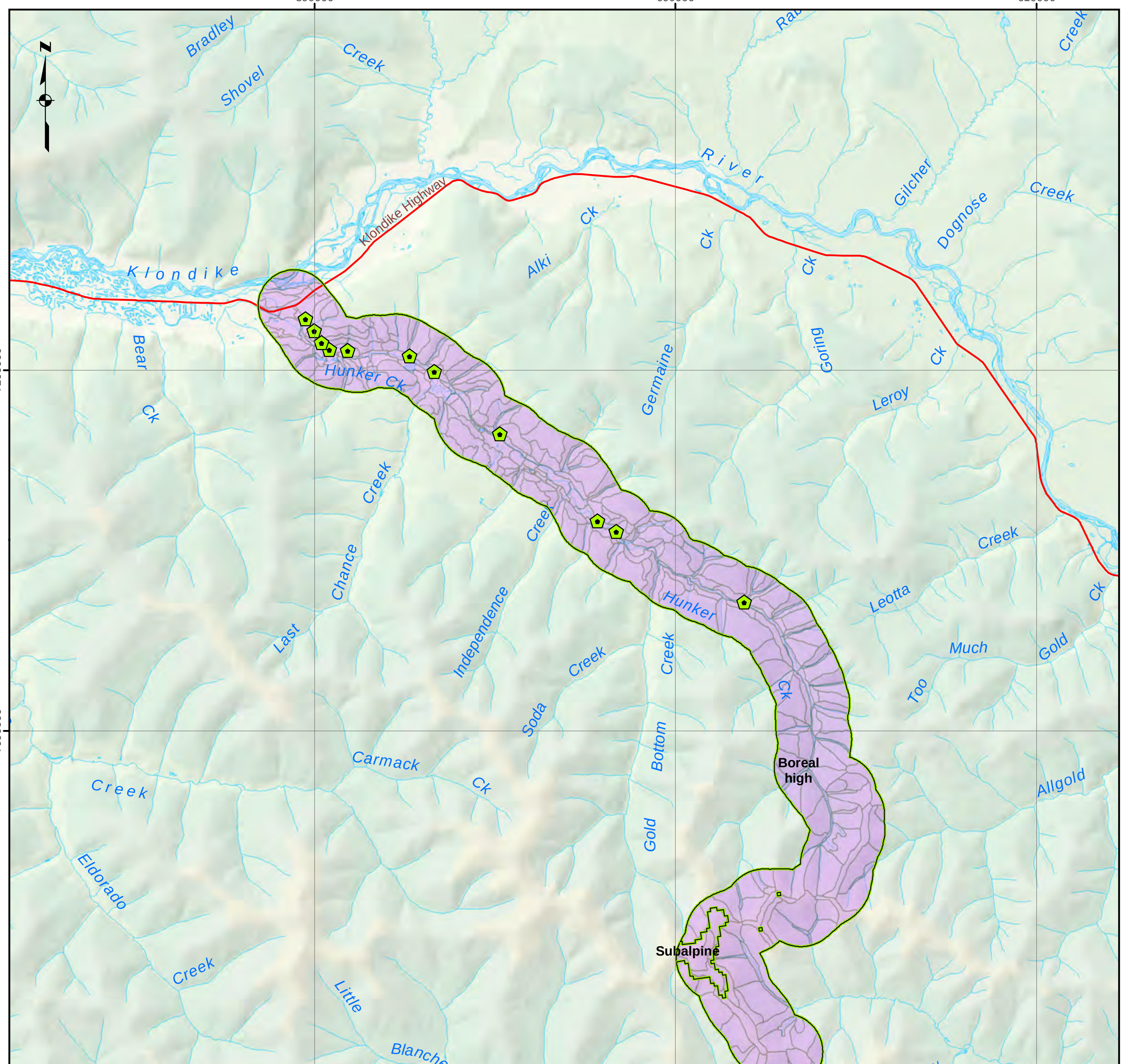

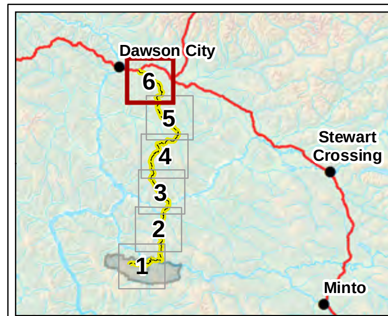

Legend

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FIGURE: 2-7

ELC/BEM polygons and field plots Map 6 of 6

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Boreal Bioclimate Zones

Treed ecosystems within the ELC survey extent of the Boreal Bioclimate Zones are most commonly mapped as young forests (44%; structural stage 6), followed closely by mature forests (38%; structural stage 7). Old forests, which are primarily coniferous-dominated, make up approximately 11% of the forested area. Overall, coniferous-dominated stands are the most commonly mapped treed ecosystems (55%); however, this includes treed wetlands and other moist-to-wet stunted spruce forests. Forests with dry-to-medium moisture regimes are mapped fairly evenly between coniferous-dominated, deciduous-dominated and mixedwood canopies. Zonal forests (ecosite 01) however, commonly have mixedwood canopies (approximately 43%). The abundance of mixedwood and deciduous-dominated forests in the 01 ecosite reflect the frequency of fire disturbance in the region. Hillsides are often mosaics of different canopy compositions and stand ages reflecting the successional development that occurs after fire disturbance.

Across the Coffee Area, the proposed NAR and the Casino Connector sections, the most commonly occurring ecosystem was ecosite 01, the zonal ecosite, which occurs across a range of soil moistures from slightly dry (submesic) to slightly moist (subhygric) with a medium nutrient regime (Table 2-4). In the Coffee Area section, the 01-WSw (Alaska birch – White spruce – Labrador tea - Lowbush cranberry – Feathermoss) vegetation association was the most commonly occurring 01 vegetation association (Photo 2-1). This association typically occurs on midslopes, across a range of aspects. The canopy is co-dominated by Alaska birch and white spruce and the ecosite typically contains Labrador tea, lowbush cranberry, green alder (*Alnus viridis*) and step moss (*Hylocomium splendens*) in the understory. Approximately 33% of the 01 ecosite mapped in the Coffee Area is in a shrub-dominated structural stage due to wildfire disturbance. Ecosite 32 (Black spruce - Labrador tea - Cloudberry - Sedge), with its two vegetation associations, also commonly occurs in the Coffee Area along north-facing, moderate lower-to-middle slopes underlain by near surface permafrost (Photo 2-2). The nutrient regime of the ecosite is typically poor and the moisture regime is moist-to-wet, with imperfect-to-poor drainage. A stunted black spruce canopy occurs over a Labrador tea-dominated shrub layer and an herb layer of sedges and cloudberry or cottongrasses.

The proposed NAR section of the ELC is predominantly (98%) in the Boreal Bioclimate zone. The 01-WSw and 01-W (Alaska birch - Labrador tea - Tall bluebells - Step moss) vegetation associations are the most common ecosystems mapped in the section (Table 2-4). The 01-W, like the 01-WSw, typically occurs on midslopes, across a range of aspects. The canopy is dominated by Alaska birch, with Labrador tea, lowbush cranberry, and step moss common in the understory. Ecosites in a shrub-dominated structural stage are also common, particularly ecosite 01, due to the influence of wildfires in the area. Ecosite 21 (Aspen - Kinnikinnick- Purple reedgrass) commonly occurs on dry, moderate-to-steep, south-facing slopes throughout the section. The canopy is aspen-dominated and an understory containing high kinnikinnick cover is common (Photo 2-3). Moist, gentle toe-slopes leading to valley bottom drainages are commonly mapped as ecosite 33 (Black spruce - Labrador tea - Sedge – Brown moss - Reindeer lichen) throughout the section. The ecosite occurs on imperfectly-to-poorly drained lower-to-toe slope sites underlain by permafrost. Additionally, although not a large percentage of the ELC mapping extent, ecosites 01-A (Aspen

- Soapberry - Purple reedgrass) and 01-Sw (White spruce - Rose - Bastard toadflax - Feathermoss) occur almost entirely within the proposed NAR section due to their occurrence at low elevations.

The 01-WSw and 01-W vegetation associations are also the most commonly mapped boreal ecosystems in the Casino Connector section of the ELC survey extent. They are typically mapped along the forested mid-to-upper, neutral slopes throughout the section. As in the Coffee Area, ecosite 32 is also commonly mapped on northerly, moderate lower-to-middle slopes underlain by near surface permafrost (Photo 2-2). The Casino Connector access (no longer being proposed) is the only section in the ELC survey extent unaffected by recent wildfire.

Table 2-4. Ecosite and vegetation associations in the Boreal Bioclimate zones mapped in the ELC mapping extent of the Coffee Project

Ecosite	Veg assoc	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
					Coffee	NAR	Casino
20	**Capu**	Purple reedgrass - Lichen	forb and graminoid dominated grassland; moderate to steep, south-facing slopes; medium to rich nutrient regime	139	92.8 (0.81%)	44.1 (0.46%)	1.6 (0.05%)
20	**Aruv**	Kinnikinnick	ground shrub dominated 'grassland'; moderate to steep, south-facing slopes; tree cover <10%; medium to rich nutrient regime	142	-	141.8 (1.49%)	-
21		Aspen - Kinnikinnick- Purple reedgrass	dry aspen-dominated forest; mid to upper slope position, predominantly southerly aspect; commonly medium nutrient regime	1275	270.4 (2.37%)	930.5 (9.76%)	74.1 (2.54%)
01	**A**	Aspen - Soapberry - Purple reedgrass	mesic aspen-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium nutrient regime	360	-	360.3 (3.78%)	-
01	**W**	Alaska birch - Labrador tea - Tall bluebells - Step moss	mesic Alaska birch-dominated forest; lower to upper slopes across a range of aspects; medium nutrient regime	1485	330.7 (2.90%)	990.6 (10.39%)	163.9 (5.61%)
01	**WSw**	Alaska birch - White spruce - Labrador tea - Lowbush cranberry - Feathermoss	mesic mixedwood forest; lower to upper slopes across a range of aspects; medium nutrient regime	2755	1384.0 (11.83%)	1036.7 (10.88%)	334.1 (11.44%)
01	**Sw**	White spruce - Rose - Bastard toadflax - Feathermoss	mesic white spruce-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium nutrient regime	293	4.8 (0.04%)	287.9 (3.02%)	-
01	**Sw(Sb)**	Spruce - Labrador tea - Lowbush cranberry - Feathermoss	mesic coniferous forest, spruce (primarily white) dominated; lower to upper slopes across a range of aspects; medium nutrient regime	1452	681.8 (5.99%)	670.9 (7.04%)	99.7 (3.41%)

Table 2-4. Ecosite and vegetation associations in the Boreal Bioclimate zones mapped in the ELC mapping extent of the Coffee Project

Ecosite	Veg assoc	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
					Coffee	NAR	Casino
01		Spruce - Feathermoss (Fire)	mesic forest; lower to upper slopes across a range of aspects; low elevations only; medium nutrient regime. (note: mapped in burned areas that are currently dominated by shrub, for which a canopy association cannot be determined)	2402	1181.1 (10.37%)	1221.3 (12.8%)	-
30		Black spruce - Labrador tea - Reindeer lichen	black spruce-dominated forest; predominately on northerly lower to upper slopes; high lichen cover; poor nutrient regime.	993	392.6 (3.45%)	538.1 (5.64%)	62.2 (2.12%)
31		Spruce - Birch - Lowbush cranberry - Feathermoss	sparse coniferous forest near Subalpine Bioclimate boundary, spruce-dominated; high shrub cover; predominantly upper slope with variable aspect; medium nutrient regime	1175	431.1 (3.78%)	616.8 (6.47%)	126.7 (4.34%)
32	Sb1	Black spruce - Scrub birch - Labrador tea - Cloudberry	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with scrub birch, Labrador tea and cloudberry in the understory; poor nutrient regime	221	187.6 (1.65%)	2.8 (0.03%)	30.7 (1.05%)
32	Sb2	Black spruce - Labrador tea - Cottongrass	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea, and cottongrass in the understory; poor nutrient regime	196	49.1 (0.43%)	84.9 (0.89%)	61.7 (2.11%)
32		Black spruce - Labrador tea - Cloudberry - Sedge	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea and lowbush cranberry in the understory; poor nutrient regime (note: mapped in areas where vegetation association for ecosite is unknown)	2283	1553.1 (13.6%)	459.3 (4.82%)	270.6 (9.27%)
33		Black spruce - Labrador tea - Sedge – Brown moss - Reindeer lichen	gentle-to-moderate, lower and toe slopes underlain by permafrost; black spruce dominated, spruce typically stunted; poor to medium nutrient regime	733	342.9 (3.01%)	325.0 (3.41%)	65.0 (2.23%)
40		White spruce - Horsetail	spruce (predominately white) dominated riparian stands; floodplains and gullies; with horsetail and feathermoss; medium to rich nutrient regime	536	199.6 (1.75%)	329.4 (3.46%)	6.8 (0.23%)

Table 2-4. Ecosite and vegetation associations in the Boreal Bioclimate zones mapped in the ELC mapping extent of the Coffee Project

Ecosite	Veg assoc	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
					Coffee	NAR	Casino
41		Balsam poplar - Rose - Horsetail	balsam poplar-dominated midbench floodplain; rose and horsetails common in the understory; located along the banks of rivers and larger creeks; rich nutrient regime	347	188.3 (1.65%)	159.0 (1.67%)	-
42		Alaska birch - Alder - Reedgrass	Alaska birch-dominated riparian community; located along sideslope gullies and associated receiving areas; medium to rich nutrient regime	180	84.6 (0.74%)	90.9 (0.95%)	4.7 (0.16%)
43		Tall shrub Balsam poplar - Willow	balsam poplar and willow dominated low bench floodplain; located along the banks of the Yukon and Stewart Rivers; tall shrub structural stage	71	26.9 (0.24%)	44.2 (0.46%)	-
F1		Spruce - Willow - Labrador tea - Sedge	poor treed fen; open spruce canopy, spruce often stunted and in the shrub layer; located on level valley bottom terrain on fluvial parent materials; poor to medium nutrient regime; underlain by permafrost	270	85.1 (0.75%)	179.1 (1.79%)	6.2 (0.21%)
F2		Spruce - Red bearberry – Brown moss	treed fen; open spruce canopy, spruce can be stunted; located on level valley bottom terrain on fluvial parent materials; medium nutrient regime; underlain by permafrost	66	-	65.5 (0.69%)	-
F3		Birch - Leatherleaf - Sedge	shrubby birch dominated fen, with leatherleaf, willows and Labrador tea; level to depressional sites; medium nutrient regime; underlain by permafrost	194	134.7 (1.18%)	58.6 (0.61%)	1.0 (0.04%)
S1		Willow - Horsetail	willow-dominated shrubby riparian community; found along streams and sideslope creeks; medium to rich nutrient regime	222	107.9 (0.95%)	98.5 (1.03%)	15.8 (0.54%)
S2		Willow - Reedgrass	willow and reedgrass dominated swamp; level, typically surrounding marshes or ponds on old fluvial plains; medium to rich nutrient regime.	12	0.3 (0.00%)	11.6 (0.12%)	-
M1		Beaked sedge	sedge-dominated marsh; fluctuating water table; rich nutrient regime	6	2.4 (0.02%)	3.7 (0.04%)	-

Table 2-4. Ecosite and vegetation associations in the Boreal Bioclimate zones mapped in the ELC mapping extent of the Coffee Project

Ecosite	Veg assoc	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
					Coffee	NAR	Casino
M2		Horsetail - Sedge	horsetail-dominated marsh; fluctuating water table; rich nutrient regime	1	-	0.9 (0.01%)	-
M		Marsh	sedge and/or herb dominated marsh; fluctuating water table; rich nutrient regime (note: mapped when dominate marsh vegetation unknown)	12	3.7 (0.03%)	8.1 (0.08%)	-
An		Anthropogenic	an area of anthropogenic disturbance, including areas cleared for camps, homesteads and air-strips	55	14.9 (0.01%)	40.1 (0.42%)	-
Gb		Gravel bar	An elongated landform generated by waves and currents and usually running parallel to the shore. It is composed of unconsolidated small rounded cobbles, pebbles, stones and sand	20	-	19.9 (0.21%)	-
Mp		Placer mine	an area cleared and disturbed through placer mine activity, includes unvegetated areas and areas undergoing revegetation, primarily shrub-dominated	54	-	54.3 (0.57%)	-
Pd		Pond	small body of water greater than 2 m deep, but not large enough to be classified as a lake	3	0.7 (0.01%)	2.2 (0.02%)	-
Rd		Road surface	an area cleared and compacted for the purpose of transporting goods and services by vehicles	6	-	5.8 (0.06%)	-
Ri		River	watercourse formed when water flows between continuous, definable banks; the flow may be intermittent or perennial	592	191.8 (1.69%)	400.3 (4.20%)	-
Ro		Rock	gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover	52	3.2 (0.03%)	48.7 (0.51%)	-
Rt		Talus	active and inactive talus and scree; typically have a low herb layer cover because of mobile substrates or lack of soil.	35	33.8 (0.30%)	0.8 (0.01%)	-
			Total	18639	7979.9	9333.3	1324.8

Photo 2-1. Boreal vegetation association 01 – WSw (Alaska birch – White spruce – Labrador tea – Lowbush cranberry – Feathermoss)

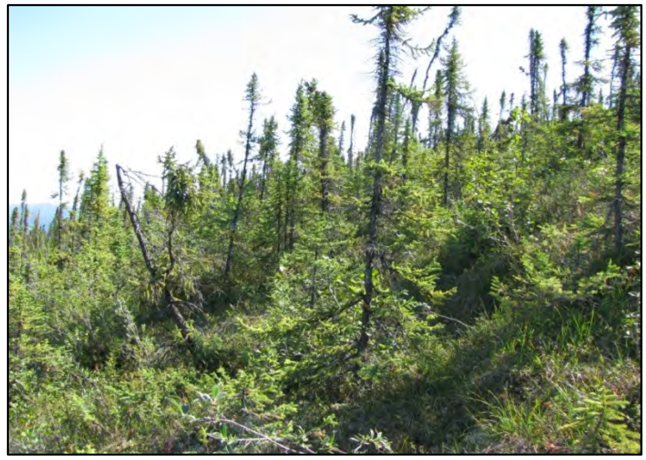


Photo 2-2. Boreal vegetation association 32 – Sb1 (Black spruce – Scrub birch – Labrador tea – Cloudberry)

Photo 2-3. Boreal ecosite 21 (Aspen – Kinnikinnick – Purple reedgrass)

Photo 2-4. Subalpine ecosite 01 (Scrub birch – Lowbush cranberry – Feathermoss)

Alpine and Subalpine Bioclimate Zones

Across all three ELC areas, the most commonly mapped ecosystem in the Alpine and Subalpine Bioclimate zones is ecosite 01 (Scrub birch – Lowbush cranberry – Feathermoss), the zonal ecosite, which commonly occurs on upper slopes across a range of aspects (Table 2-5). The ecosite occurs across a range of soil moistures from slightly dry (submesic) to slightly moist (subhygric) and typically has a medium nutrient regime. Scrub birch, northern Labrador tea (*Rhododendron tomentosum*), Labrador tea and lowbush cranberry dominate the well-developed shrub layer and a mixture of feathermosses (*Hylocomium* and *Pleurozium*) and reindeer lichens (*Cladina* spp.) occur in the moss and lichen layer.

The Coffee Area of the ELC survey extent is approximately 30% Subalpine and contains no Alpine areas. Ecosite 01 dominates, however ecosite 31 (Spruce - Scrub birch - Feathermoss) and ecosite 32 (Black spruce - Labrador tea - Lowbush cranberry - Sedge) are also commonly mapped (Table 2-5). Similar to ecosite 01, ecosite 31 occurs on upper slopes across a range of soil moistures from slightly dry (submesic) to slightly moist (subhygric), typically with a medium nutrient regime. A sparse canopy of white and black spruce (~15% cover) occurs over a dense shrub layer of scrub birch, willows, Labrador tea, bog blueberry and lowbush cranberry. While ecosite 31 is commonly mapped on neutral and warm aspects, ecosite 32 is mapped on north-facing moderate lower-to-mid slopes with near surface permafrost. Stunted black spruce and scrub birch dominate the shrub layer of ecosite 32, with sedge, feathermosses, peat mosses and reindeer lichens common underneath. The widely distributed rounded hillcrests within the Coffee Area are typically mapped as ecosite 12 (Scrub birch - Mountain avens - Lichen) and ecosite 13 (Scrub birch - Crowberry - Lowbush cranberry). Ecosite 12 occurs on gently sloping, dry crests and is dominated by mountain avens, low growing scrub birch and lichens. Ecosite 13 occurs on north-facing upper-slopes and crests with exposed boulder channels. The ecosite is co-dominated by scrub birch and ground shrubs including crowberry, Arctic white heather and lowbush cranberry.

Only 2% of the NAR section occurs within the Subalpine Bioclimate zone. As with the Coffee Area, no Alpine areas occur and the most commonly mapped ecosystems are ecosite 01 and ecosite 31. The small patches of subalpine that occur within the NAR section commonly occur along the ELC mapping extent boundary.

The Casino Connection access route occurs in both the Subalpine and Alpine Bioclimate zones. Close to one quarter of the Casino Connection section is mapped as ecosite 01 (Table 2-5). Ecosite 30 (Scrub birch - Sedge – Feathermoss) is also commonly mapped and occurs on moist, gentle-to-moderate slopes with near surface permafrost and imperfect-to-poor drainage. This ecosite has a well-developed shrub layer of scrub birch, Labrador tea and willows and typically has spruce muskeg sedge (*Carex lugens*), feathermosses and reindeer lichens below. Only 4% of the Casino section is in the Alpine Bioclimate zone and much of this area is mapped as ecosite 11 (Felsenmeer). Felsenmeer is infrequent in the ELC survey extent, occurs on upper slopes and crest positions and consists of boulder fields with typically less than 40% vegetative cover. Species commonly present in ecosite 11 include mountain avens, willows, alpine sweet grass (*Anthoxanthum monticolai*), mountain sagewort (*Artemisia norvegica* ssp. *saxatilisi*), alpine harebell (*Campanula lasiocarpa*), rock mosses (*Racomitrium* spp.) and lichens.

Table 2-5. Ecosite and vegetation associations is the Subalpine/Alpine Bioclimate zones, mapped in the ELC mapping extent of the Coffee Project

Ecosite	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
				Coffee	NAR	Casino
10	Tors	protruding bedrock outcrops on mountain crests; vegetation growth is mainly restricted to fractures and crevices where soil has accumulated.	1.5	1.1 (0.01%)	-	0.4 (0.01%)
11	Felsenmeer	veneer of angular rock fragments/boulders fields over sloping ground, typically upper-slope to crest position; vegetative cover is typically <40% and includes dwarf shrubs, graminoids, mosses and lichens.	125	-	0.6 (0.01%)	124.2 (4.25%)
12	Scrub birch - Mountain avens - Lichen	plateaus and gentle crests at high elevations; vegetation community dominated by mountain avens, low-growing dwarf birch and lichens; poor to medium nutrient regime	101	83.7 (0.74%)	6.5 (0.06%)	10.8 (0.37%)
13	Scrub birch - Crowberry - Lowbush cranberry	moderately sloping, northerly aspect, upper slope; low shrub and ground shrub dominated sites with exposed boulder channels; poor nutrient regime	302	174.6 (1.53%)	15.3 (0.16%)	111.8 (3.83%)
14	Scrub birch - Willow - Mountain avens	low stature shrub-dominated sites with scrub birch, willows, Labrador tea, and lowbush cranberry; commonly upper slope or crest; medium nutrient regime	136	72.4 (0.64%)	6.6 (0.07%)	57.0 (1.95%)
01	Scrub birch - Lowbush cranberry - Feathermoss	shrub-dominated ecosystem with scrub birch, willows, Labrador tea, lowbush cranberry, and bog blueberry; predominantly mid to upper slopes; poor to medium nutrient regime	2489	1730.9 (15.21%)	101.5 (1.06%)	656.2 (22.47%)
31	Spruce - Scrub birch - Feathermoss	sparsely treed areas often near the boundary with the Boreal Bioclimate zone; conifers with ≤15% cover, high shrub cover; predominantly upper and mid slopes; medium nutrient regime	828	539.3 (4.74%)	70.7 (0.74%)	217.5 (7.44%)
30	Scrub birch - Sedge - Feathermoss	mid to lower slopes; predominantly cool and neutral aspects; scrub birch, willows, Labrador tea, sedge and feathermoss common; permafrost and seepage typically present; poor to medium nutrient regime	597	318.0 (2.79%)	1.0 (0.01%)	278.1 (9.52%)

Table 2-5. Ecosite and vegetation associations is the Subalpine/Alpine Bioclimate zones, mapped in the ELC mapping extent of the Coffee Project

Ecosite	Name	Description and typical situation	Total Area (ha)	Area (ha) and (% of Section)		
				Coffee	NAR	Casino
32	Black spruce - Labrador tea - Lowbush cranberry - Sedge	stunted black spruce (black spruce in shrub structural stage) and shrub dominated; predominantly on cool, moderate mid to lower slopes; permafrost and seepage present; poor nutrient regime	588	471.1 (4.14%)	1.5 (0.02%)	115.5 (3.96%)
40	Willow - Horsetail - Peatmoss	willow-dominated riparian sites; located along sideslope creeks and drainage channels; shrub layer predominately medium stature; medium to rich nutrient regime	79	54.4 (0.48%)	0.1 (0.00%)	24.2 (0.83%)
An	Anthropogenic	areas of anthropogenic disturbance, including areas cleared for camps, homesteads and air-strips	0.5	0.5 (0.00%)	-	-
Rd	Road surface	an area cleared and compacted for the purpose of transporting goods and services by vehicles	2	-	2.4 (0.03%)	-
Ro	Rock	gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover	2	1.0 (0.01%)	1.3 (0.01%)	-
		Total	**5251**	3447.2	207.6	1595.8

[1] Definitions of soil moisture regimes can be found in Appendix B.

Summary of ELC Wetland, Riparian and Grassland Ecosystems

Wetland, floodplain and grassland ecosystems all occur in the ELC survey extent (Table 2-4). These three ecosystem types are relatively infrequent on the landscape but have important ecological roles. Wetlands are critical landscape features for hydrologic storage and filtering, provide important habitat for wildlife and also have the potential to support rare plant species. The Yukon does not have extensive wetlands relative to most other areas of northern Canada (McKenna *et al.* 2004). Floodplain ecosystems also provide important habitat for a variety of wildlife species and act as natural filters, removing excess sediment and nutrients from floodwaters. Steep, south-facing grasslands are floristically diverse ecosystems that support plants not commonly found in other ecosystems and have the potential to provide forage areas for wildlife.

Less than 4% of the overall ELC mapping extent is mapped as wetland (Table 2-6). The NAR section of the ELC mapping extent, which follows valley bottoms along much of its length, has the highest percentage of wetlands mapped. The largest concentrations of wetlands within this section occur near the junction of Ballarat Creek and the Yukon River and the junctions of Barker Creek and Maisy May Creek with the Stewart River. Within the Coffee Area, mapped wetlands occur primarily at low elevations near Coffee Camp and the junction of Coffee Creek and the Yukon River. The area (ha) of wetland ecosystems (ecosites) mapped in the ELC survey extent is summarized by structural stage in Table 2-6.

The most common wetland mapped is the poor treed fen, ecosite F1 (Spruce -Willow - Labrador tea – Sedge), which occurs on level-to-gentle wet valley bottoms, underlain by permafrost (Photo 2-5). The spruce canopy is typically stunted and willows, Labrador tea, sedges and cottongrass are abundant in the understory. Ecosite F1 is often mapped in complex with ecosite F3 (Birch - Leatherleaf – Sedge), a shrub-dominated fen ecosystem. Alaska birch, leatherleaf, and Labrador tea dominate the shrub layer over a sedge and cottongrass dominated herb layer. Willow-dominated riparian swamps (ecosite S1) are commonly mapped along creeks and sideslope drainages throughout the ELC mapping extent. Riparian marshes (ecosites M1 and M2) and commonly associated Willow-Reedgrass swamps (ecosite S2) are very infrequent.

Floodplains ecosystems are also important wildlife features. Floodplains are found in the Coffee Area and NAR section of the ELC survey extent, and make up 3.5% and 4.6% of the area mapped, respectively (Table 2-7). Floodplains occur along the Yukon and Stewart Rivers, as well as along smaller watercourses including Coffee Creek, Ballarat Creek and Maisy May Creek. Floodplains often occur adjacent to wetlands on the broader valley bottoms within the ELC mapping extent. These ecosystems are typically nutrient rich due to repeat flood events and/or ground water access. As a result, the canopy is often more productive than other forested ecosites within the ELC mapping extent.

Within the Coffee Area there are both highbench and midbench floodplains mapped along the banks of the Yukon River and Coffee Creek. These ecosystems occur in close proximity, with some transitional mixedwood stands also present. Highbench floodplains (ecosite 40) are the most commonly mapped floodplain ecosystem in the NAR section. Most of the highbench floodplains in the ELC mapping extent are mapped as mature (Structural stage 7) or old (Structural stage 8). Midbench floodplains in the NAR section are primarily mapped as young stands (Structural stage 6; Photo 2-6), whereas mature midbench stands dominate the Coffee Area. Lowbench floodplains (ecosite 43) are infrequent in the ELC mapping extent and only occur along the banks of the Yukon and Stewart Rivers. There were no field plots completed in this ecosite due to its limited distribution. Lowbench floodplain communities experience frequent flooding and as a result are maintained in a shrub-dominated structural stage with little herb, moss or lichen layer development.

Grasslands within the ELC mapping extent are restricted to moderate-to-steep, dry, southerly slopes and account for less than 2% of the overall area (Table 2-4). Grasslands are very dry during the summer and because of their position on steep slopes, are susceptible to erosion. Species commonly present include purple reedgrass (*Calamagrostis purpurascens*), pasture sage (*Artemisia frigida*), prickly rose, kinnikinnick, and spikelike goldenrod (*Solidago simplex*). Grasslands support a diversity of plant species, including species typically not found in other ecosystems. Within the Coffee area, grass and herb dominated communities occur along the warm, steep slopes above Coffee Creek, near the Yukon River. Grasslands, either grass or ground shrub dominated, occur in the NAR section along southerly slopes above Barker, Ballarat and Maisy May Creeks, as well as the Stewart and Yukon River.

Table 2-6. Wetland ecosystems mapped within the ELC mapping extent of the Coffee Project

Ecosite	Ecosite Name	Wetland Class	Structural Stage	Total Area (ha)	Area (ha) in ELC survey extent		
					Coffee	NAR	Casino
F1	Spruce -Willow - Labrador tea - Sedge	Fen	4	213	44.4 (0.39%)	162.2 (1.70%)	6.2 (0.21%)
			5	3	2.8 (0.02%)	-	-
			6	1	1.2 (0.01%)	-	-
			7	52	36.6 (0.32%)	15.8 (0.17%)	-
			8	1	-	1.2 (0.01%)	-
			Total	270	85.1 (0.36%)	179.1 (1.88%)	6.2 (0.21%)
F2	Spruce - Red bearberry – Brown moss	Fen	4	15	-	14.9 (0.16%)	-
			6	11	-	10.8 (0.11%)	-
			7	28	-	27.6 (0.29%)	-
			8	12	-	12.2 (0.13%)	-
			Total	66	-	65.5 (0.69%)	-
F3	Birch - Leatherleaf - Sedge	Fen	4	194	134.7 (1.18%)	58.6 (0.61%)	1.0 (0.04%)
S1	Willow - Horsetail	Swamp	4	222	107.9 (0.95%)	98.5 (1.03%)	15.8 (0.54%)
S2	Willow - Reedgrass	Swamp	4	12	0.3 (0.00%)	11.6 (0.12%)	-
M1	Beaked sedge	Marsh	3	6	2.4 (0.02%)	3.7 (0.04%)	-
M2	Horsetail - Sedge	Marsh	3	1	-	0.9 (0.01%)	-
M	Marsh	Marsh	3	12	3.7 (0.03%)	8.1 (0.08%)	-
			Total	783	334.1 (2.93%)	426.0 (4.47%)	23.0 (0.79%)

Table 2-7. Riparian ecosystems mapped within the the ELC mapping extent of the Coffee Project

Ecosite	Ecosite Name	Wetland type	Structural Stage	Total Area (ha)	Area (ha) in Section		
					Coffee	NAR	Casino
40	White Spruce - Horsetail	Highbench Floodplain	4	71	64.9 (0.57%)	5.9 (0.06%)	-
			6	41	2.7 (0.02%)	38.4 (0.40%)	-
			7	120	33.8 (0.30%)	86.4 (0.91%)	-
			8	182	77.2 (0.68%)	104.4 (1.01%)	-
			Total	414	178.6 (1.57%)	235.1 (2.47%)	-
41	Balsam poplar - Rose - Horsetail	Midbench Floodplain	4	2.5	-	2.5 (0.03%)	-
			5	62	55.1 (0.48%)	6.7 (0.07%)	
			6	151	10.8 (0.09%)	139.9 (1.47%)	-
			7	132	122.4 (1.07%)	10.0 (0.10%)	-
			Total	347	188.3 (1.65%)	159.1 (1.67%)	-
43	Tall shrub Balsam poplar - Willow	Lowbench Floodplain	4	71	26.9 (0.24%)	44.2 (0.46%)	-
			Total	832	393.7 (3.46%)	438.3 (4.60%)	-

Photo 2-5. Boreal ecosite F1 (Spruce – Willow – Labrador tea – Sedge)

Photo 2-6. Boreal ecosite 41 (Balsam Poplar – Rose – Horsetail)

2.2.2 BROAD ECOSYSTEM MAPPING AND FIELD RESULTS

The majority of the BEM was completed via orthophoto interpretation. Plot data in this portion of the LSA, aside from wetland plot data, is minimal (36 vegetation plots).

The 2015 wetland-specific surveys completed a total of 16 Ground Plots and 69 Visual Plots. Ground plots were concentrated in areas where wetlands were more common, including the junctions of Ballarat Creek with the Yukon River, and the junctions of Barker Creek and Maisy May Creek with the Stewart River. Most of the plots completed along the length of the NAR from the Klondike Highway to Maisy May Creek were Visual Plots. It was noted during the survey that much of the area surrounding the access road had been previously disturbed by placer mining; therefore brief Visual Plots were sufficient to document vegetation communities. Thirty-five ELC plots occur within the BEM extent (Figures 2-2 to 2-4) due to uncertainty in the final spatial separation of the ELC and BEM areas during field sampling. ELC plots, including wetland plots, within and nearby the BEM extent were used wherever possible during polygon attribution. An overview of the wetland and ELC field plot locations, colour coded by survey type, are presented in Figures 2-2 to 2-7.

A total of 1,623 BEM polygons were mapped within the 36,581.8 ha BEM extent, for an average polygon size of approximately 23 ha (within the 20–25 ha target range for this project; Figures 2-2 to 2-7).

The area (ha) of each broad ecosystem mapped within the BEM extent is summarized in Table 2-8. The majority of the NAR occurs in the Boreal Bioclimate zone, therefore ecosystems occurring at higher elevations, such as the subalpine shrub category, account for less than 5% of the BEM extent. The BEM extent does not overlap the Alpine Bioclimate zone.

The most commonly mapped BEM category was the Upland/Closed Canopy Forest (UpF). Much of the BEM extent centers on north-south oriented valley bottoms, therefore closed canopy forests along neutral lower-to-upper valley side slopes are very common. The Upland/Closed Forest category was most commonly mapped in the shrub-dominated structural stage (33.5%) which is reflective of the wildfire regime in the area. Young (Structural stage 6) and Mature (Structural stage 7) stands are also common, constituting 32.3% and 27.1% of the category mapped, respectively. A fairly even mix of coniferous-dominated, deciduous-dominated and mixedwood canopies are mapped in the BEM extent (Table 2-9). Stunted Coniferous Forests (Stcs) are commonly mapped on northerly lower-to-middle slopes and along moderate-to-gentle toe-slopes across a range of aspects. These areas are underlain by near-surface permafrost and typically have imperfect-to-poor drainage.

Placer mining (Pm) is the second most abundant broad category mapped along the NAR and predominantly occurs in shrub or sparsely vegetated structural stages (Table 2-8). The vast majority of the valley bottoms along the NAR have been previously or are currently being placer mined. The placer mining process typically involves the removal of natural vegetation and surface soils — many placer mined areas within the BEM extent are in the process of revegetating but these plant communities do not yet resemble natural communities. Willows and grasses tend to dominate re-vegetating placer mined areas (Photo 2-7, Photo 2-8).

Wetlands, which are of special interest in the BEM extent, are also infrequent and account for less than 3% of the area mapped. Poor treed fens are the most commonly mapped wetland (1% of the mapping extent; Table 2-10). Poor treed fens are found on broad, level valley bottoms on primarily fluvial deposits. Black and white spruce dominate the often stunted canopy and Labrador tea, lowbush cranberry, sedges and brown mosses are commonly found in the understory. These sites have poor to very poor drainage and are underlain by near surface permafrost. Shrub dominated fens, with birch, leatherleaf, sedges and cottongrass sometimes occur in complex with poor treed fens. Within the BEM extent fens are found primarily along Ballarat Creek, Barker Creek, Maisy May Creek, and along the Stewart River, near the Maisy May Creek junction. Marshes account for 0.14% of the area mapped and can be found along the Stewart River, near the Maisy May Creek junction (Photo 2-9). Marshes are dominated by sedges and/or horsetails, have a fluctuating water table and are typically rich in nutrients. Low elevation, sideslope, shrubby riparian areas, which are classified as willow-dominated swamps, account for 1% of the area mapped. These ecosystems occur throughout the mapping extent along creeks and sideslope drainages, are dominated by willows and commonly contain horsetails in the understory.

Table 2-8. Broad ecosystems mapped in the BEM extent for the Coffee Project

BEM code	Category	Description and typical situation	Total Area (ha)	Fire affected area (ha)	Area (ha) and % of BEM
Fe	Felsenmeer	veneer of angular rock fragments/boulders fields over sloping ground, typically upper-slope to crest position; vegetative cover is typically <40% and includes dwarf shrubs, graminoids, mosses and lichens	4	0.0	4.2 (0.01%)
Ss	Subalpine / Alpine Shrub	shrub-dominated communities of the Subalpine and Alpine Bioclimate Zones; dwarf-shrub to medium stature shrubs occur; common species include scrub birch, Labrador tea, bog blueberry, lowbush cranberry, crowberry and mountain avens	375	10.1	364.6 (0.1%)
Fcs	High Elevation Sparse Coniferous Forest	sparse coniferous forest near Subalpine / Boreal Bioclimate boundaries, spruce-dominated; shrub cover typically high	1897	531.8	1365.6 (3.73%)
HSr	High Elevation Shrubby Riparian	shrub-dominated riparian communities of the Subalpine Bioclimate zone; willow-dominated communities typically found along edges of sideslope creeks and receiving areas	4	0.0	4.3 (0.01%)
Gg	Grassland	an area dominated by grasses, however sedges, dwarf shrubs and low-to-medium stature shrubs can also occur; tree cover is <10%; typically maintained in a grassy state due to environmental conditions	388	12.0	376.0 (1.02%)
UpF	Upland / Closed Canopy Forest	upland, closed canopy forests; canopy can be deciduous, coniferous or mixedwood	34507	8810.8	25,695.7 (70.24%)
RF	Riparian Forest	riparian forests, including mid and high bench floodplains, as well as forested communities found along sideslope creeks and receiving areas; canopy can be deciduous, coniferous or mixedwood	1898	476.4	1421.8 (3.89%)
Stcs	Stunted Coniferous Forest	moist to wet stunted spruce forests, underlain by permafrost; imperfect to poor drainage; Labrador tea, bog blueberry, lowbush cranberry and sedges common in the understory; primarily middle to toe slopes	3143	378.5	2764.8 (7.56%)
LSr	Low Elevation Shrubby Riparian	shrub-dominated riparian communities of the Boreal Bioclimate zones, including low-bench floodplains located along rivers and willow-dominated communities located along creeks and sideslope drainages	418	32.2	385.4 (1.05%)

Table 2-8. Broad ecosystems mapped in the BEM extent for the Coffee Project

BEM code	Category	Description and typical situation	Total Area (ha)	Fire affected area (ha)	Area (ha) and % of BEM
B	Bog	a peat-covered or peat- filled area, generally with a high water table dominated by mosses, especially Sphagnum. Most bogs in the Yukon are underlain by permafrost, therefore there is little standing water except in ponds	4	0.0	4.5 (0.01%)
F	Fen	a peatland with moderate to well-developed sedge, grass, and reed peat material formed in eutrophic environments. Water is at or near the fen surface. Includes poor fens which are transitional between bogs and fens. A poor fen is intermediate in nutrient regime and is similar floristically to fens and bogs. sedges, brown mosses and peat mosses compose much of the organic matter	648	45.7	602.1 (1.65%)
S	Swamp	shrubby mineral wetland on sites with a flowing or fluctuating, semi-permanent, near-surface watertable. Swamp tend to have abundant available nutrients from groundwater and can have surface standing water	40	0.0	40.5 (0.11%)
M	Marsh	Periodically inundated mineral ground characterized by a vegetation cover of emergent rushes, sedges, grasses and aquatic plants, and typically occupying the shoreline of a pond, lake or river	51	0.0	51.0 (0.14%)
Pd	Pond	small body of water greater than 2 m deep, but not large enough to be classified as a lake	5	-	5.4 (0.01%)
Ri	River	watercourse formed when water flows between continuous, definable banks; the flow may be intermittent or perennial	141	-	141.1 (0.39%)
Gb	Gravel bar	an elongated landform generated by waves and currents and usually running parallel to the shore.	10	-	10.3 (0.03%)
Ro	Rock	gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover	18	-	17.8 (0.05%)
Rt	Talus	active and inactive talus and scree; typically have a low herb layer cover because of mobile substrates or lack of soil	2	-	2.1 (0.01%)
Rd	Road surface	an area cleared and compacted for the purpose of transporting goods and services by vehicles	53	-	52.7 (0.14%)

Table 2-8. Broad ecosystems mapped in the BEM extent for the Coffee Project

BEM code	Category	Description and typical situation	Total Area (ha)	Fire affected area (ha)	Area (ha) and % of BEM
Pm	Placer mining	an area cleared and disturbed through placer mine activity, includes unvegetated areas and areas undergoing revegetation. Willows and grasses, along with young birch trees, commonly dominate revegetating areas.	3115	6.9	3108.1 (8.49%)
Ppd	Placer mining pond	a pond created through placer mining activity	164	-	163.6 (0.45%)
		Total	46886	10,304.4 (28.17%)	36,581.8 (100.00%)

Table 2-9. Upland/closed canopy forests and riparian forests, separated by canopy composition, mapped in the BEM extent of the Coffee Project

	Area (ha) and % of BEM	
Canopy Composition	**Upland / Closed Canopy Forest**	**Riparian Forest**
Coniferous	6752.8 (18.46%)	414.8 (1.13%)
Deciduous	4873.9 (13.32%)	261.3 (0.71%)
Mixedwood	5302.9 (14.50%)	227.0 (0.62%)
Shrub-dominated	8766.1 (23.96%)	518.7 (1.42%)
Total	25695.7	1421.8

Table 2-10. The area of wetland ecosystems mapped in the BEM extent, separated by structural stage

BEM code	Wetland Class	Structural Stage	Area (ha) and % of BEM
F	Fen	4	499.7 (1.37%)
		6	21.2 (0.06%)
		7	66.6 (0.18%)
		8	14.6 (0.04%)
		Total	602.1 (1.65%)
B	Bog	4	4.5 (0.01%)
M	Marsh	3	51.0 (0.14%)
S	Swamp	4	40.5 (0.11%)
LSr	Low-elevation Shrubby Riparian	4	385.4 (1.05%)
		Total	1083.5 (2.96%)

Photo 2-7. Area mapped as placer mining along the NAR.

Photo 2-8. Placer pond along the NAR.

Photo 2-9. Marsh and adjacent willow-dominated swamp along the Stewart River, near the Maisy May Creek junction.

3 RARE PLANTS

Prior to field work, a desktop review of vegetation species expected to be present in the LSA was conducted for species of potential conservation concern listed under the federal *Species at Risk Act* (SARA; Government of Canada 2014), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; Government of Canada 2015), and the Yukon Conservation Data Centre (Yukon CDC).

Records of known rare plants in the Project area were compiled from the Yukon CDC for Track-list and Watch-list species with reference to west-central Yukon (Yukon CDC 2014, 2015, 2016) and from known locations in the Flora of the Yukon Territory (Cody 2000). Records indicated that several rare plant species are known to occur or have the potential to occur within the LSA, based on the likelihood that similar habitat may be found. A list of potential rare plants was compiled and used during 2014, 2015, and 2016 field surveys to stratify the LSA for targeted searching in areas of high rare plant potential. The compiled list of potential rare plants can be found in Appendix D.

3.1 SURVEY METHODOLOGY

The desktop review was supported by field investigations from July 5–9, 2014, August 12–18, 2015, and July 4-8, 2016. Priority areas surveyed for rare plants were defined by areas of high rare plant potential within 500 m of the proposed Project footprint (Figure 3-1). These priority areas make up the rare plant survey extent.

A helicopter overview flight was scheduled for the first day of the survey in both 2014 and 2015 to narrow the search effort to priority areas that included dry, south-facing slopes, open deciduous, coniferous and mixedwood forests, subalpine and alpine areas, scree and rock outcrops, wetlands, riparian corridors, and disturbed sites. Within these habitat types, multiple sites were targeted for rare plant surveys to ensure adequate coverage of representative vegetation.

Follow-up rare plant surveys were conducted in 2016 to improve coverage of the LSA, specifically the Coffee Area within the boundary of the proposed heap leach and Ballarat Creek. Priority areas included collapsed pingos and tors where the potential for rare plant habitat exists. A pingo is an ice covered landform associated with previously glaciated areas in arctic and subarctic regions (Parks Canada 2012). When the ice core of a pingo melts it can collapse leaving a doughnut-shaped ring of raised vegetation enclosing a small round lake. In addition to pingos and tors, open deciduous and mixedwood forests were surveyed to a greater extent along the south-facing slopes of the lower Ballarat Creek, north of the Yukon River to improve overall coverage of the rare plant survey.

The rare plant survey methodology was based on the Alberta Native Plant Council (ANPC) Guidelines for Rare Plant Surveys in AB (ANPC 2012); this is a standardized methodology commonly practiced across western Canada. Within targeted areas, field crews searched for species of potential concern. When a rare plant was found the following information was collected:

- Species name with reference to the Flora of North America (FNA 2014, 2015, 2016);
- Location, elevation and estimated area of extent (documented by GPS);
- Site information including general site conditions, habitat type, and associated species;
- Population estimate and phenology at the time of observation;
- Photographs of the species and surrounding habitat; and
- Voucher specimen collected for verification where appropriate.

Following fieldwork, samples collected for verification were sent to Bruce Bennett (Coordinator, Yukon CDC) for identification confirmations. Voucher specimens were deposited at the B.A. Bennett (B.A.B.Y.) herbarium in Whitehorse, Yukon.

3.2 RESULTS

No COSEWIC or SARA-listed plant species were observed during rare plant surveys; however, populations of four territorial Watch-list plant species were found (Figure 3-2). Species on the Watch-list require more information on their distribution and abundance before a conservation status can be determined, but could be determined to be threatened or endangered in the Yukon (Yukon CDC 2016). Watch-list plant species found during rare plant surveys included:

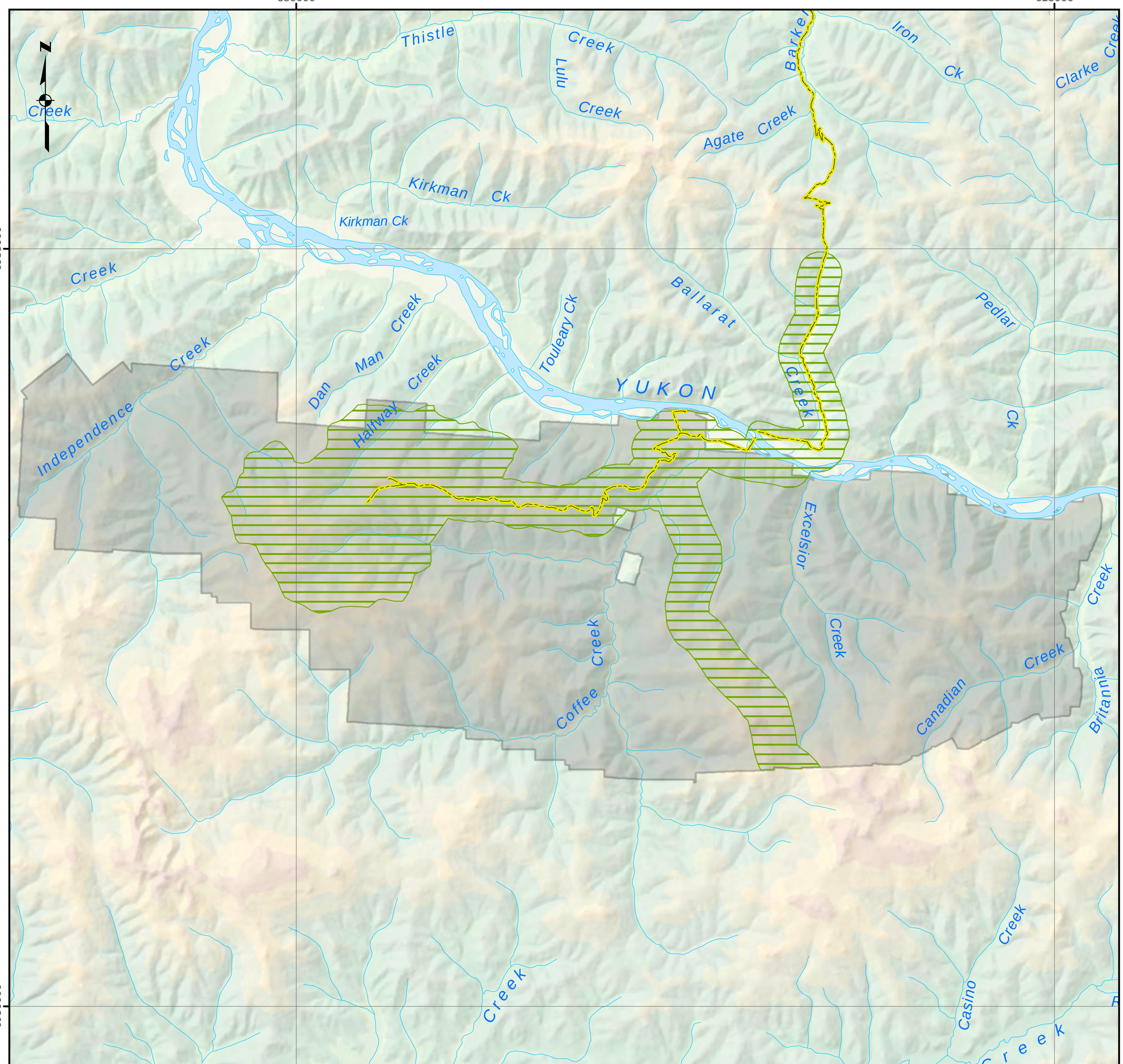
- Coffee Creek scorpionweed (*Phacelia mollis*; S3S4; Photo 3-1);
- Spotted lady's-slipper (*Cypripedium guttatum*; S2S3; Photo 3-2);
- Small enchanter's nightshade (*Circaea alpina* ssp. *alpina*; S2S3; Photo 3-3); and
- Dry-spike sedge (*Carex siccata*; S2S3; Photo 3-4).

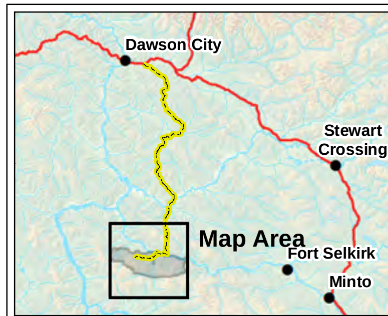
Additionally, a small population of hairy wood rush (*Luzula rufescens*) was found within the survey extent. At the time of the survey, hairy wood rush was included on the territorial Watch-list; however, following the survey, the status of hairy wood rush was re-assessed by the Yukon CDC and down-listed from S2S3 (May be at Risk) to S4 (Apparently Secure) and removed from the Watch-list.

Locations, habitat, distribution, and abundance information for the four Watch-list plant findings are presented in Table 3-1. Definitions of global, national, and territorial/provincial status ranks for these species are provided in Table 3-2, along with their status in bordering jurisdictions to provide additional context. Rare plant information sheets are provided in Section 3.2.1.

Global and national status rankings were obtained from NatureServe Explorer (NatureServe 2016). Alaska rankings were from the Alaska Natural Heritage Program (ANHP; ANHP 2016). Subnational status rankings were obtained from their respective Conservation Data Centres in BC and AB (ESRD 2016, BC CDC 2016), the Northwest Territories Department of Environment and Natural Resources (Working Group on General Status of NWT Species 2011), and Yukon (Yukon CDC 2014, 2015, 2016).

The Yukon status rankings are determined based on standardized methods developed by NatureServe Canada. Factors for evaluating species are categorized into three broad groups including threats, trends, and rarity. Additional factors taken into account when evaluating a species of conservation concern are range extent, area of occupancy, number of occurrences, viability of occurrences, environmental specificity, and intrinsic value (Master *et al*. 2012). As the knowledge of species' occurrences in Yukon increases over time, these rankings will be revised to reflect their true status (B. Bennett, pers. comm., October 2014).





Legend

- Settlement/Community
- Highway
- Proposed Route
- Survey Extent
- Coffee Property

FIGURE: 3 - 1

Baseline rare plant survey extent

Data Sources
1:250,000/1,000,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Disclaimer
This document is not an official land survey and the spatial data presented is subject to change.

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KM

Map Reference Scale: 1:250,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MS	Checked: MP/AM	Date: 1/6/2017

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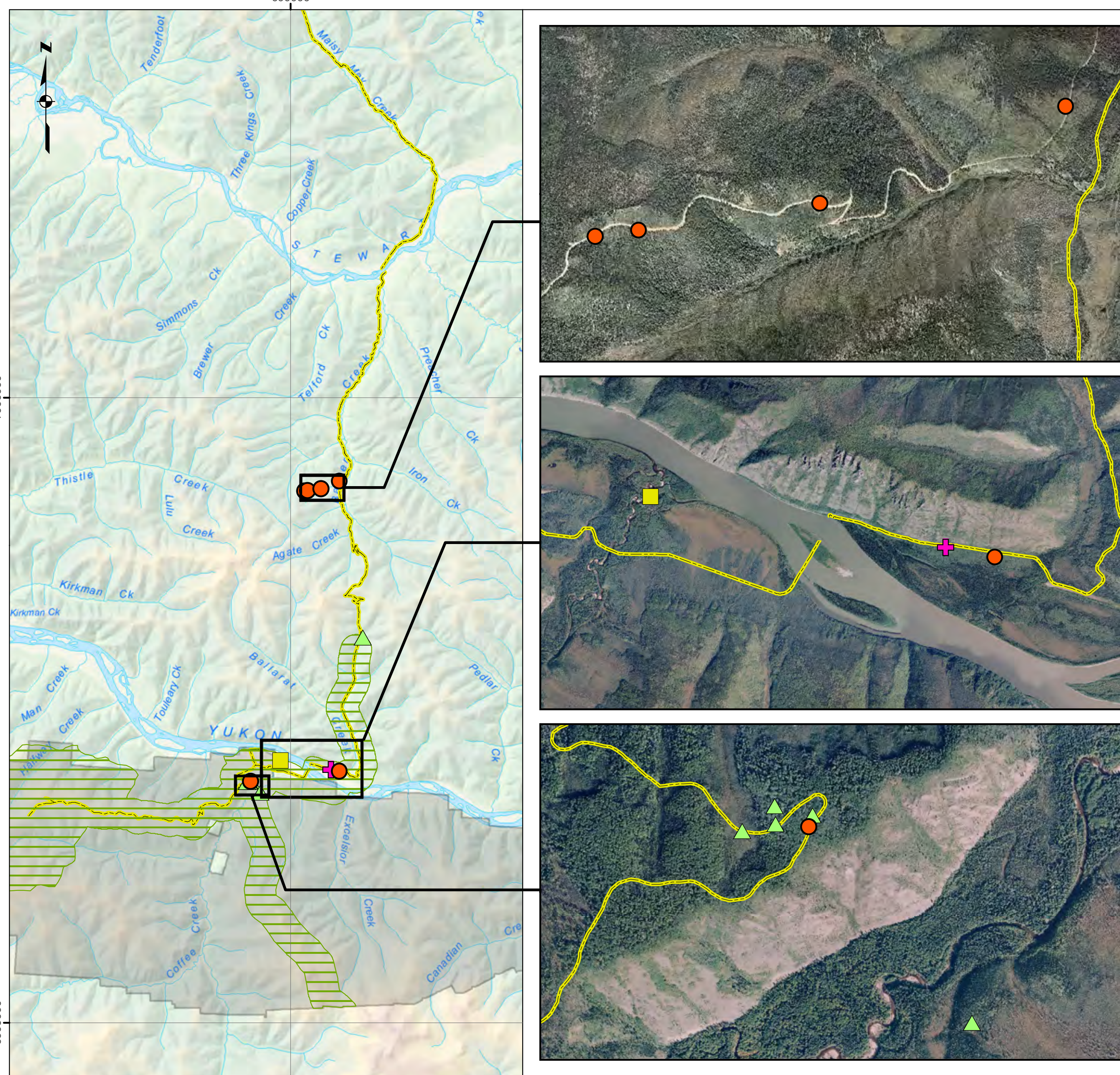

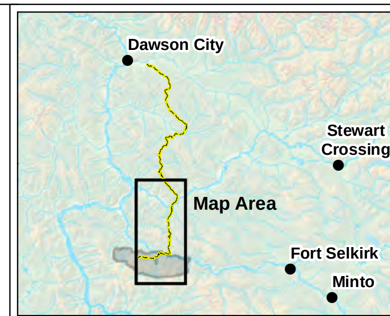

Legend

- Settlement/Community
- Highway
- Proposed Route
- Coffee Property
- Survey Extent

Species Name

- *Circaea alpina ssp. alpina*
- *Cypripedium guttatum*
- *Phacelia mollis*
- *Carex siccata*

FIGURE: 3 - 2

Baseline rare plant survey and incidental findings

Data Sources
1:250,000/1,000,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Disclaimer
This document is not an official land survey and the spatial data presented is subject to change.

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Map Reference Scale: 1:350,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

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Table 3-1. Rare plants results from 2014-2016 surveys, Coffee Project

Site[1]	Species Name	Common Name	Abundance and Distribution	Location Description	Habitat	Lat[2]	Long[2]	Elev (m)	Year
PM-1	*Phacelia mollis*	Coffee Creek scorpionweed	2 individuals in a patch	Approximately 325 m southeast of Coffee Creek	Open mixed forest on a moderate slope with well-developed dwarf shrub/forb understory and tufted grasses	62.88919	-139.0712	424	2014
PM-2	*Phacelia mollis*	Coffee Creek scorpionweed	1 patch of 4 individuals	North side of existing Java Road near km two	Disturbed, exposed soil along the edge of adjacent forest	62.8957	-139.0873	454	2015
PM-3	*Phacelia mollis*	Coffee Creek scorpionweed	1 individual	North side of existing Java Road near km two	Disturbed, exposed soil along the edge of adjacent forest	62.8959	-139.0849	462	2015
PM-4	*Phacelia mollis*	Coffee Creek scorpionweed	6 individuals scattered linearly for 80 m	Approximately 10 m northeast of existing Java Road near km two	Open trembling aspen forest on moderate slope with well-developed dwarf shrub/forb understory and some leaf litter	62.8965	-139.0849	493	2015
PM-5	*Phacelia mollis*	Coffee Creek scorpionweed	24 individuals scattered linearly for 100 m	West side of existing Java Road near km three	Disturbed, exposed soil with few associated forb species	62.89615	-139.0822	618	2014
PM-6	*Phacelia mollis*	Coffee Creek scorpionweed	17 individuals in a patch of approximately 20 m radius	Approximately 160 m east of tributary along proposed new road between Barker and Ballarat	Open trembling aspen (*Populus tremuloides*) forest on a moderate slope with dwarf shrub/forb understory and high leaf litter	62.97654	-138.9358	708	2015
CG-1	*Cypripedium guttatum*	Spotted lady's-slipper	4 scattered patches each with 11 individuals	East side of Java Road near kilometer three	Edge of open, trembling aspen forest at the crest of the bank with well-developed dwarf shrub/forb understory and tufted grasses	62.89578	-139.0825	620	2014
CG-2	*Cypripedium guttatum*	Spotted lady's-slipper	Approximately 3,000 individuals in several patches within a larger patch about 1,318 m^2	Base of south-facing slope above the lower Ballarat Creek floodplain, north of the Yukon River	Open trembling aspen forest on moderate slope with well-developed shrub/forb understory and tufted grasses	62.9002	-138.9706	427	2015

Table 3-1. Rare plants results from 2014-2016 surveys, Coffee Project

Site[1]	Species Name	Common Name	Abundance and Distribution	Location Description	Habitat	Lat[2]	Long[2]	Elev (m)	Year
CG-3	*Cypripedium guttatum*	Spotted lady's-slipper	Approximately 1,000 individuals in several patches within a larger patch about 8,800 m^2	North side of alternate road alignment along Thistle Mountain	Open trembling aspen forest on moderate slope with well-developed dwarf shrub/forb understory and tufted grasses	63.0616	-139.0035	870	2015
CG-4	*Cypripedium guttatum*	Spotted lady's-slipper	5 scattered patches of approximately 100 individuals (4 patches north of road, 1 patch south of road)	Along alternate road alignment over Thistle Mountain along edge of cutbank	Open trembling aspen dominated forest on moderate slope with well-developed dwarf shrub/forb understory and tufted grasses	63.0618	-138.9994	844	2015
CG-5	*Cypripedium guttatum*	Spotted lady's-slipper	1 patch of 21 individuals down slope about 10 m	South side of alternate road alignment along Thistle Mountain	Open trembling aspen dominated forest on moderate slope with well-developed dwarf shrub/forb understory and tufted grasses	63.0627	-138.9824	715	2015
CG-6	*Cypripedium guttatum*	Spotted lady's-slipper	Approximately 3,000 individuals total; 1,000 individuals west of the road and 2,000 individuals east of the road	West and east side of proposed road along Barker on edge of cut bank; area	Open trembling aspen forest on moderate slope with well-developed dwarf shrub/forb understory and tufted grasses	63.0665	-138.9591	650	2015
CA-1	*Circaea alpina* ssp. *alpina*	Small enchanter's nightshade	1 patch, 1m^2 of approximately 150 individuals	East of Coffee Creek, north of the proposed winter road	Transitional habitat between upland and sedge meadow, moist shaded area below deciduous shrubbery	62.9072	-139.0445	393	2015
CS-1	*Carex siccata*	Dry-spike sedge	Approximately 100 individuals scattered within a somewhat linear patch about 600 m in length	Base of south-facing slope above the lower Ballarat Creek floodplain, north of the Yukon River	Open trembling aspen to mixedwood forest on flat to moderate slope with well-developed shrub/forb understory	62.9013	-138.9812	447	2016

[1] Site number is unique to the species name proceeded by a number. For example, "CA" = *Circaea alpina* ssp. *alpina* and "1" = site 1.

[2] Location represents the individuals within a patch closest to the proposed Project footprint. Where a species was found along existing or proposed road, the location represents the individual in the center of the patch, closest to the road.

Table 3-2. Global, national and subnational rankings of rare plants found in the survey extent for the Coffee Project, 2014-2016

Species Name	Common Name	Yukon[1]	British Columbia[1]	Alberta[1]	Northwest Territories[1]	Alaska[1]	National (Canada)[2]	Global[3]
Phacelia mollis	Coffee Creek scorpionweed	S3S4	n/a	n/a	n/a	S3	N2N3	G3
Cypripedium guttatum	Spotted lady's-slipper	S2S3	n/a	n/a	SNR	S4	N4	G5
Circaea alpina ssp. *alpina*	Small enchanter's nightshade	S2S3	SNR	S4	SNR	SNR	N5	G5
Carex siccata	Dry-spike sedge	S2S3	S5	S5	S5	SNR	N5	G5

Source: AKEPIC (2016); BC CDC (2016); ESRD (2016); NatureServe (2016); Working Group on General Status of NWT Species (2011); Yukon CDC (2016).

Notes (Nature Serve 2016):

[1] S = Provincial/Territorial/State ranks follow the NatureServe Subnational Conservation Status Rank; S3S4 = a range rank to denote a status with some uncertainty between Vulnerable and Apparently Secure; S2S3 = a range rank to denote a status with some uncertainty between Imperiled and Vulnerable; SNR = Unranked; S3 = Vulnerable; S4 = Apparently Secure.

[2] N = NatureServe National Conservation Status Rank; N2N3 = a range rank to denote a status with uncertainty between Imperiled and Vulnerable; N4 = Apparently Secure; N5 = Secure.

[3] G = NatureServe Global Conservation Status Rank; G3 = Vulnerable; G5 = Secure.

3.2.1 RARE PLANT INFORMATION SHEETS

Species information sheets were produced for the four Watch-list plants observed during the survey and include the species name, conservation status rank, geographic distribution, botanical description, typical habitat and the location where it was found within the LSA. Descriptions were adapted from FNA (2014, 2015, 2016), Flora of the Yukon Territory (Cody 2000), Central Yukon Species Inventory Project (CYSIP 2014), Illustrated Flora of British Columbia (Douglas *et al*. 1998–2002), and from personal communications with Bruce Bennett and Randi Mulder of the Yukon CDC in Whitehorse, Yukon.

Cypripedium guttatum (Spotted lady's-slipper)

Family: Orchidaceae — Orchid Family

Spotted lady's-slipper is ranked S2S3 in Yukon and is on the Yukon CDC Watch-list (Table 3-2). The conservation rank for this species is not fully known. Information suggests it is either Imperiled or Vulnerable in Yukon. This species is known from western and northern Yukon, as well as Asia, AK and the Northwest Territories (NWT).

Spotted lady's-slipper is a perennial forb from rhizomatous roots with slender hairy stems 10–20 cm high. There are two leaves at the base of the stem with strong parallel veins. The flower is solitary at the top of the stem, white in color with obvious purple-pink blotches. Fruit capsules are large, hairy to sticky and strongly drooping.

Typical habitat for this species is open deciduous and mixed forest, tundra, meadows and scree at elevations between 0-800 m (FNA 2014 and 2015). Its occurrence in these habitats may be restricted to calcareous soils (Cody 2000).

Photo 3-1. *Cypripedium gluttatum* (Spotted lady's slipper)

Traditional/ Medicinal Use: Traditional and medicinal use of spotted-lady's slipper by Yukon First Nations is not well known. This is likely due to the inherent rarity of the species and its limited abundance and distribution on the landscape. Other lady's-slipper species within the same genus have been used throughout North America to treat insomnia, anxiety, fever, headache, tremors, delirium, irritable bowel syndrome and to ease the pain of menstruation and childbirth from sedative and antispasmodic properties in the roots (Wilson 2007).

Survey Results: Spotted lady's-slipper was found at a six sites within the LSA (Table 3-1); three of which are located along previous road alignments that that are no longer being considered. All sites where spotted lady's-slipper was found were south-facing, moderate slopes, dominated by open trembling aspen forest with a few scattered white spruce, with the exception of one north-facing slope. The ground cover was comprised of kinnikinnick with scattered prickly rose, soapberry, highbush cranberry (*Viburnum edule*), purple reedgrass, false toadflax, and fireweed (*Chamerion angustifolium*). Most spotted lady's-slipper occurrences were in the late stage of fruiting at the time of the survey, due to senescence. All sites where spotted lady's-slipper was found hosted plants which appeared healthy with no obvious sign of stress.

***Phacelia mollis* (Coffee Creek scorpionweed)**

Family: Hydrophyllaceae — Waterleaf Family

Coffee Creek scorpionweed is endemic to central and western Yukon and AK. It is ranked as S3S4 in Yukon and is on the Yukon CDC Watch- list (Table 3-2). The conservation rank for this species is not fully known. Information suggests it is either Vulnerable or Apparently Secure in Yukon. This species has been previously found from a number of sites in west-central Yukon.

Photo 3-2. *Phacelia mollis* (Coffee Creek scorpionweed)

Coffee Creek scorpionweed is a perennial forb from a taproot with soft hairy stems 15–50 cm high. Leaves are mostly basal with some stem leaves and are lobed with soft hairs giving it a gray-green appearance. The flowering head is showy consisting of a few to numerous blue, lavender, or yellowish-white flowers that have long purple stamens (male reproductive parts) that project out of each flower, topped by a yellow-orange anther that contains pollen.

Typical habitat for this species is steep, dry open slopes, rocky bluffs and disturbed sites, such as river flats, mine tailings and along dirt roads (CYSIP 2014). Due to a limited global range, this endemic species has a limited abundance and distribution.

Traditional/ Medicinal Use: Traditional and medicinal use of Coffee Creek scorpionweed by North American First Nations, including Yukon First Nations could not be found in the literature.

Survey Results: Coffee Creek scorpionweed was found at six sites within the LSA (Table 3-1). Habitat for three of these sites was open trembling aspen forest, while the other three were found in disturbed sites with exposed soil. All sites where Coffee Creek scorpionweed were found hosted plants which appeared healthy with no obvious sign of stress.

Circaea alpina ssp. *alpina* (Small enchanter's-nightshade)

Family: Onagraceae — Evening Primrose Family

Small enchanter's-nightshade is ranked S2S3 in Yukon and is on the Yukon CDC Watch-list (Table 3-2). The conservation rank for this species is not fully known. Information suggests it is either Imperiled or Vulnerable in Yukon. This species is also known from Eurasia and is circumpolar from Newfoundland to AK, south to the northern United States. Prior to the Coffee Project rare plant survey, small enchanter's-nightshade in Yukon was only known from southeast Yukon, near a hot spring.

Photo 3-3. *Circaea alpina* ssp. *alpina* (Small enchanter's-nighshade)

Small enchanter's-nightshade is a delicate perennial forb from a tuberous rhizome. Stems are erect, simple or branched and smooth, to 15 cm tall. Leaves are pale green, born on long stems and orientated opposite to the main stem. Leaves are heart to egg shaped, 2–5 cm long with shallow undulating margins or weak teeth. Flowers are white to pale pink, 8–12 and small in size, born on stalks extending upward and congregating at the top of the plant. Petals are two, deeply notched with two reflexed sepals. The flower head is subtended by two reflexed linear bracts. Fruits are one seeded, round to pear-shaped capsules, about 2 mm long and covered with soft hooked hairs.

Typical habitat for this species is moist woodland, thickets, and sometimes shores of rivers, lakes, and edges of swamps (Cody 2000; EOL 2015).

Traditional/ Medicinal Use: Traditional and medicinal use of Small enchanter's-nightshade by North American First Nations has been documented, although not known to Yukon First Nations, possibly due to its low abundance on the landscape (Cody 2000; Trelawny 2003).

Survey Results: Small enchanter's-nightshade was only found at one site within the LSA (Site CA-1; Table 3-1). The habitat was transitional between upland and sedge meadow. The area was moist and partially shaded with some cover of grey alder (*Alnus incana*), northern bush willow (*Salix arbusculoides*), red-osier dogwood (*Cornus stolonifera*), prickly rose and highbush cranberry. Associated ground cover species included bunchberry (*Cornus canadensis*), northern bedstraw (*Galium boreale*), field horsetail (*Equisetum arvense*), common red raspberry (*Rubus idaeus*) and purple reedgrass. The population consisted of approximately 150 individuals within 1 m². All plants had completed flowering and were in fruit at the time of the survey. Despite the small size of this occurrence, all plants appeared healthy with no obvious sign of stress.

Carex siccata (Dry-spike sedge)

Family: Cyperaceae — Sedge Family

Dry-spike sedge is ranked S2S3 in Yukon and is on the Yukon CDC Watch-list (Table 3-2). The conservation rank for this species is not fully known. Information suggests it is either Imperiled or Vulnerable in Yukon. This species is known from North America including Yukon, NWT, BC east to southwestern Quebec, and the northern United States with occurrences documented as far south as Arizona and New Mexico.

Photo 3-4. *Carex siccata* (Dry-spike sedge) (photo copied from eflora BC and taken by J. Fenneman)

Dry-spike sedge is a perennial grass-like plant that grows from a long, cordlike underground rhizome. Stems are leafy and erect, standing 25-40 cm tall. Leaves are flat, pale green, 1.5-3.0 mm wide and taper to a tip. Flowering heads exceed the leaves with 4-8 unstalked spikes clustered at the top of the stem. These cylindrical heads measure approximately 2-3 cm with both male and female flowers; male flowers are typically towards the tip of the head. Female fruits (perigynia) are yellow to red-brown in color, egg-shaped, 3-6 mm long, and 1.5-2 mm wide with winged margins and a bidentate beak at the tip. Two feathery stigmas can be seen sticking out of the bidentate beak. The fruits are covered with a yellow or red-brown scale with 3 nerves that are green on the margin. The fruit itself is a small lens-shaped achene.

Typical habitat for dry-spike sedge includes a variety of upland sites such as open, sandy pine forests and savannas, dry mixed woodlands, prairies, sand dunes, sandy fields, sunny rocky outcrops, alpine or subalpine meadows. (Cody 2000; FNA 2016).

Traditional/ Medicinal Use: Traditional and medicinal use of dry-spike sedge by North American First Nations is not well documented; however, the family that dry-spike sedge belongs to referred to as Cyperaceae is recognized as having economic, ethnobotanical, and horticultural importance (Simpson and Inglis 2001).

Survey Results: Dry-spike sedge was only found at one site within the LSA (Site CS-1; Table 3-1). The site was flat to moderately sloped, dominated by open trembling aspen with a few scattered white spruce. The understory was well-developed including kinnikinnick, fireweed, purple reedgrass, and bastard toadflax with scattered soapberry, prickly rose, and highbush cranberry.

3.3 DISCUSSION

Populations of four Yukon Watch-list plant species, Coffee Creek scorpionweed, spotted lady's-slipper, small enchanter's-nightshade, and dry-spike sedge were found during rare plant surveys in the LSA, 2014-2016. Species on the Watch-list require more information on their distribution and abundance before a conservation status can be determined, but could be determined to be threatened or endangered in the Yukon (Yukon CDC 2016). The conservation concern for these species throughout their range in Yukon may eventually be higher or lower; however, the exact level of conservation concern cannot be ascertained at this time, due to the large size of the Yukon Territory and current level of search effort. Consequently, current knowledge on the conservation status of Watch-list species found during rare plant surveys is uncertain. New locations discovered in the LSA are important additions to the database for the species and are useful for the Yukon CDC to reassess status rankings, as well as assist land managers and planners to avoid uncertainties.

Cypripedium guttatum (Spotted lady's-slipper) – S2S3

Spotted lady's slipper has been found at several sites within central and northern Yukon; however, there is some uncertainty whether this species is considered Imperiled or Vulnerable in Yukon, as indicated by its range rank S2S3 (Table 3-2).

Spotted lady's slipper was found at one site in 2014 and five additional sites in 2015 (Table 3-1). Spotted lady's slipper was found on south facing, moderate slopes of similar species composition, with the exception of one site where a small population was found growing along the existing road on a south facing slope. Spotted lady's slipper was never found in habitats where Labrador tea occurred. Species composition appeared to be important in predicting the presence or absence of spotted lady's slipper. Preferred habitat consisted of open, trembling aspen forest and few scattered white spruce. The understory was consistently dominated by kinnikinnick with varying amounts of purple reedgrass, false toadflax and other shrubs. The combination of species composition, slope and aspect appear to play a strong role in dictating suitable habitat for spotted lady's slipper. Although it was not part of the survey, it is likely that soil type and soil moisture also play a strong role in supporting suitable habitat for this species.

Phacelia mollis (Coffee Creek scorpionweed) – S3S4

Coffee Creek scorpionweed has been found at a number of locations in western Yukon; however the global population of this species is found only within Yukon and AK. Within Yukon, there is some uncertainty whether it is considered Vulnerable or Apparently Secure, due to the range in habitats where it has been found (Table 3-2).

Coffee Creek scorpionweed was found growing in undisturbed open, trembling aspen to mixed forest, as well as disturbed exposed soil areas (Table 3-1). It appears that Coffee Creek scorpionweed is able to colonize disturbed areas and may be present at other human-disturbed sites in the LSA. Given its range in habitat type preference and potential to exist in previously disturbed areas, the concern for Coffee Creek scorpionweed is low. Discussions with the Yukon CDC reveal that Coffee Creek scorpionweed has recently been found at a number of sites (including disturbed habitats), which may potentially lead to a down-listing for this species (B. Bennett, pers. comm., October 2015).

Circaea alpina spp. *alpina* (Small enchanter's-nightshade) – S2S3

Previous to rare plant surveys in 2015, small enchanter's-nightshade was only known from southeast Yukon. Although this species is circumpolar from Newfoundland to AK and in the northern United States, several Data Centres have not declared a conservation status. In BC, the conservation status is S4 (Apparently Secure); suggesting Yukon is currently at the edge of this species range. This may also be due to lack of suitable habitat in Yukon. These predictions are supported by the Yukon conservation status of S2S3 for small enchanter's-nightshade, indicating some uncertainty whether it is considered Imperiled or Vulnerable in Yukon (Table 3-2).

Small enchanter's-nightshade was found growing in transitional habitat between upland and sedge meadow (Table 3-1). Partial shading from a canopy of deciduous shrubs created a moist, cool microclimate and apparent suitable habitat for this species. This finding represents a large and impressive range extension for this species, not previously known in western Yukon.

Carex siccata (Dry-spike sedge) – S2S3

Dry-spike sedge is listed as S2S3 in Yukon which indicates uncertainty whether this species is considered Imperiled or Vulnerable in the territory (Table 3-2). Prior to rare plant surveys in 2016, dry-spike sedge was only known from four sites in Yukon. This finding represents the fifth collection in Yukon and provides important information on the overall distribution of dry-spike sedge at present. Discussions with the Yukon CDC determined that all known sites in Yukon are widely distributed and threats to occurrences are currently low. This finding also represents the most northern site of dry-spike sedge known in Yukon.

Dry-spike sedge is typically found in open, sandy pine forests, but a variety of upland sites have also been recorded including open, dry willow dominated, black spruce, white spruce, and aspen forests (Table 3-1).

4 EXOTIC AND INVASIVE PLANT SPECIES

Prior to field work, a desktop review of plant species expected to be present in the LSA was conducted for invasive plants recognized by Environment Yukon and the Yukon Invasive Species Council (YISC). Invasive plants are those that are introduced by humans to areas outside of their natural range of distribution, where they become established and disperse, generating a negative impact on the economy, environment and social realms (IUCN 2011). In Canada, most invasive plants are not native to North America, originating from Europe or Asia. Although there are a few native plant species that have invasive properties, this survey focused on non-native (exotic) invasive plant species.

Records of known invasive plants in the Yukon are stored on the Alaska Exotic Plants Information Clearinghouse (AKEPIC) data portal, as part of the ANHP, University of Alaska Anchorage. AKEPIC is a database and mapping application that provides geospatial information for invasive plants in AK and neighboring Canadian Territories (AKEPIC 2015). Database search efforts and consultation with Environment Yukon and YISC found no known records of invasive plants in the LSA. This is likely due to a lack of survey effort and subsequent reporting. To the best of our knowledge, the Coffee Project invasive plant survey was the first of its kind in the LSA, providing important baseline information for the Yukon Territory.

4.1 METHODOLOGY

4.1.1 SURVEY METHODOLOGY

The desktop review was supported by field investigations from August 8-18, 2015 and July 7, 2016 in areas of high invasive plant potential (i.e., areas with existing human disturbance) within the LSA. At the time of the invasive plant survey in 2015, the final alignment of the NAR was unknown; therefore, surveys were conducted for all road alignment options. The exotic and invasive plant survey extent was defined by existing roads from the North Klondike highway south to Coffee Camp and the Coffee airstrip (Figure 4-1 and Figure 4-2). In 2016, the survey area was extended to include the Java Road from the Coffee airstrip to the proposed mine site, including all existing disturbed areas around the proposed mine site (Figure 4-2). Areas where rank 1 (high priority) invasive plant species were found in 2015 were revisited in 2016 with onsite Environmental Monitors to monitor populations and, where possible, remove infestations.

Areas of high invasive plant potential included previously disturbed sites, mainly roadsides, pullouts, junctions, and cleared areas. Active and inactive placer mining along the NAR and previous human habitation at Coffee Camp increased the likelihood of invasive plants by creating a dispersal vector for seed transport and species introductions. The greatest potential for occurrence of invasive plants was based on the likelihood and/or proximity to previous disturbance. A list of invasive plant species reported in Yukon and assessed by Environment Yukon was used to target search effort during field surveys (available online at:

http://www.env.gov.yk.ca/animals-habitat/documents/yukon_invasive_plants_by_invasiveness.pdf).

The invasive plant survey methodology was based on the 2006 Survey of Exotic Plants along NWT Highways (Oldham 2007) where a combination of roadside driving and walking surveys were used to investigate the survey extent for potential invasive plants. Roads were driven in a truck at slow speed, averaging 20 km/hr or in a UTV, allowing surveyors to assess either side of the road. The survey along the northern portion of the survey extent was conducted by dividing the entire length of driveable road within the survey extent into 2 km transects with a start and end waypoint. Within each 2 km segment, invasive plants were observed and recorded, including a density distribution class for each species from 1–8, adapted from the BC Ministry of Forests Weed Density Distribution Classes (Luttmerding *et al.* 1990; Appendix E). For the purposes of this survey, class nine was excluded to simplify and highlight key differences observed in invasive plants. Walking surveys were conducted at pullouts, junctions, cleared areas, along the current Coffee airstrip and around Coffee Camp. Walking surveys recorded density distribution for invasive plants at point locations and for non-linear areas. Where it was feasible, invasive plants found at point locations were hand pulled, bagged and incinerated on site.

In Yukon, invasive plants range in degree of invasiveness from a rank of 1 (high priority) to 7 (least concern; Environment Yukon 2012). All invasive plant species were recorded during field surveys with a focus on rank 1 invasive plants for management purposes. When an invasive plant was found the following information was collected:

- Species name with reference to the FNA (2015 and 2016);
- Yukon invasiveness rank (1-7);
- Location (with a handheld GPS);
- Habitat type (road, pullout, clearing etc.);
- Density distribution based on the BC Ministry of Forests Weed Density Distribution Classes;
- Phenology (i.e., leafing, flowering, fruiting etc.);
- Vigor (perceived plant growth at the time of survey i.e., poor, good, excellent);
- Photographs of the species and surrounding habitat; and
- Voucher specimen collected for verification where appropriate.

Samples collected for verification were sent to Bruce Bennett (Coordinator, Yukon CDC) for identification confirmation. Voucher specimens were deposited at the B.A.B.Y. herbarium in Whitehorse, Yukon.

4.1.2 MAPPING METHODOLOGY

Invasive plants found during field surveys were mapped separately for the northern and southern portion of the survey extent. The northern portion of the survey extent includes existing road disturbances north of the Yukon River and the southern portion includes existing road disturbances south of the Yukon River. Invasive plants were mapped according to 1) abundance and 2) density distribution. In the northern portion, density distribution maps were generated by a Kernel Density Analysis using ModelBuilder in ArcGIS for

Desktop. This analysis derives kernel densities from point data by species using density distribution class data collected in the field (Appendix E) to illustrate the location of invasive plants (i.e., distribution) and the number of plants (i.e., density) for each infestation. This method generates values for all locations within a defined search area, known as the radius or bandwidth. Resulting densities were categorized as either Nil, Moderate or High. Density distributions considered Nil were classes 1 to 3; Moderate was classes 4 to 6; High was classes 7 and 8. In the southern portion of the survey extent, invasive plant maps are based on point location information.

4.2 RESULTS

Populations of 18 invasive plant species were found during field surveys (Table 4-1). These 18 species ranged from invasiveness rank 1 (high priority, highly invasive) to rank 7 (least concern, species for which both native and introduced populations exist). For a complete list of all invasive plant locations found during field surveys refer to Appendix F.

At the time of the survey, plant phenology was flowering to fruiting and vigor was good to excellent. Habitats within the survey extent where invasive plants were found included roadsides, pullouts, junctions and previously disturbed areas. Invasive plant abundance was greater in the northern portion of the survey extent compared to the south. Abundance of rank 1 invasive plants in the northern portion of the survey extent is provided in Figure 4-1. In the southern portion of the survey extent, abundance of rank 1 invasive plants is provided in Figure 4-2. Abundance of all other invasive plants in the northern and southern portions of the survey extent is provided in Appendix F.

Rank 1 invasive plant species are of the highest concern for management and are the focus of the following sections. During field surveys, five rank 1 invasive plants were found including:

- Smooth brome (*Bromus inermis*) – northern portion (Figure 4-3); southern portion (Figure 4- 4)
- Narrow-leaved hawksbeard (*Crepis tectorum*) – northern portion (Figure 4-5); southern portion (Figure 4-6)
- Perennial sow-thistle (*Sonchus arvensis* ssp. *uliginosus*) – southern portion only (Figure 4-7)
- White sweetclover (*Melilotus albus*) – northern portion (Figure 4-8); southern portion (Figure 4-9)
- Yellow sweetclover (*Melilotus officinalis*) – northern portion only (Figure 4-10)

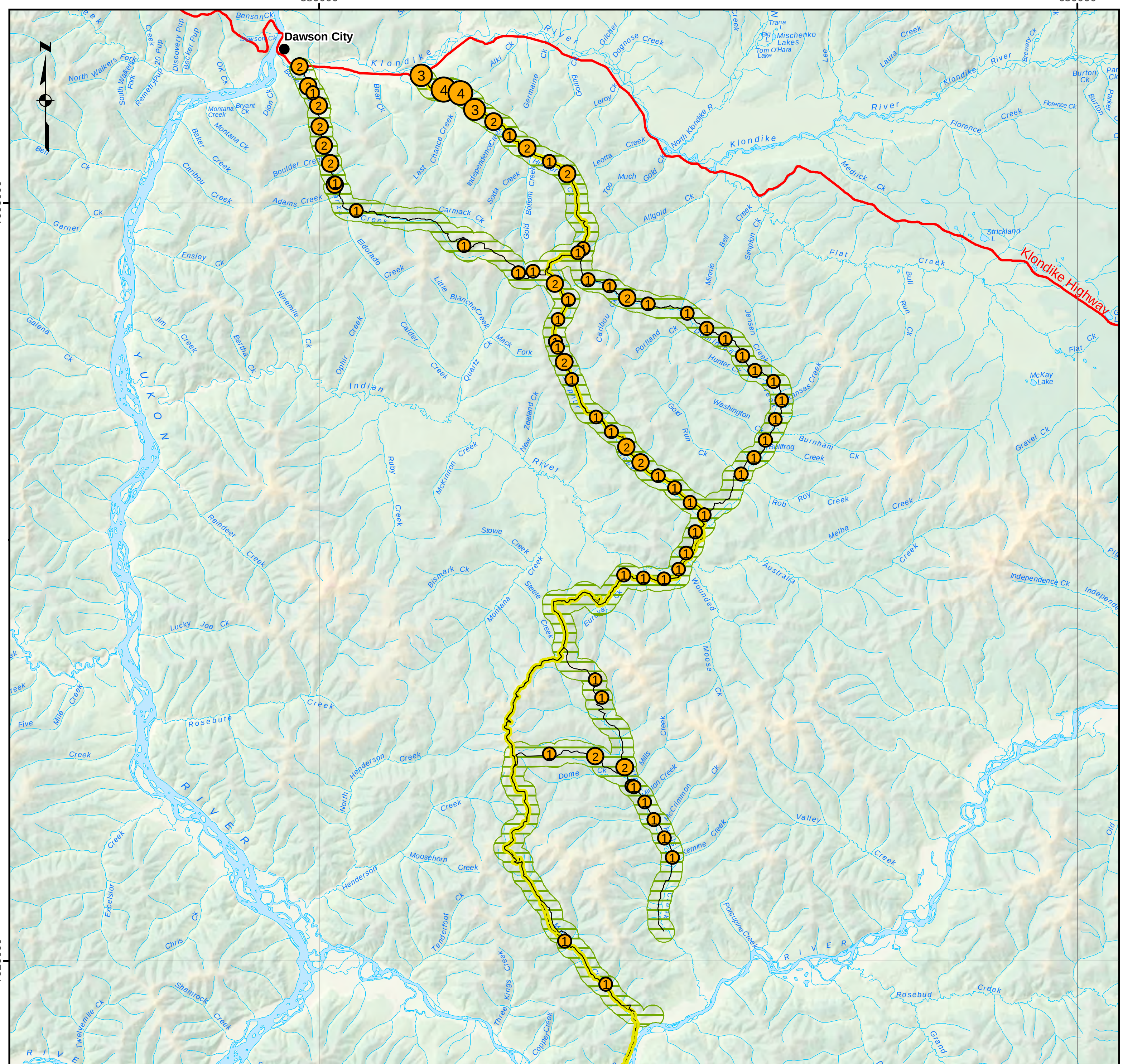
Invasive plant information sheets for rank 1 species found in the survey extent are provided in Section 4.2.1.

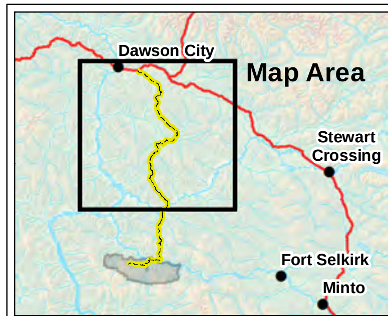
Table 4-1. Invasive plants found in the Coffee Project survey extent, 2015 and 2016

Invasiveness Rank[1]	Species Name[2]	Common Name	Habitat	General Location		
				Northern Portion	Southern Portion	
				Existing Roads	Java Road/ Proposed Mine Site	Coffee Property
1	*Bromus inermis*	Smooth brome	Clearing	√	--	√
1	*Crepis tectorum*	Narrow-leaved hawksbeard	Roadside, Clearing	√	√	√
1	*Melilotus albus*	White sweetclover	Roadside, Clearing	√	--	--
1	*Melilotus officinalis*	Yellow sweetclover	Roadside	√	--	--
1	*Sonchus arvensis* ssp. *uliginosus*	Perennial sow-thistle	Clearing	--	--	√
2	*Caragana arborescens*	Siberian peashrub	Planted	√	--	--
2	*Elymus repens*	Creeping wild rye	Clearing	√	--	--
2	*Poa pratensis*	Kentucky bluegrass	Roadside, Clearing	√	--	--
2	*Silene vulgaris*	Bladder campion	Clearing	√	--	--
2	*Taraxacum officinale*	Common dandelion	Roadside, Clearing	√	--	√
2	*Trifolium hybridum*	Alsike clover	Roadside	√	--	--
2	*Trifolium pretense*	Red clover	Roadside	√	--	--
3	*Capsella bursa-pastoris*	Shepherd's purse	Roadside, Clearing	√	--	√
3	*Chenopodium album*	Lamb's-quarter	Roadside	√	--	--
3	*Heracleum sibiricum*	Siberian cow-parsnip	Roadside	√	--	--
3	*Matricaria discoidea*	Pineapple weed	Clearing	--		√
3	*Thlaspi arvense*	Field pennycress	Roadside	√	--	--
5	*Plantago major*	Great plantain	Roadside, Clearing	√	--	√
7	*Sinapis alba*	White mustard	Planted	--	--	√

[1] Yukon invasiveness rank (Environment Yukon 2012).

[2] Primary reference flora used was the online version of the FNA (2015 and 2016).





Legend

- Settlement/Community
- Highway
- Existing Access
- Proposed Route
- Survey Extent

Rank 1 Invasive Species Location (by abundance)

- 1 Species
- 2 Species
- 3 Species
- 4 Species

FIGURE: 4 - 1

Abundance of rank 1 invasive plants in the northern portion of the survey extent

Data Sources
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Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Rank 1 invasive species: Bromus inermis, Crepus tectorum, Melilotus albus and Melilotus officinale.

Disclaimer
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0 5 10 15
KM

Map Reference Scale: 1:500,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

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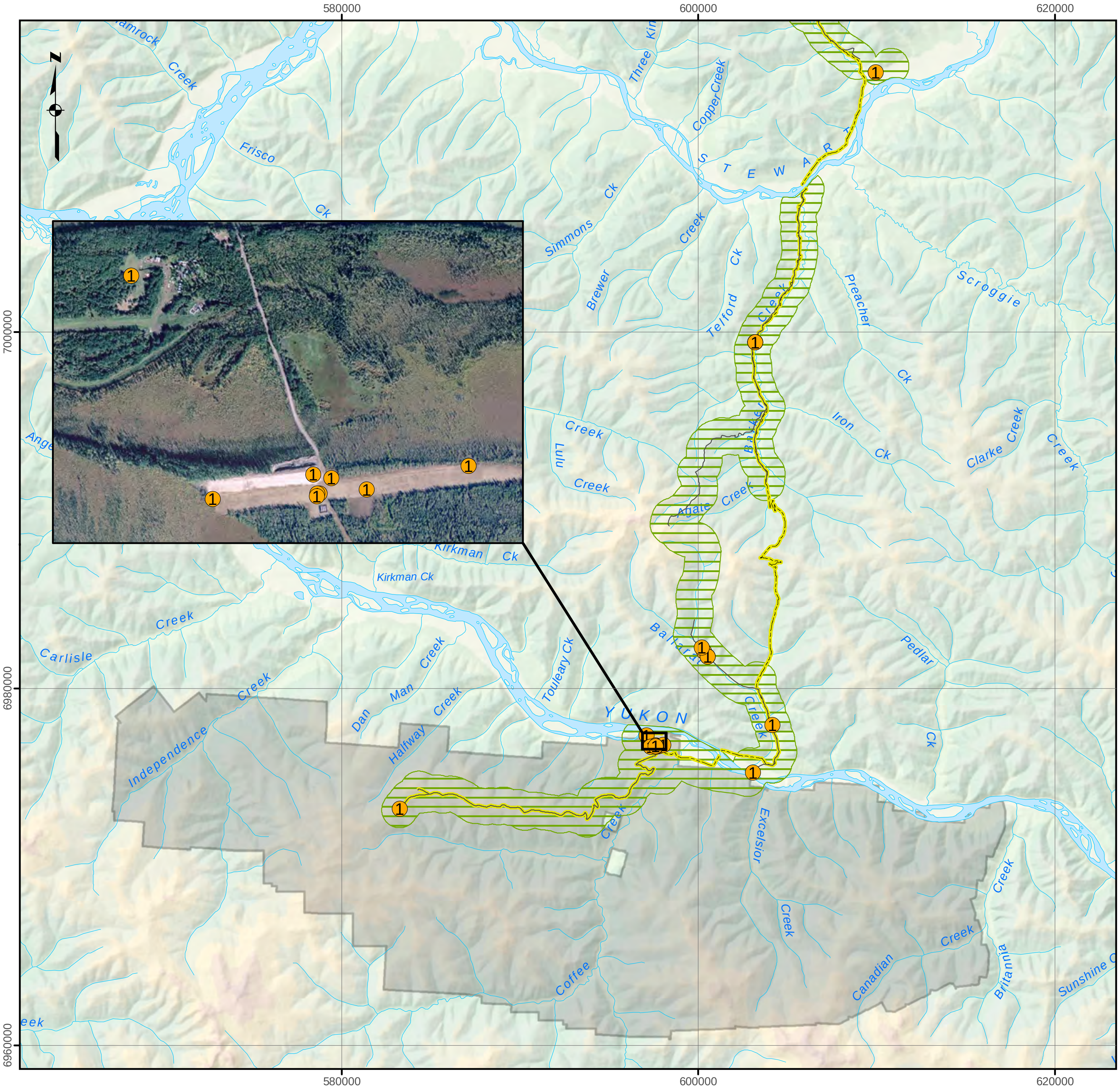

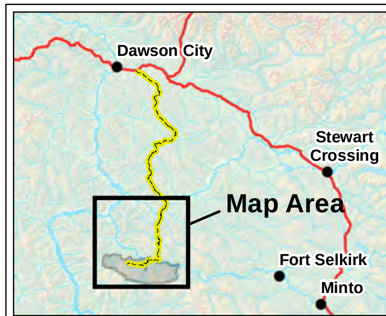

Legend

- ● Settlement/Community
- (1) Rank 1 Invasive Species Locations
- Proposed Route
- Existing Access
- Survey Extent
- Coffee Property

FIGURE: 4 - 2

Abundance of rank 1 invasive plants in the southern portion of the survey extent

Data Sources
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Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Rank 1 invasive species: Bromus inermis, Crepus tectorum, Melilotus albus and Melilotus officinale.

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Map Reference Scale: 1:300,000 (Printed at 8.5 x 11)
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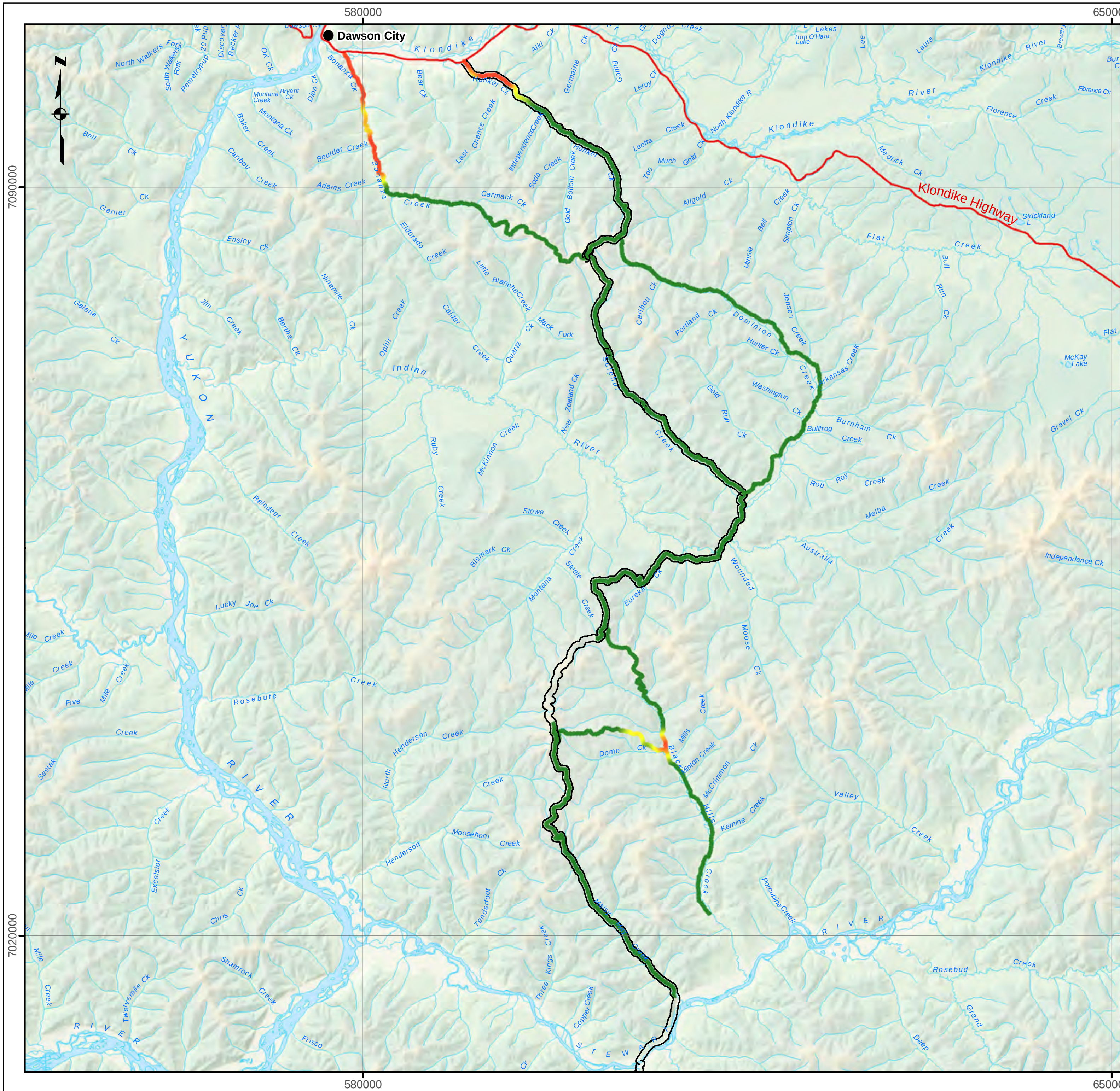

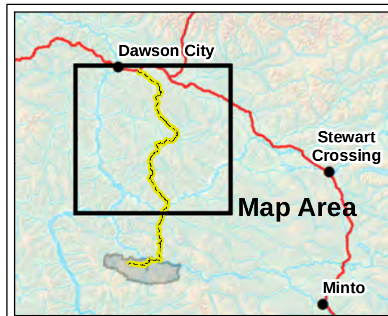

Legend

- Settlement/Community
- Highway
- Proposed Route

Density of smooth brome (Bromus inermis)

High

Moderate

Nil

FIGURE: 4 - 3

Density distribution of smooth brome, northern portion of the survey extent

Data Sources
1:250,000/1,000,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

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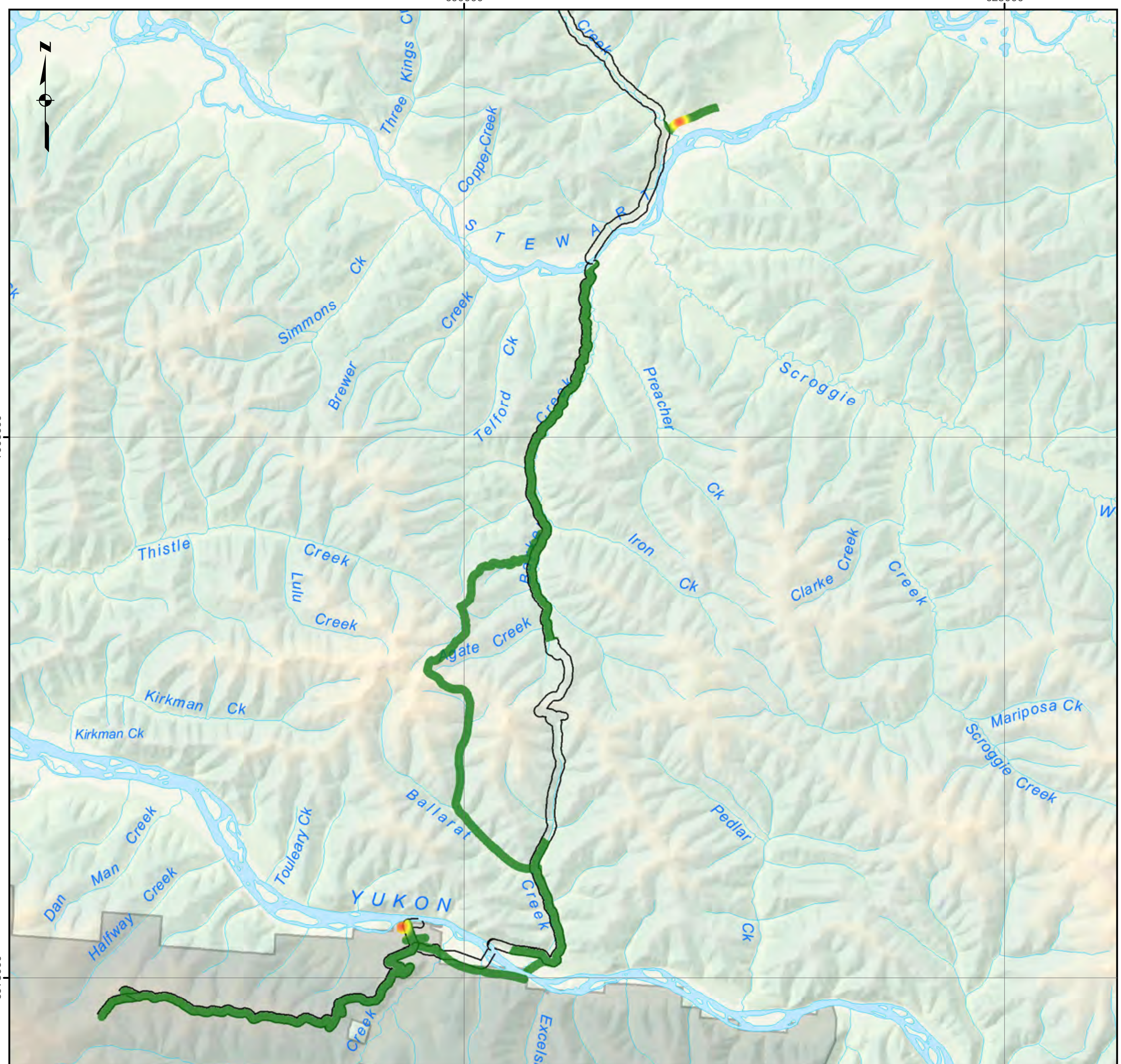

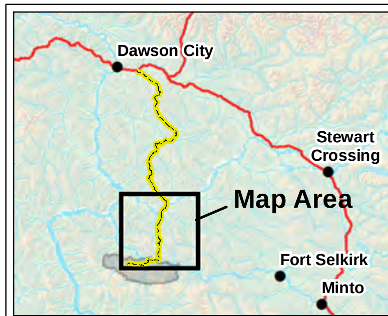

Legend

- Settlement/Community
- Proposed Route
- Coffee Property

Density of smooth brome (Bromus inermis)

High
Moderate
Nil

FIGURE: 4 - 4

Density distribution of smooth brome, southern portion of the survey extent

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Map Reference Scale: 1:250,000 (Printed at 8.5 x 11)
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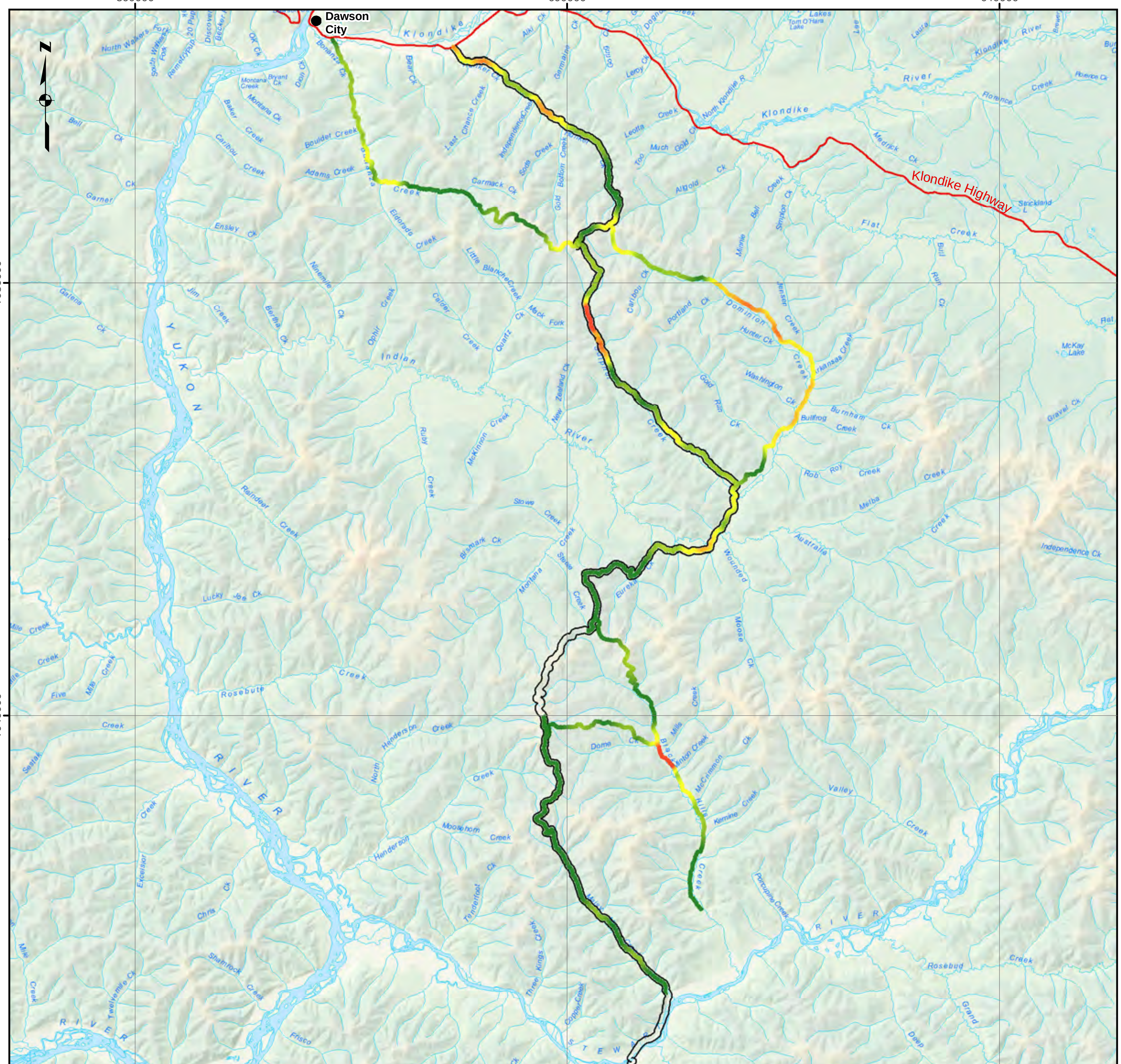

Legend

- Settlement/Community
- Highway
- Proposed Route
- Coffee Property

Density of narrow-leaved hawksbeard (Crepis tectorum)

High

Moderate

Nil

FIGURE: 4 - 5

Density distribution of narrow-leaved hawksbeard, northern portion of the survey extent

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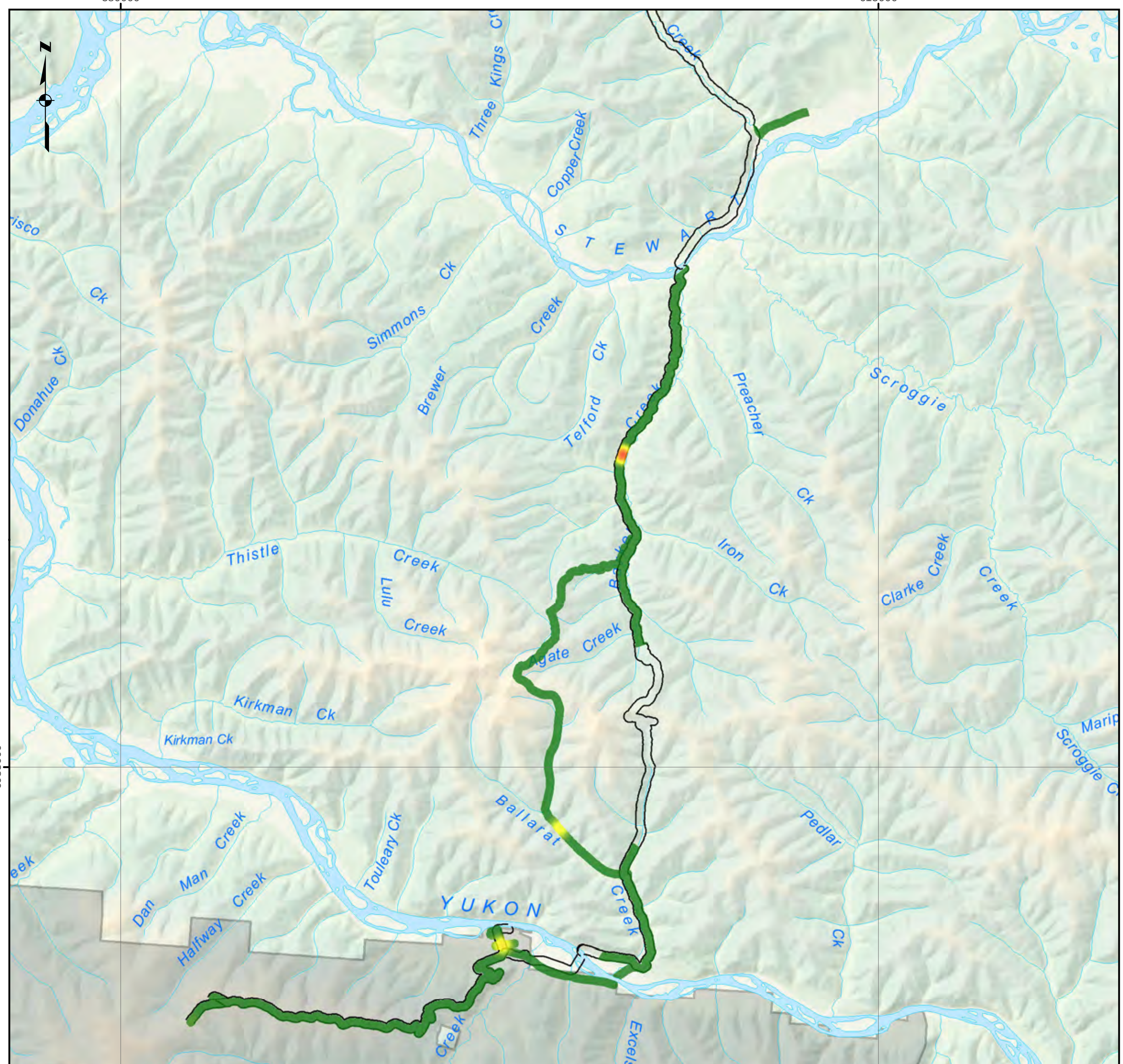

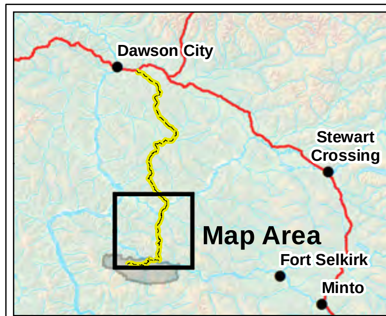

Legend

- ● Settlement/Community
- Proposed Route

Density of narrow-leaved hawksbeard (Crepis tectorum)

High

Moderate

Nil

FIGURE: 4 - 6

Density distribution of narrow-leaved hawksbeard, southern portion of the survey extent

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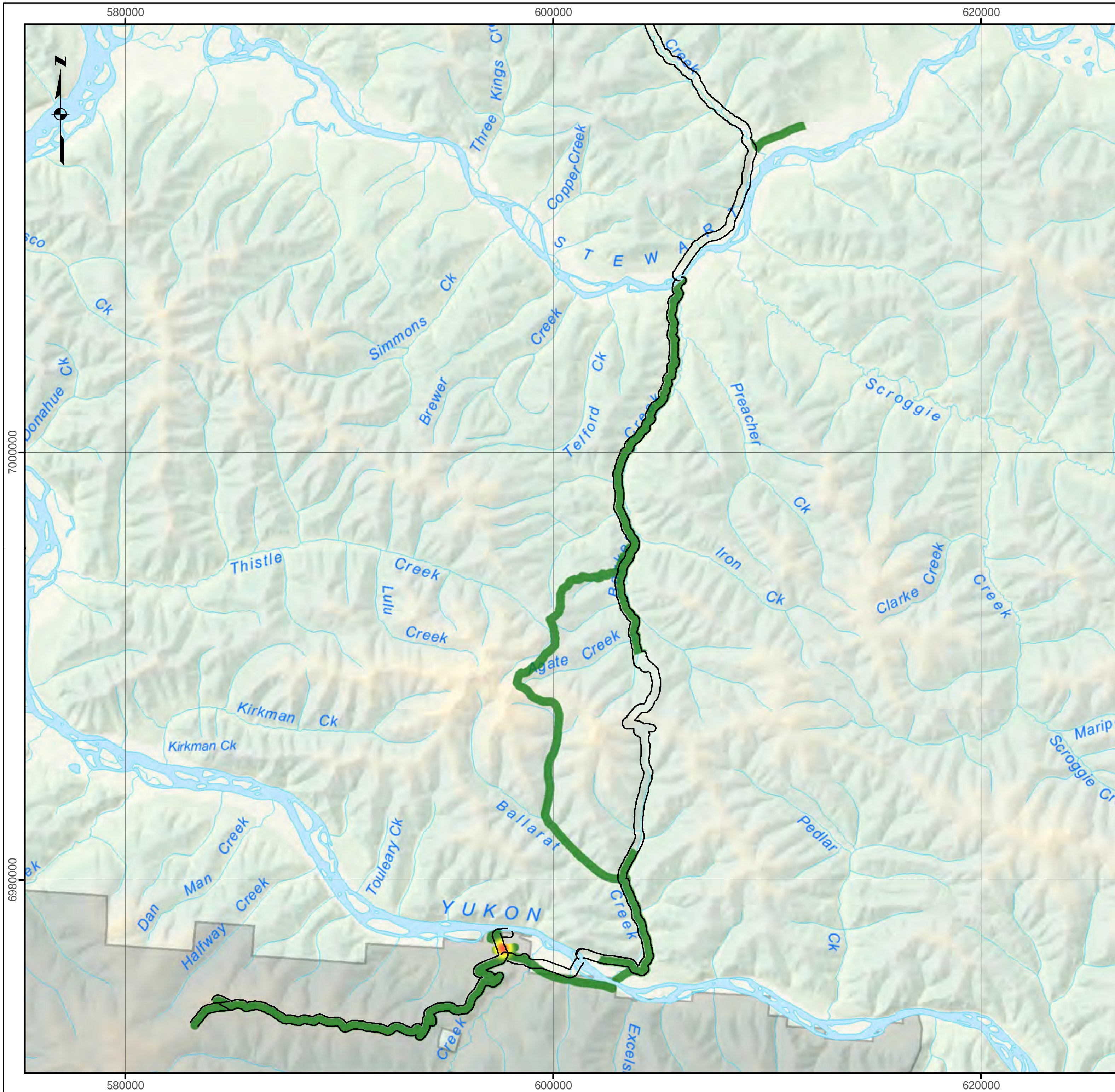

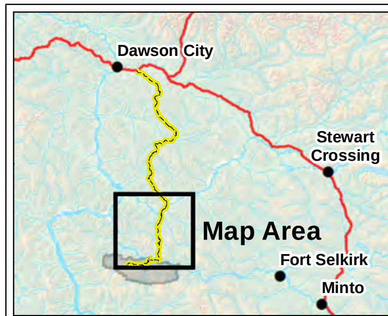

Legend

- Settlement/Community
- Proposed Route
- Coffee Property

Density of perennial sow-thistle (Sonchus arvensis ssp. arvensis)

High

Moderate

Nil

FIGURE: 4 - 7

Density distribution of perennial sow-thistle, southern portion of the survey extent

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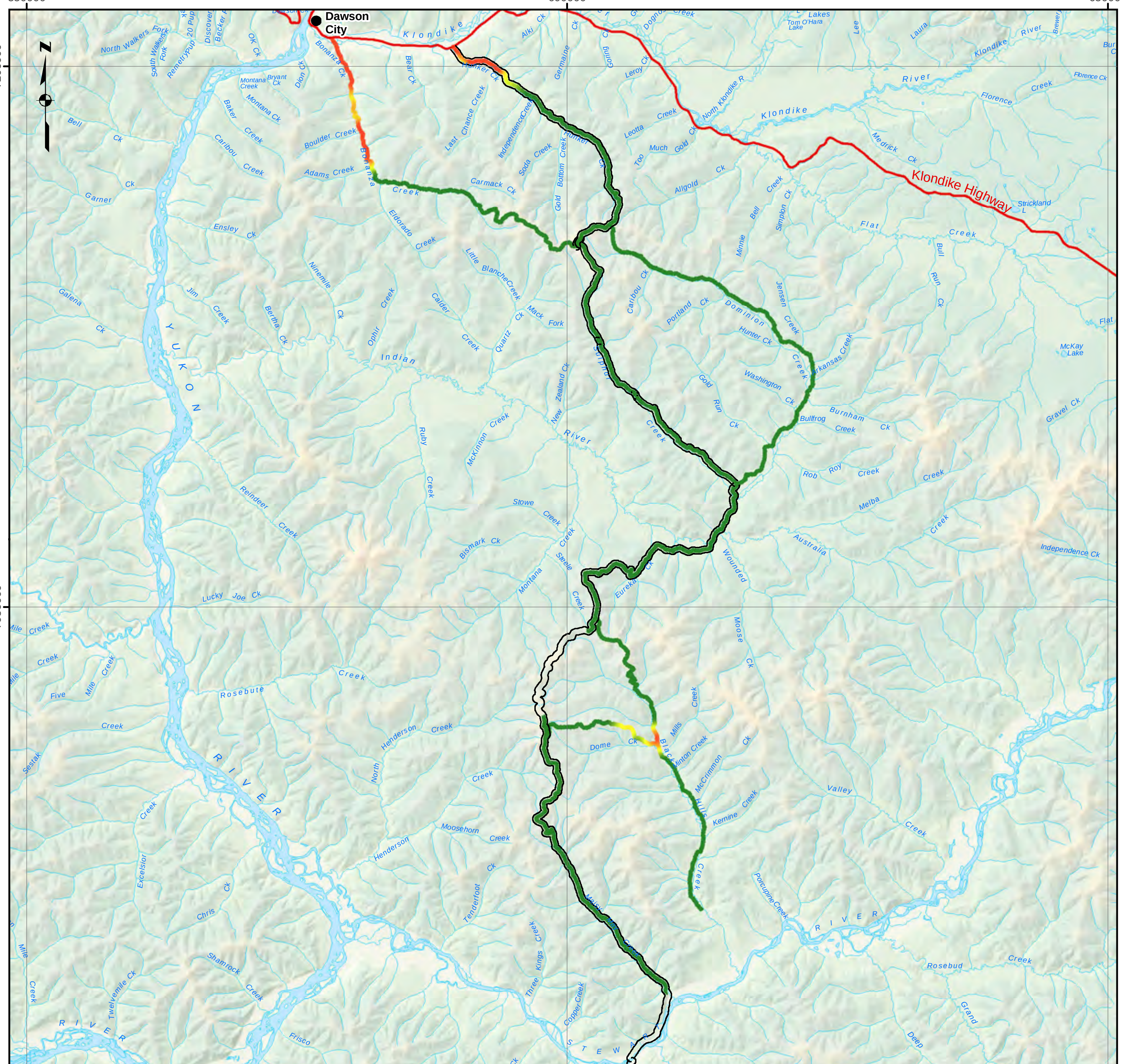

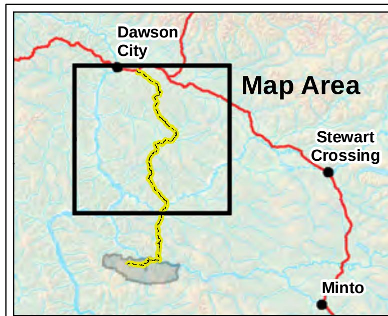

Legend

- Settlement/Community
- Highway
- Proposed Route
- Coffee Property

Density of white sweetclover (Melilotus albus)

High

Moderate

Nil

FIGURE: 4 - 8

Density distribution of white sweetclover, northern portion of the survey extent

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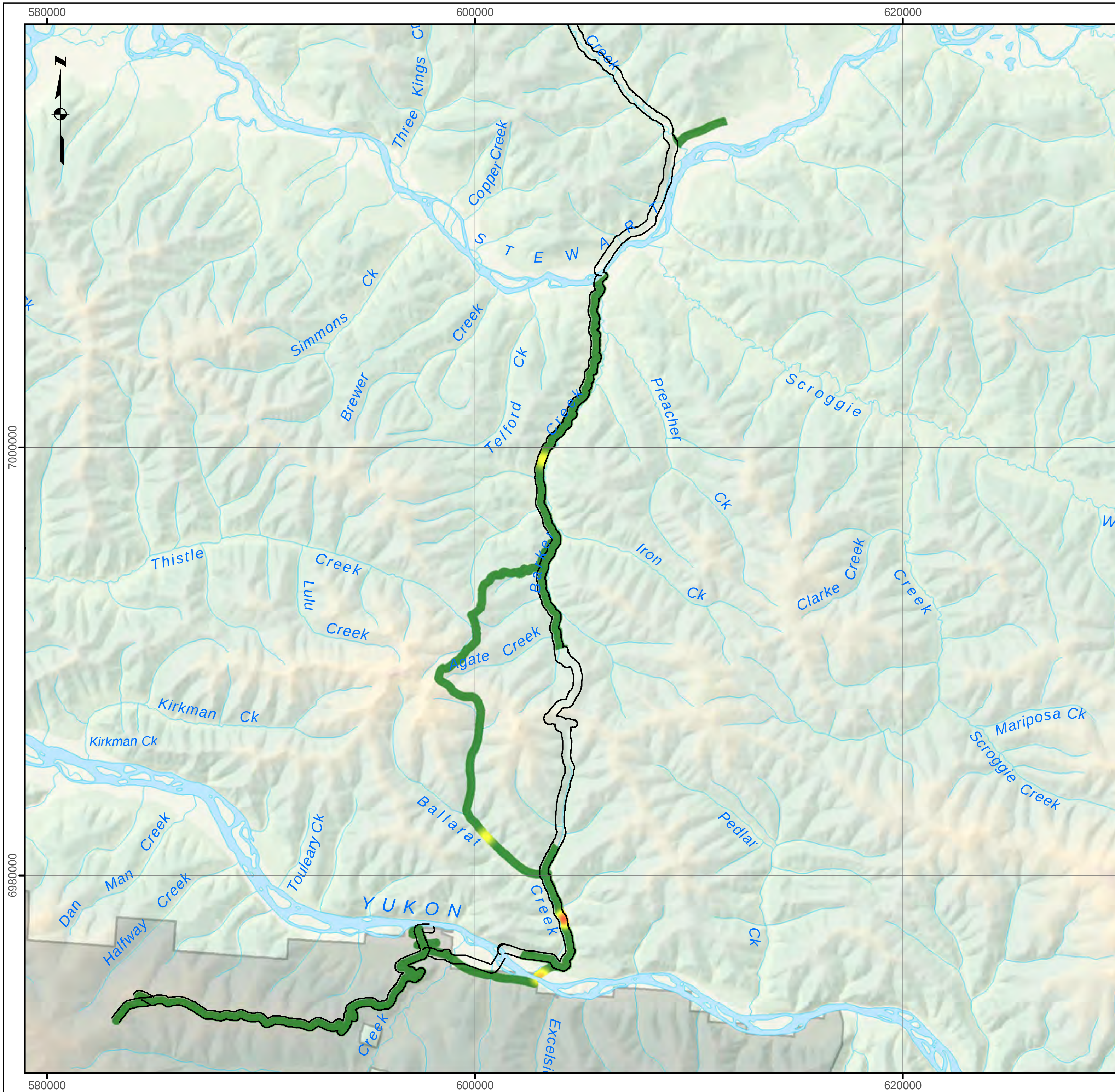

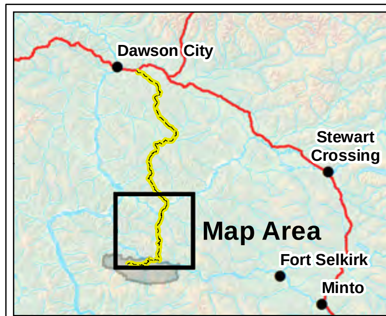

Legend

- ● Settlement/Community
- Proposed Route
- Coffee Property

Density of white sweetclover (Melilotus albus)

- High
- Moderate
- Nil

FIGURE: 4 - 9

Density distribution of white sweetclover, southern portion of the survey extent

Data Sources
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KM

Map Reference Scale: 1:250,000 (Printed at 8.5 x 11)
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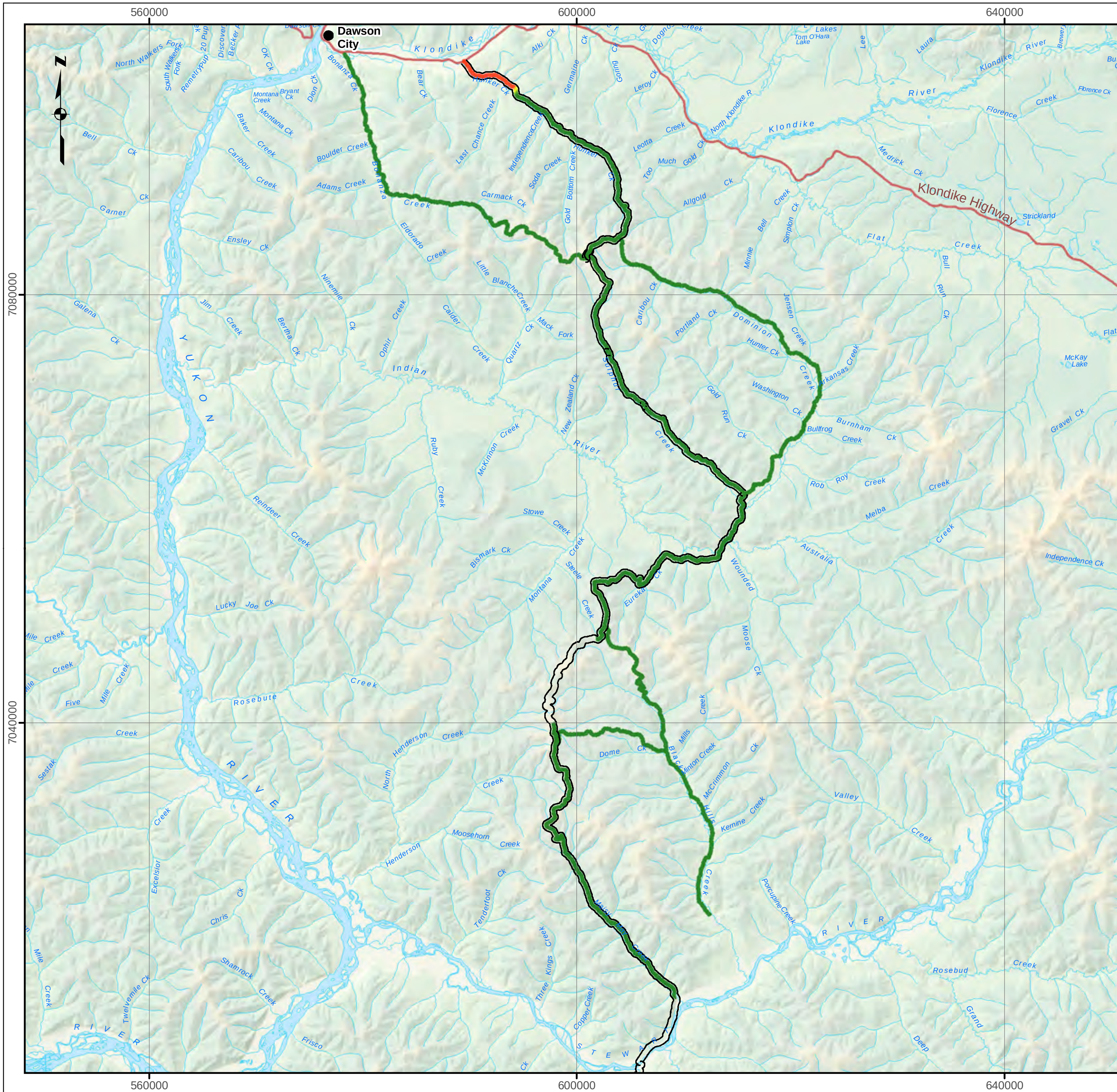

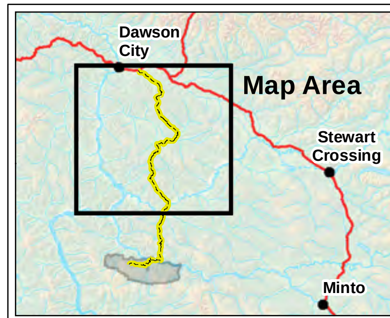

Legend

- Settlement/Community
- Highway
- Proposed Route

Density of yellow sweetclover (Melilotus officinale)

High

Moderate

Nil

FIGURE: 4 - 10

Density distribution of yellow sweetclover, northern portion of the survey extent

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0 5 10 15
KM

Map Reference Scale: 1:500,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MS	Checked: MP/AM	Date: 02/09/2016

KAMINAK GOLD CORPORATION EDI

Path: J:\YukonProjects\20141414_Y_0306_Kaminak_CoffeeCk\Mapping\2016_Mapping\2016_Baseline\008_VegetationVeg_Baseline_mxd\Fig4_10_OfficinaleDensity.mxd

4.2.1 INVASIVE PLANT INFORMATION SHEETS

Species information sheets were developed for rank 1 invasive plants observed during field surveys. Information sheets include species name, Yukon invasiveness rank, geographic distribution, botanical description, typical habitat and the location where it was found within the survey extent. Descriptions were adapted from the FNA (2015 and 2016), Flora of the Yukon Territory (Cody 2000), the Illustrated Flora of British Columbia (Douglas *et al.* 1998–2002) and YISC (YISC 2015).

Bromus inermis (Smooth brome)

Family: Poaceae — Grass Family

Smooth brome has been widely introduced in North America for use in pastures and grass as hay. Its native origin is Germany, Hungary, France and northern Asia. Across Canada, smooth brome is known for its invasive properties. In Yukon, its invasiveness rank is 1 (top priority). It is found along most Yukon highways, as a result of roadside seeding and erosion control, as well as old settlements located far from roads or rivers, likely due to hay production. It is known from every community in Yukon except Old Crow.

Smooth brome is a cold hardy, persistent, creeping perennial grass. Once established, it grows creeping underground rhizomes. Stems are smooth to soft or stiff-hairy, up to 1.2 m in height. Leaf blades are flat, smooth to somewhat hairy, 3-10 mm wide. Commonly, there is a "W" shaped line on the upper leaf. It has ear-shaped lobes at the bases of the leaf that clasp the stem and a translucent tongue-like appendage called a ligule, 0.5-2.5 mm long. Seed heads are 7-20 cm long with spikelets that contain the grass flowers and seeds. Spikelets are purple tinged and the overall shape resembles a cigar with tapered ends.

Smooth brome was found scattered along the NAR and around Coffee Camp in 2015 (Table 4-1, Figure 4-3 and 4-4). The density distribution of smooth brome along the NAR was relatively low compared to other invasive plant species. It was recorded from 14 transects and the density distribution class ranged from 2 – "few sporadically occurring individuals" to 6 – "several well-spaced patches or clumps" (Luttmerding *et al.* 1990; Appendix E). At Coffee Camp, it was prevalent and found throughout most of the cleared areas surrounding buildings with a high density distribution class of 8 (continuous dense occurrence of a species). The site was revisited in 2016 to discuss mowing practices in areas of infestations with onsite Environmental Monitors.

Photo 4-1. ***Bromus inemis*** **(Smooth brome)**

Crepis tectorum (Narrow-leaved hawksbeard)

Family: Asteraceae — Aster Family

Narrow-leaved hawksbeard is native to Europe. Introduced as a contaminant in seed, it is now widespread across Canada and the northeastern United States. In Yukon, its invasiveness rank is 1 (top priority). It is found along roadsides, pull outs, pastures and disturbed, open areas. In Yukon, it occurs along all major highways.

Narrow-leaved hawksbeard is an annual forb from a short taproot. Stems are erect, smooth to hairy, solitary, branched, measuring 0.3-1.0 m tall. It has two different types of leaves. Basal leaves are lance to oblanceolate in shape, 2-15 cm long and 0.3-4 cm wide, smooth to short-hairy with variable margins. Stem leaves clasp the stem and are mostly linear. Flowers are yellow, numerous and concentrated at the ends of branches. Subtending the flower heads are bracts that are short woolly-hairy or stiff-hairy.

Narrow-leaved hawksbeard was found scattered along the NAR, at the existing Coffee Airstrip and adjacent existing road, and one site along the Java Road at Km 21 in the vicinity of the proposed mine site (Table 4-1, Figure 4-5 and 4-6).

The presence of narrow-leaved hawksbeard along the NAR and at previously disturbed, open areas was high compared to other invasive plant species. It was recorded from 68 transects and the density distribution class ranged from 2 – "few sporadically occurring individuals" to 7 – "continuous uniform occurrence of well-spaced individuals" (Luttmerding *et al.* 1990; Appendix E). In the southern portion of the survey extent, narrow-leaved hawksbeard was found at five sites along the Coffee airstrip. Two sites were associated with the fuel tank location along the Coffee airstrip and three sites were along the edges of the Coffee airstrip itself. The density distribution ranged from 1 – "rare individual, a single occurrence to 8 – "continuous dense occurrence of a species" (Luttmerding *et al.* 1990; Appendix E). All individuals were pulled, bagged, and incinerated onsite with the exception of the largest and most dense patch of narrow-leaved hawksbeard found along the Coffee airstrip adjacent the wind sock (225 m^2). This patch was not eradicated, due to time limitations.

Photo 4-2. *Crepis tectorum* (Narrow-leaved hawksbeard)

***Sonchus arvensis* ssp. *uliginosus* (Perennial sow-thistle):**

Family: Asteraceae — Aster Family

Perennial sow-thistle has been introduced to North America. It is native to Europe and the Caucasus region of Asia (Royer and Dickson 1999). Perennial sow-thistle is known to be invasive and in several states and provinces is legally listed as noxious. In Yukon, its invasiveness rank is 1 (top priority). It is known from primarily the Whitehorse area, as well as Carmacks, Destruction Bay, Johnson's Crossing, and the Kotaneelee gas plant. Recent reports signal a spread of this species along highway corridors in Yukon.

Perennial sow-thistle resembles a tall dandelion more than a true thistle plant. It is a perennial forb with persistent, aggressive underground rhizomes that spread horizontally, up to 10 feet from the flowering plant. Stems are erect, branched, smooth, growing up to 2 m tall and exude a milky juice when punctured.

Leaves are alternate on the stem, strongly clasping, and waxy with weakly prickly edges. Flowering heads are yellow, large 3–5 cm wide, subtended by smooth, green, waxy bracts. Fruit seeds are 2.5-3.5 mm long, ribbed and cross-wrinkled topped with a conspicuous pappus of white wispy bristles that can easily be dispersed by the wind.

Perennial sow-thistle was found at only one site along the current Coffee airstrip in 2015 (Table 4-1, Figure 4-7) where four individual plants were observed directly adjacent to the plane loading/unloading dock. All individuals were "dead-headed" meaning the top part of the plant containing the seeds was removed, bagged and burned in the incinerator on site. No individuals were found growing during 2016 surveys.

Photo 4-3. *Sonchus arvensis* spp. *uliginosus* (Perennial sow-thistle)

***Melilotus albus* (White sweetclover)**

Family: Fabaceae — Pea Family

White sweetclover has been widely introduced in North America for agricultural purposes as a forage crop and honey plant. It is considered weedy or invasive across most countries where introduced. Its native origin is Europe and Asia. In Yukon, its invasiveness rank is 1 (top priority). It is found along most major Yukon highways and also spreads along rivers. Sites where white sweetclover is known on the Yukon River are Whitehorse, Carmacks and Dawson and it is considered a serious problem on Alaskan waterways, including tributaries of the Yukon River.

White sweetclover is an annual or biennial forb from a taproot that rapidly colonizes well-drained, gravelly soils such as roadsides, waste areas and river banks. Stems are erect, 0.5-2 m tall, freely branched, finely to short-hairy or glabrous. Leaves are alternate on the stem, pinnately compound in three's, oblong to elliptic in shape, 1-4 cm long, mostly smooth with fine-teeth on the margins. Flowers are sweet-scented, arranged in long spikes of 20-50 white, pea-like flowers. Fruit pods are egg-shaped, nodding, 3-6 mm long, smooth and net-veined. A single plant can produce up to 300,000 seeds which remain viable in the soil or in water for several years (80% survival after 30 years; YISC 2015).

White sweetclover was found in several locations along the NAR (Table 4-1, Figure 4-8 and 4-9) in 2015. The density distribution of white sweetclover along the NAR was moderate compared to other invasive plant species. It was recorded from 14 transects and the density distribution class ranged from 2 – "few sporadically occurring individuals" to 8 – "continuous dense occurrence of a species" (Luttmerding *et al.* 1990; Appendix E). One notable patch was found on the north side of the Yukon River in an open clearing, previously disturbed, directly adjacent the river. This patch was pulled, bagged, and incinerated onsite.

Photo 4-4. *Melilotus albus* (White sweetclover)

***Melilotus officinalis* (Yellow sweetclover)**

Family: Fabaceae — Pea Family

Yellow sweetclover has been widely introduced in North America for agricultural purposes as a forage crop and honey plant. It is considered weedy or invasive across most countries where introduced. Its native origin is Europe and Asia. In Yukon, its invasiveness rank is 1 (top priority). It is found along several major Yukon highways, but is not as prevalent as white sweetclover.

Yellow sweetclover is very similar to white sweetclover. It is an annual or biennial forb from a taproot that colonizes well-drained, gravelly soils such as roadsides, waste areas and river banks. Stems are erect, 0.5-2 m tall, freely branched, finely to short-hairy or glabrous. Leaves are alternate on the stem, pinnately compound in three's, oblong to elliptic in shape, 1-4 cm long, mostly smooth with fine-teeth on the margins. Flowers are yellow, sweet-scented in drying, arranged in long spikes of 20-50 pea-like flowers. Fruit pods are egg-shaped, nodding, 3-5 mm long, smooth and cross-ribbed. A single plant can produce up to 300,000 seeds which remain viable in the soil or in water for several years (80% survival after 30 years; YISC 2015).

Yellow sweetclover was only found in 2015 along the NAR within approximately 6 km of the North Klondike highway (Table 4-1, Figure 4-10). The density distribution of yellow sweetclover was moderate where it was found (density distribution class ranged from 4 – "several sporadically occurring individuals" to 6 – "several well-spaced patches or clumps of a species"; Luttmerding *et al.* 1990; Appendix E).

Photo 4-5. *Melilotus officinalis* (Yellow sweetclover)

4.3 DISCUSSION

Invasive plants found during field surveys range in degree of invasiveness (i.e., concern) from high priority (1) to least concern (7). Yukon ranks are based on general abundance, persistence, invasiveness rank in neighbouring jurisdictions, climate projections, and expert opinion of the Yukon CDC (Environment Yukon 2012). High priority species are those that are of most concern to the economy, environment, and human health (YISC 2015). The IUCN states that "invasive species represent the second most significant cause of species extinction worldwide after habitat destruction. The spread of invasive species is facilitated by increasing trade, travel, and the transporting of goods, as these organisms may "hitchhike" on ships, containers, cars, soils, etc. This is, therefore, a global problem that requires international cooperation and action" (IUCN 2011). Across Canada, it is estimated that there are 1,229 non-native vascular plant species to Canada, 486 of which are considered weedy or invasive (CFIA 2008). Relative to other jurisdictions, Yukon has fewer invasive species with approximately 154 non-native plant species, 20 of which are considered invasive (YISC 2015).

Not all invasive plants included in this report require targeted management or attention, but are included because they have been found to be invasive in other jurisdictions. Pineapple weed is a non-native species in Yukon and is known to be invasive in other jurisdictions; however, it is of low invasive concern in the territory (Environment Yukon 2012; YISC 2015). Similarly, alsike clover and common dandelion are widespread, persistent, and aggressive, but may not replace native species or change ecosystem function (Environment Yukon 2012; YISC 2015). Although these definitions may change, due to factors such as climate change, the focus of invasive plant surveys for the Coffee Project on high priority species is supported by the findings. Rank 1 invasive plants are considered highly invasive in Yukon and may displace or replace native ecosystems (Environment Yukon 2012).

In general, concentrations of invasive plants were less frequent in the southern portion of the survey extent compared to the northern portion. Prior to mining exploration at Coffee Creek, human habitation (i.e., farming) has led to relatively few invasive plants introductions, such as smooth brome and other lower priority species. Narrow-leaved hawksbeard and perennial sow-thistle are high priority species found in the vicinity of Coffee Camp. Both of these species had relatively low abundance and distribution in the southern portion of the study area. Coffee Camp is a relatively isolated location with no road access and limited disturbance. This indicates there are few vectors of dispersal for exotic species to be introduced.

Disturbed areas accessed by UTV and on foot in the southern portions of the survey extent had fewer invasive plants than areas accessible by truck in the northern portions of the survey extent. This is likely due to less exposure from humans and fewer vectors of plant introduction and dispersal (i.e., seeds in mud on vehicle tires). The northern section has a longer history of traffic and disturbance than the southern portion of the survey extent. It is well known that the presence of invasive plants is related to disturbance with introduction and spread commonly from machinery and equipment (YISC 2015). The most common invasive plant species observed at previously disturbed sites, clearings, pullouts and road junctions was narrow-leaved hawksbeard, followed by common dandelion, white sweetclover, and Kentucky bluegrass.

A common observation made along existing roads in the northern portion of the survey extent was that in areas where the road ditch was absent or narrow and native vegetation (i.e., alders, willow) was found growing on the edge of the roadside, invasive plants were not found. Invasive plants were found in areas previously disturbed, where an open niche was present for seed establishment and there is a vector for seed dispersal. Along the edges of the road where only a narrow band of disturbance was present, there were fewer invasive plants than in wider ditches.

Once established, the ecological impacts of invasive plants can be wide ranging. Smooth brome, white and yellow sweetclover form dense sod mats that smothers and excludes native species, inhibit natural succession and reduce biodiversity (YISC 2015). Perennial sow-thistle is also an aggressive species that forms dense mats through a network of underground roots. It is known to reduce water resources when found growing at high densities and can invade lake shores, beaches and agricultural areas (YISC 2015). Narrow-leaved hawksbeard, the most common invasive plant found during field surveys, is a prolific seed producer that readily colonizes open, disturbed areas and chokes out native species. All rank 1 invasive plants found during field surveys can be seen along major Yukon highways (Line *et al.* 2008), displacing habitat where native plants once thrived.

5 VEGETATION AND SOIL TRACE METALS SAMPLING

Trace metals sampling for the Coffee Project characterizes baseline vegetation and soil trace metal concentrations within the trace metals RSA with the potential to be affected by Project development. Trace metals are defined as, "elements that occur in natural and perturbed environments in small amounts and when present in sufficient bioavailable concentrations are toxic to living organisms" (Adriano 2001). Trace metals in dust deposition as total suspended particulates (TSP) can pose a risk to vegetation through elevated metal concentrations in soil and vegetation tissues. Dust on the surface of a leaf may alter pH, increase the temperature of the plant, and/or reduce the plants ability to photosynthesize (Auerbach *et al.* 1997; Spatt and Miller 1981; Walker and Everett 1987). Baseline data on trace metals in vegetation and soil for the Coffee Project will provide a benchmark to assess potential Project effects to metal concentrations in soil and vegetation.

Natural sources of trace metals in vegetation and soil is largely dependent on parent material or underlying geological material (e.g., bedrock) and the amount of weathering that has occurred; the older and more established the soil, the less it is influenced by the parent material (Adriano 2001). Anthropogenic sources of trace metals such as atmospheric deposition (i.e., dust) may include mine tailings, sewage and waste water, fossil fuel combustion, landfills, metal scrap heaps, and mining and smelting (Adriano 2001; CACAR 2003).

The Canadian Council of Ministers of the Environment (CCME) have established Canadian soil quality guidelines for the protection of environmental and human health by developing standards for soil quality in Canada (CCME 2006). These guidelines outline the "numerical concentrations that are recommended as levels that should result in negligible risk to biota, their functions, or any interactions that are integral to sustaining the health of ecosystems" (CCME 2006). Currently, no standards exist to assess trace metal concentrations in vegetation.

5.1 SAMPLING METHODOLOGY

Baseline data on vegetation and soil metal concentrations for the Coffee Project were initially collected in 2014, 2015 and 2016. Sites around the proposed mine site and Coffee Camp were sampled in July 2014 and sites along the proposed NAR were sampled in July and August 2015. For the 2014 and 2015 data collection years, site selection generally coincided with the Ecosystem Mapping Program (Section 2.0). Sample sites were located within three distance categories based on the proposed Project Footprint: adjacent (0-25 m), near (75-250 m), and far (1.5-2.5 km)(Figure 5-1). The 2016 sampling program consisted of sample sites within the near sample zone, the far sample zone, and the Moose Mountain and Thistle samples zones (Figure 5-1).

Vegetation included in baseline sampling consisted of four focal species or species groups: willow (*Salix* spp.), fruticose lichen (*Cladina* spp.), horsetail (*Equisetum arvense, Equisetum pratense,* and *Equisetum sylvaticum*), and lowbush cranberry. These plant species were chosen based on value as wildlife forage, importance to First Nations, and comparability to other studies:

- Willow is an important forage species for moose and other wildlife that consume the leaves, twigs, branches, and catkins (high in vitamin C) for sustenance. As a medicinal plant, the inner bark can be used to relieve headaches, fever, cold, flu, or pain related to urinary tract, sciatic nerve pain, tendonitis, osteoarthritis, back pain, muscle aches, sprains, or menstrual cramping. (Gray 2011; Schofield 1998). Willow is also used for basket making, making snares, tanning hides, and is a source for natural dyes (Schofield 1998; Leary 2009).
- Lichen is an important food source for caribou, particularly during the winter. Lichen lacks an outer cuticle; therefore, it absorbs nutrients from the atmosphere and has been used in previous studies to monitor air quality.
- Horsetail is eaten by wildlife including moose and bears. Some species of horsetail have medicinal uses (Gray 2011, Schofield 1998); although it is unknown whether local First Nations used horsetail in the Coffee Creek area for this purpose.
- Lowbush cranberry is harvested by First Nations (Mishler and Simeone 2004; InterGroup Consultants Ltd. 2009; Bates and DeRoy 2014) and local First Nations have reported previously harvesting it in the Coffee Creek area (Tr'ondëk Hwëch'in 2012b). Berries reduce the development of kidney stones and urinary tract infections, lower blood sugar, benefit the cardiovascular and immune system, stimulate digestion, prevent bacteria build up in the mouth, and improve eyesight (Gray 2011; Schofield 1998). Many bird and wildlife species also forage on lowbush cranberry for sustenance.

Both soil and vegetation samples were collected at each site; however, the vegetation species sampled at each site were subject to availability (not every species was available at every site). Collections were made using the following procedures:

- A new pair of nitrile gloves were worn for each vegetation and soil sample.
- Stainless steel tablespoons used for soil sampling were cleaned with alcohol wipes before and after each sample.
- A minimum of 10 grams of each vegetation sample was collected at each site within a 10 m radius of plot centre. For each of the focal species or species groups the following plant parts were collected:
    - Willow —current year's growth from at least 3 different individuals
    - Lichen —entire specimen
    - Horsetail — above ground portions
    - Lowbush cranberry — above ground portions and berries where available
- A minimum of 100 grams of soil from the top soil layer was collected at each site to a depth of ≤10 cm and above permafrost where possible. This reflects the top layer of the rooting zone where the potential for metal uptake in plants is expected to be the greatest.
- Samples were placed in new zip-loc bags, refrigerated and sent to an accredited laboratory for metals analyses.

Vegetation and soil samples were analyzed for total metal concentrations using inductively coupled plasma mass spectrometry (ICP-MS) by an accredited laboratory. Vegetation samples were analyzed for 31 total metals including: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. Excluding boron, soil analysis included the same suite of metals, with the addition of lithium, zirconium, and soil pH.

In 2016, the baseline vegetation and soil trace metals sampling study design was revised to incorporate available data from dust isopleth modelling and improve extent and coverage around the proposed mine site. The improved study design considered spatial distribution and sample size to include new sample sites at varying distances from the proposed Project footprint. Distance categories were revised to better represent dust fall isopleth modelling and prevailing winds (South, Northeast, and Northwest). Sample sites were situated along 10 transects radiating out from the proposed mine site. To prevent pseudo-replication and ensure independence between sites, all transects were spaced a minimum of 300 m apart. Along each transect, sample sites were located at one of four distance categories: adjacent (100 m), near (1000 m), far (5.5-7.5 km), and control (≥15 km); control sites represent locations unaffected by Project activities.

From 2014-2016, the total number of vegetation and soil trace metals sample sites visited was 89 (Figure 5-1). Seventy-seven soil sites where located in the Coffee Area including 68 willow, 61 lichen, 61 lowbush cranberry, and 22 horsetail sites. Twelve soil sites were located along the NAR including 10 willow, 5 lichen, 8 lowbush cranberry, and 9 horsetail sites. A table of all sites, locations, distance class, disturbance category, and species collected is provided in Appendix G.

5.1.1 ANALYTICAL METHODS

A suite of total metals were analyzed for baseline concentrations in soil and vegetation. A subset of these total metals, referred to as chemicals of potential concern (CoPC), were selected to facilitate closer analysis based on the following considerations:

- Site conditions determined by baseline metal concentrations in vegetation and soil (i.e., several metals were not present at detectable levels in vegetation and soil samples and were therefore not selected as CoPC);
- Potential as a source of contamination in soil and vegetation (e.g., arsenic is a minor constituent associated with gold ores; CCME 1997); and
- The level of risk associated with each element. Several sources were consulted including:
    - Canadian Environmental Quality Guidelines (provided by the CCME) including soil quality guidelines;
    - Relevant studies and literature on the presence, effects and other aspects of metals in northern terrestrial biota (e.g. Gamberg 2000 & 2008; CACAR 2003).

In the study, Contaminants in Arctic Moose and Caribou, cadmium, copper, lead, and zinc were identified as trace metals of potential concern in northern biota (Gamberg 2008). Similarly, Contaminants in Yukon Country Foods identified arsenic and mercury as trace metals of potential concern (Gamberg 2000). The baseline water quality report found several total metals in surface water samples at varying amounts above reportable detection limits with the most notable being uranium (Lorax 2016). Based on this review, nine CoPC were selected including:

- Arsenic;
- Cadmium;
- Chromium;
- Copper;
- Mercury;
- Lead;
- Selenium;
- Uranium; and
- Zinc.

To facilitate closer analysis of trace metals in soil and vegetation the LSA was divided into two sections: the Coffee Area and NAR. Soil samples were screened for trace metal concentrations against CCME soil quality guidelines for CoPC following industrial standards. The analysis focused on samples that align with the revised study design implemented in 2016. Samples with metal concentrations below the CoPC reportable detection limit (RDL) provided by the laboratory were not included in the analysis. Horsetail was excluded from the analysis, due to insufficient sample size.

Average metal concentrations (mg/kg dry weight) in soil, willow, lichen, and lowbush cranberry were plotted by distance category (adjacent (100 m), near (1000 m), far (5.5-7.5 km), and control (≥15 km)), using standard box and whisker plots in R version 3.3.1 (R Core Team 2016). Boxplots are a standard and convenient way to analyze distribution and variability. Descriptive statistics including the five number summary (median, mean, minimum, maximum, standard deviation, first quartile, third quartile, and interquartile range) are provided in Appendix H.

Analytical Methods for Power Analysis — A power analysis was conducted using simulations to determine if samples size and study design were sufficient to detect a change in metal concentrations in soil and vegetation relative to recommended threshold values. CCME soil quality guidelines for the Protection of Environmental and Human Health provide recommended thresholds for all CoPC; however, no CCME guidelines currently exist for trace metals in vegetation. Where no threshold exists, a Project specific threshold was defined based on the median plus two standard deviations from 2014 baseline samples.

The power analysis focused on changes in trace metal concentrations to soil and focal plants (willow, lichen, and lowbush cranberry) for nine CoPC using R version 3.3.1 (R Core Team 2016). Power simulations were not performed for metals and substrates where more than 50% of baseline samples were below the detection limit. CoPC included in the power analysis were arsenic, cadmium, chromium, copper, lead, mercury, selenium, uranium, and zinc.

Simulations were used to determine the effect size for a sampling design with four distance categories (adjacent (100 m), near (1000 m), far (5.5-7.5 km), and control (≥15 km)) with a minimum eight samples per category (Bolker 2007). Metal concentrations in three groups were simulated from a normal distribution, based on the mean and standard deviation of 2014 baseline sampling data following a log-transformation. Data for the fourth group were simulated assuming an increase in median metal concentrations for that group. For every 10% increase in metal concentrations, 1000 data sets were simulated.

A one-way ANOVA was run on each simulated data set and power was calculated as the proportion of tests with a significant difference among groups (p-value of less than 0.1). The level at which increased metal concentrations could be detected with statistical power of 0.8 (i.e. at least 80% of simulations) was compared to proposed thresholds to determine if a statistically significant change could be detected before exceeding the threshold.

5.2 RESULTS

Trace metal concentrations in soil were low with the exception of arsenic and chromium. Arsenic and chromium concentrations were above CCME soil quality guidelines in 24 (27%) and 4 (4%) samples, respectively. Arsenic samples above CCME guidelines were generally found within close proximity to the proposed mine site including adjacent (100 m) and near (1000 m) distances from the proposed Project footprint. Chromium samples above CCME guidelines were found at near (1000 m) and control sites (≥15 km) relative to the proposed Project footprint. Relatively few soil samples reported mercury and selenium above the laboratory RDL. pH was below the recommended range in 71 (79%) samples at various distances from the proposed Project footprint. Both arsenic and chromium contain outlier data; therefore, average and median values for all CoPC and pH are provided in Table 5-1.

No CCME guidelines currently exist for trace metals in vegetation. Trace metal concentrations in vegetation found little to no selenium in any of the focal species where all samples were below the RDL in lichen and lowbush cranberry, and only three were above the RDL in willow. Selenium in willow did not translate to selenium in soil at the same sites. Arsenic and uranium were detected in relatively more lichen samples than lowbush cranberry and willow where only one and three samples were above the RDL, respectively. The results suggest low concentrations of arsenic and uranium in lichen with an average of 0.1 mg/kg and 0.01 mg/kg, respectively, and no influence of outlying data. Similarly, chromium was detected in relatively more lichen samples than lowbush cranberry and willow where only three and four samples were above the RDL, respectively. Average concentration of chromium in lichen was 0.4 mg/kg. In comparison to lichen and willow, few lowbush cranberry samples had detectable concentrations of cadmium. Mercury was detectable in lichen, lowbush cranberry, and willow at low concentrations averaging 0.02 mg/kg, 0.01 mg/kg, and 0.01 mg/kg respectively. All average metal concentrations for CoPC in willow, lichen, and lowbush cranberry are provided in Table 5-2.

To facilitate closer analysis of trace metals in soil and vegetation, the LSA was divided into the Coffee Area around the proposed mine site (including Coffee Creek, Java Road, and the no longer considered Casino Connector) and the proposed NAR (Figure 5-1).

Table 5-1. Baseline trace metal concentrations in soils, 2014-2016

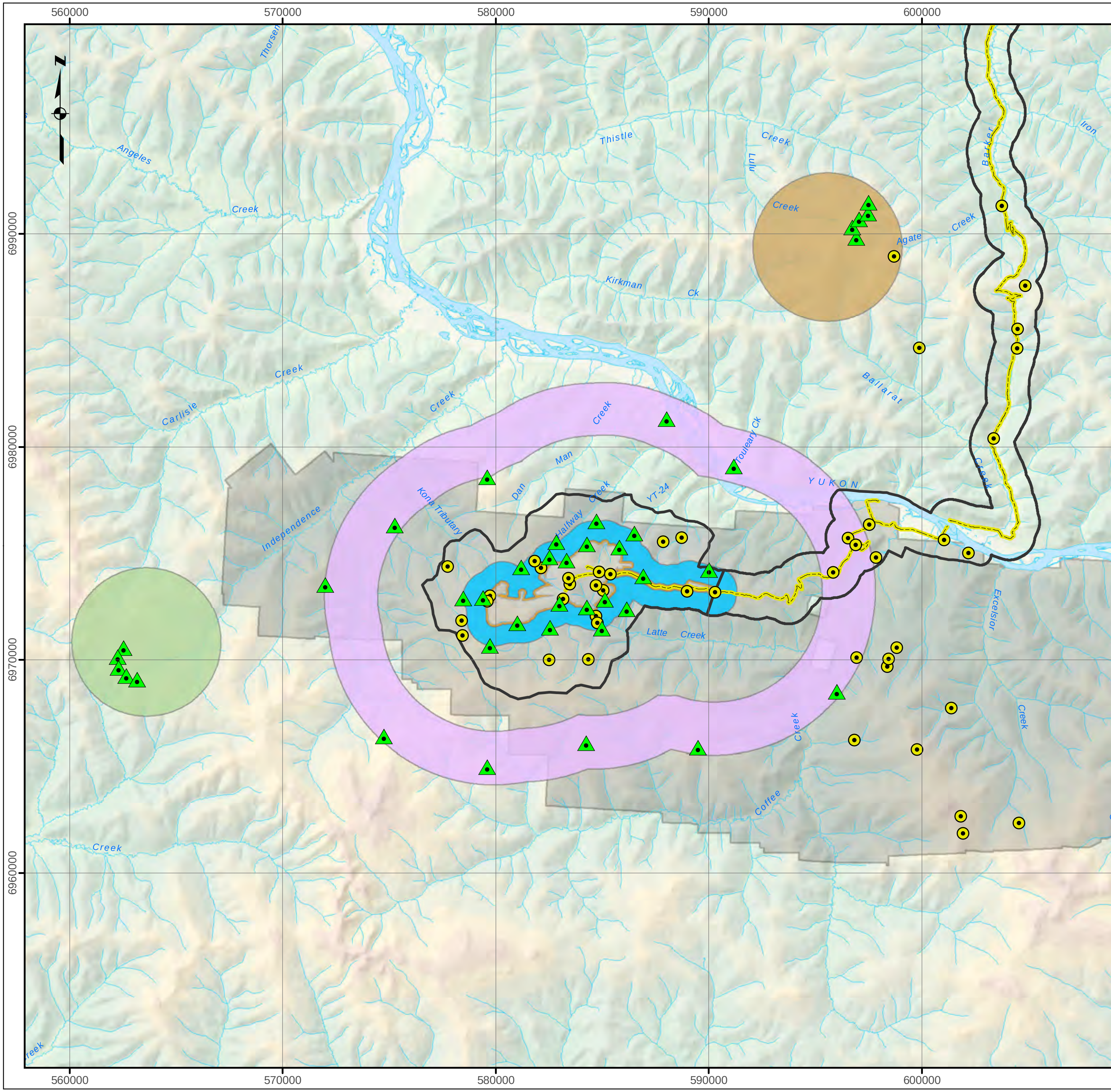
Parameter[1]	CCME Ind[2]	Average Concentration[3]	Median Concentration[3]	# Sites/(%) Above CCME Ind[4]
Arsenic	12	20.2 (n=89)	7.7 (n=89)	24 (27%)
Cadmium	22	0.3 (n=89)	0.2 (n=89)	0
Chromium	87	34.1 (n=89)	26.8 (n=89)	4 (4%)
Copper	91	20.1 (n=89)	16.8 (n=89)	0
Lead	600	9.2 (n=89)	7.8 (n=89)	0
Mercury	50	0.10 (n=34)	0.07 (n=34)	0
Selenium	2.9	0.8 (n=10)	0.6 (n=10)	0
Uranium	300	2.1 (n=52)	0.9 (n=52)	0
Zinc	360	46.8 (n=89)	41.4 (n=89)	0
pH	6-8	5.16 (n=89)	4.96 (n=89)	71 (79%)

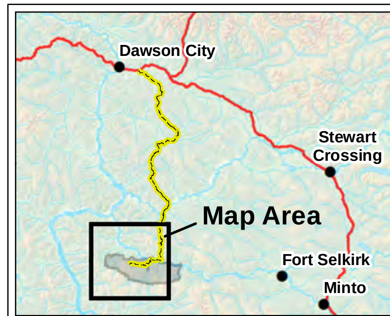
[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Industrial Soil Quality Guidelines provided by the CCME
[3] Samples above the RDL included in analysis; uranium was analyzed for in 2015 and 2016 only
[4] Values for pH are below CCME Industrial Soil Quality Guideline; none were above the recommended range

Table 5-2. Baseline trace metal concentrations in vegetation, 2014-2016

Parameter[1]	Willow Average Concentration	Lichen Average Concentrations	Lowbush Cranberry Average Concentration
Arsenic	n/a[2]	0.1 (n=44)	n/a[2]
Cadmium	1.8 (n=49)	0.03 (n=44)	0.03 (n=27)
Chromium	n/a[2]	0.4 (n=40)	n/a[2]
Copper	4.0 (n=49)	1.2 (n=39)	3.8 (n=5)
Lead	0.04 (n=48)	0.2 (n=39)	0.03 (n=50)
Mercury	0.01 (n=12)	0.02 (n=42)	0.01 (n=44)
Selenium	n/a[2]	n/a[2]	n/a[2]
Uranium	0.01 (n=10)	0.01 (n=44)	n/a[2]
Zinc	111.2 (n=49)	12.4 (n=44)	23.7 (n=50)

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Not enough samples above the RDL to conduct analysis





Legend

- Settlement/Community
- 2016 Trace Metals Sample Sites
- 2014 Trace Metals Sample Sites
- Proposed Route
- Coffee Property
- Local Study Area

Trace Metals Sampling Zones

- Adjacent Sample Zone
- Near Sample Zone
- Far Sample Zone
- Moose Mountain Sample Zone
- Thistle Mountain Sample Zone

FIGURE: 5-1

Trace metals sample sites within the Coffee Area

Data Sources
Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Project data displayed is site specific. Survey data was collected by EDI Environmental Dynamics Inc. (2014/2015).

Disclaimer
This document is not an official land survey and the spatial data presented is subject to change.

0 1 2 3 4 5
KM

Map Reference Scale: 1:250,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MP	Checked: AM	Date: 1/6/2017

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5.2.1 COFFEE AREA

A total of 77 sample sites were surveyed in the Coffee Area in 2014 and 2016 (Figure 5-1). These included sites around the proposed mine site, along the existing Java Road, and along the previously considered Casino Connector route. Figures for all CoPC in soil, willow, lichen, and lowbush cranberry are provided where more than 50% of the samples were above the RDL. Large outlier data were removed from the figures to improve readability of the graphs and are indicated below.

Soil sampling in the Coffee Area had low concentrations of CoPC with the exception of arsenic and chromium. Eight soil samples were above the CCME recommended guideline for arsenic in soil, including one site with naturally high arsenic concentration (CCTMBS-603; 520 mg/kg; Figure 5-2). This site was located in the near distance category to the proposed mine site, which may be explained by the relationship of arsenic to ores that are commonly mined (CCME 1997). Three soil samples were above the CCME recommended guideline for chromium in soil, including one site with naturally high chromium concentrations (Figure 5-4; CCTMRS-635; 291 mg/kg). This site was a control site located ≥15 km from the proposed Project footprint; therefore, it is unknown why chromium concentrations were high other than a naturally high source or an error in sampling or analysis protocol. Site CCTMBS-603 contained higher than average concentration of uranium in the soil (26.8 mg/kg). The concentration at this site is well below CCME guidelines; however, it is an outlier in the dataset. More than half of the soil samples (79%) had a pH below CCME soil quality guidelines which recommend a range of 6–8. Of these samples all had a baseline pH between 4 and 6. Only four sites had a pH between 7 and 8.

In the absence of CCME guidelines for trace metals in vegetation, willow samples in the Coffee Area appeared to have low concentrations of CoPC. Few CoPC were detected in willow, including cadmium (Figure 5-9), copper (Figure 5-10), lead (Figure 5-11), and zinc (Figure 5-12). Outlier data were removed from the figures to improve readability, including cadmium (10.3 mg/kg) and zinc (293 mg/kg) at control site CCTMRW-614, cadmium at CCTMCW-610 (14.1 mg/kg) in the far distance category, zinc (298 mg/kg) at control site CCTMRW-636, and lead at CCTMRW-639 (0.224 mg/kg) also collected at a control site. Willow is a species of metal tolerance; therefore, metal concentrations were expected to be higher for some metals in willow than other plants collected in the same area.

All CoPC were detectable in lichen and appeared to be low with the exception of selenium which was non-detect across all lichen samples. Compared to willow, arsenic (Figure 5-13), chromium (Figure 5-14), mercury (Figure 5-18), and uranium (Figure 5-19) were detected in lichen at low concentrations; there was somewhat less cadmium (Figure 5-14), copper (Figure 5-16), and zinc (Figure 5-20) in lichen than willow. Lead was somewhat higher in lichen than willow at 0.15 mg/kg (Figure 5-17). Outlier data were removed from the figures to improve readability, including copper (3.06 mg/kg) and lead (0.45 mg/kg) at CCTMBL-602 in the near distance category and uranium (0.05 mg/kg) at CCTMA-601 in the adjacent distance category.

Few CoPC were detected in lowbush cranberry, including copper (Figure 5-21), lead (Figure 5-22), mercury (Figure 5-23) and zinc (Figure 5-24). Compared to the other focal plants, lowbush cranberry had concentrations more similar to willow than lichen with the exception of mercury and zinc which were more similar to lichen. Average zinc was four times higher in willow (107 mg/kg) than both lowbush cranberry (24 mg/kg) and lichen (12 mg/kg). Outlier data was removed from Figure 5-23 to improve readability where mercury at CCTMBC-634 was 0.032 mg/kg.

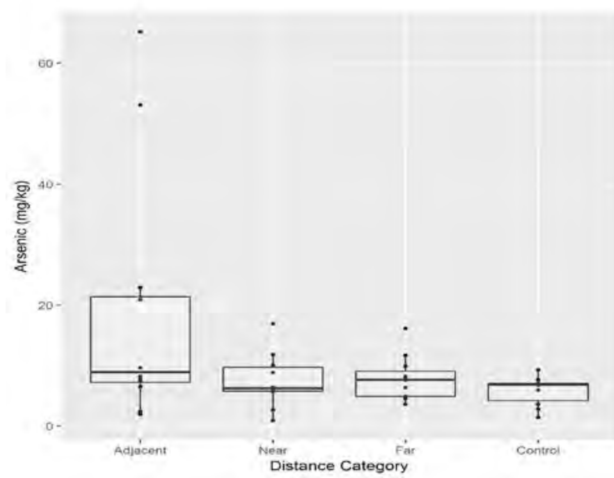


Figure 5-2. Arsenic concentrations in soil for the Coffee Area.

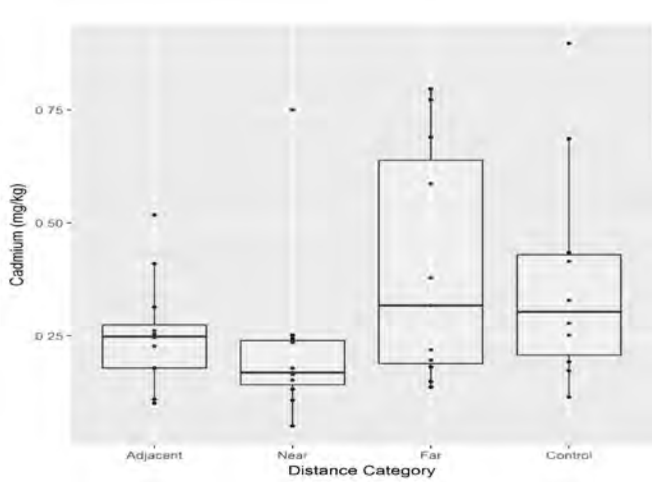


Figure 5-3. Cadmium concentrations in soil for the Coffee Area.

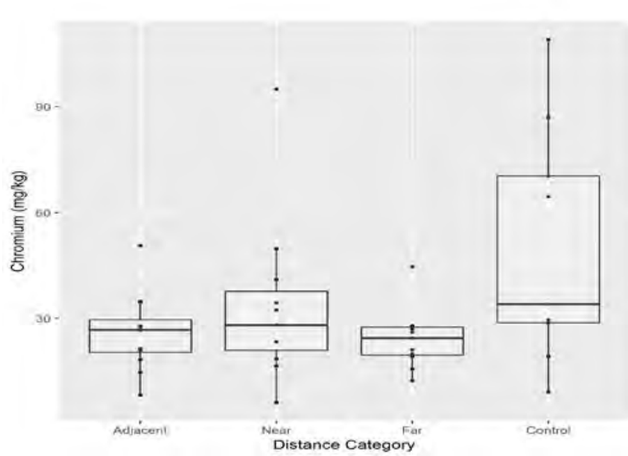


Figure 5-4. Chromium concentrations found in soil for the Coffee Area.

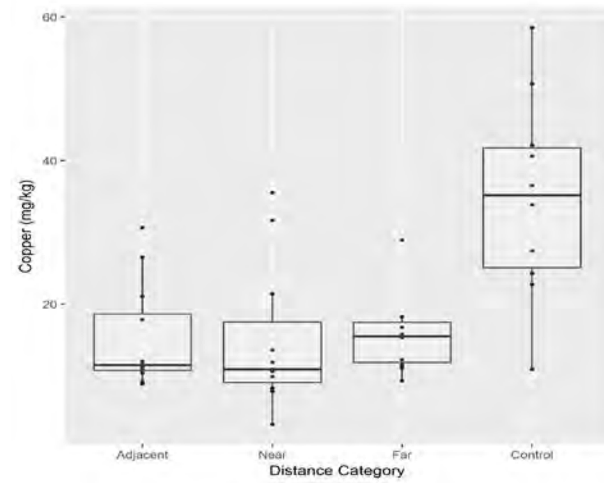


Figure 5-5. Copper concentrations in soil for the Coffee Area.

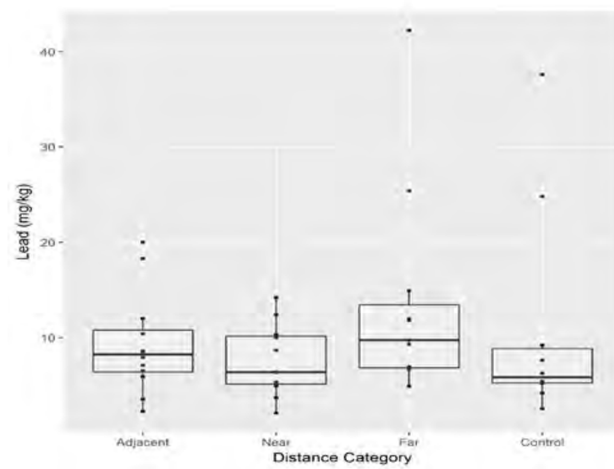


Figure 5-6. Lead concentrations in soil for the Coffee Area.

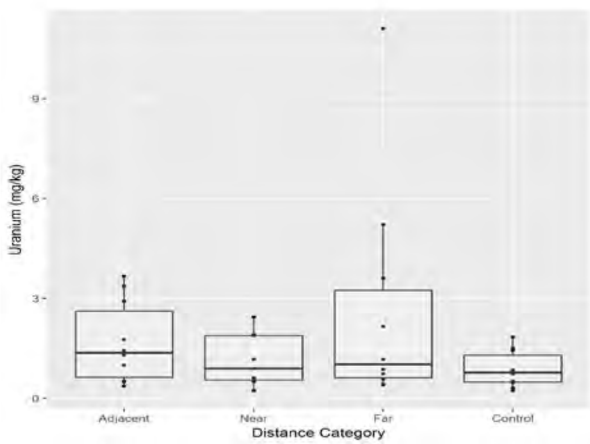


Figure 5-7. Uranium concentrations in soil for the Coffee Area.

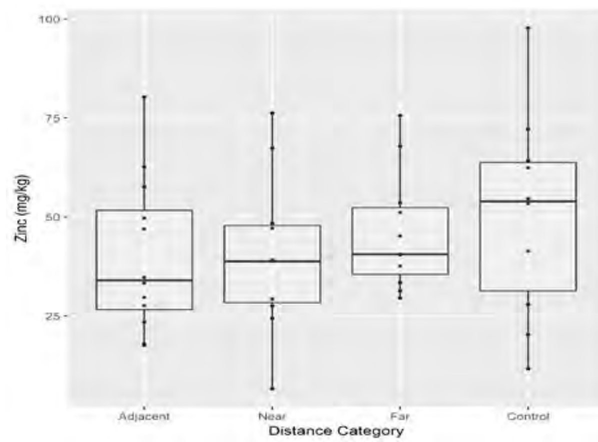


Figure 5-8. Zinc concentrations in soil for the Coffee Area.

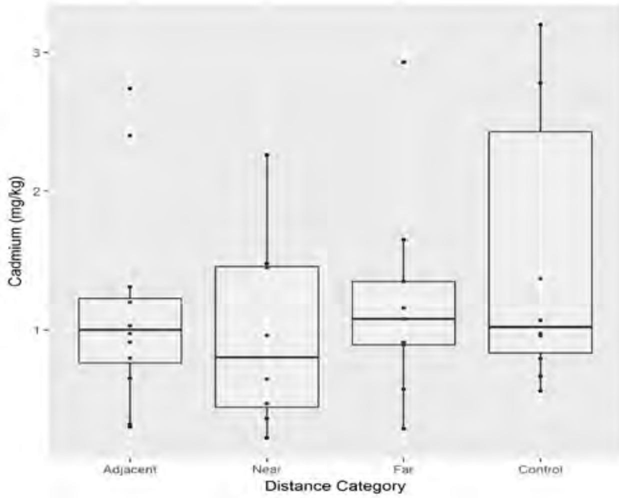


Figure 5-9. Cadmium concentrations in willow for the Coffee Area.

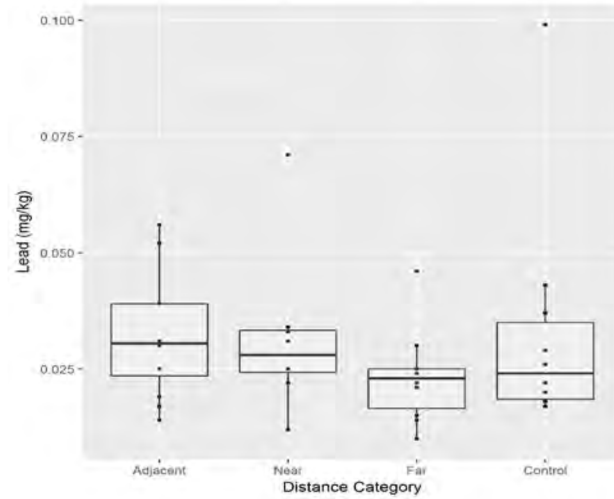


Figure 5-11. Lead concentrations in willow for the Coffee Area.

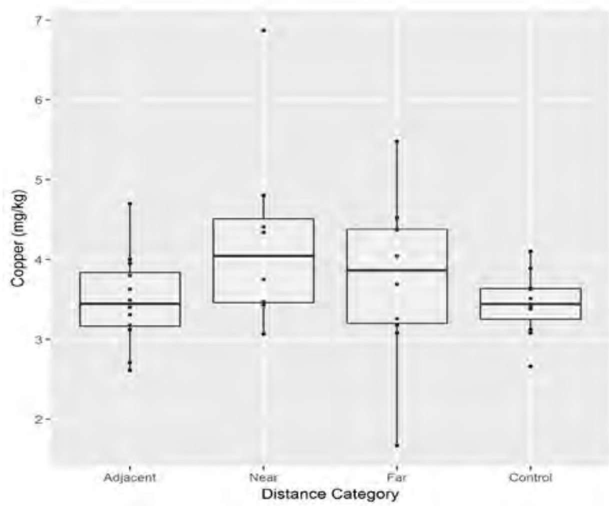


Figure 5-10. Copper concentrations in willow for the Coffee Area.

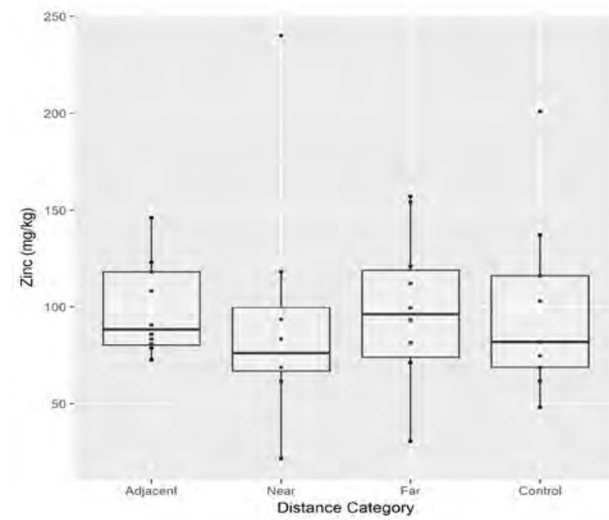


Figure 5-12. Zinc concentrations in willow for the Coffee Area.

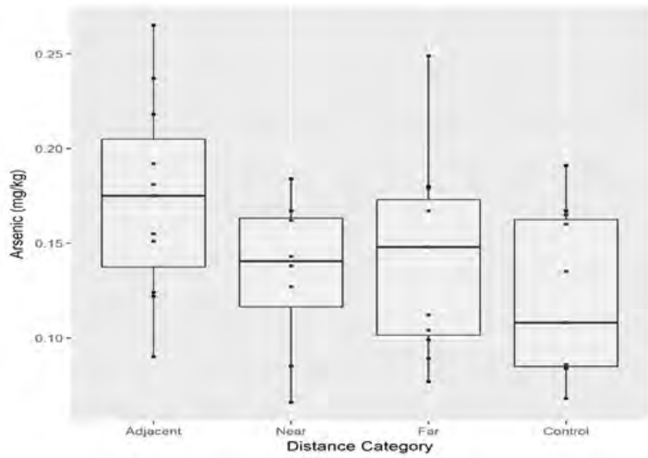


Figure 5-13. Arsenic concentrations in lichen for the Coffee Area.

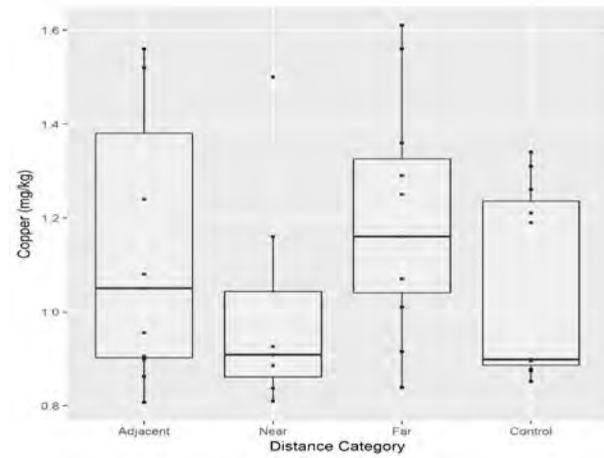


Figure 5-16. Copper concentrations in lichen for the Coffee Area.

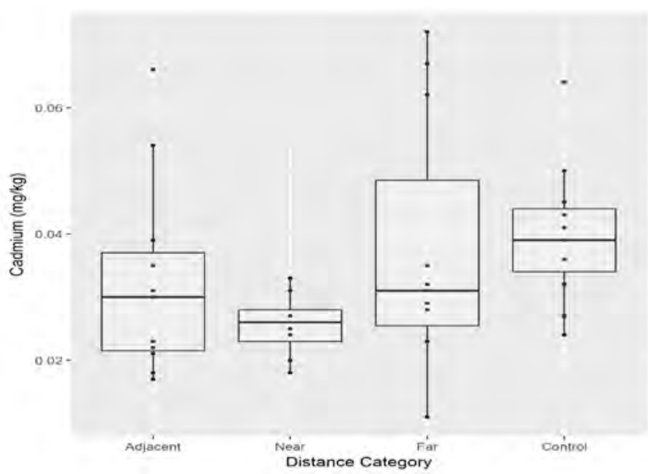


Figure 5-14. Cadmium concentrations in lichen for the Coffee Area.

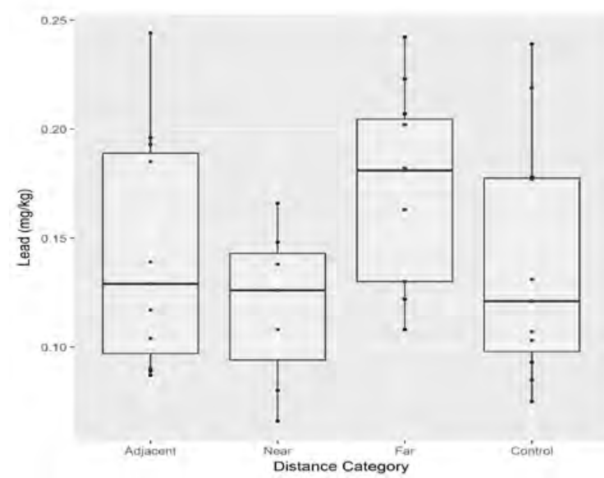


Figure 5-17. Lead concentrations in lichen for the Coffee Area.

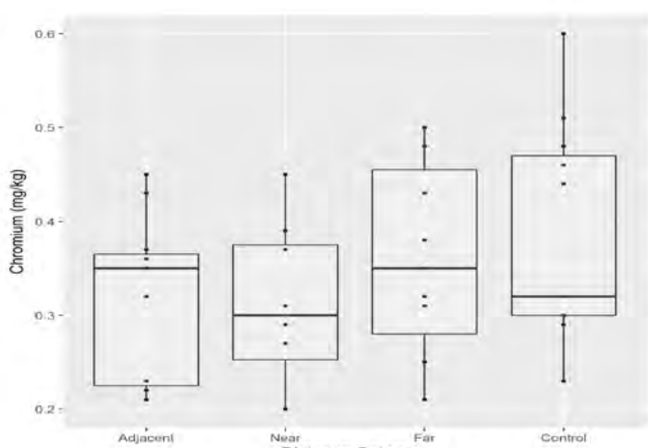


Figure 5-15. Chromium concentrations in lichen for the Coffee Area.

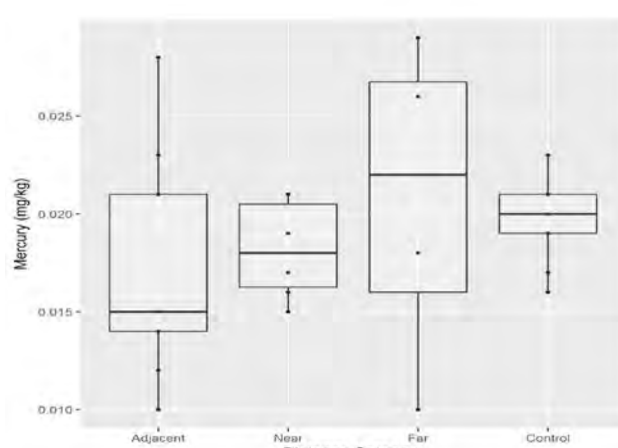


Figure 5-18. Mercury concentrations in lichen for the Coffee Area.

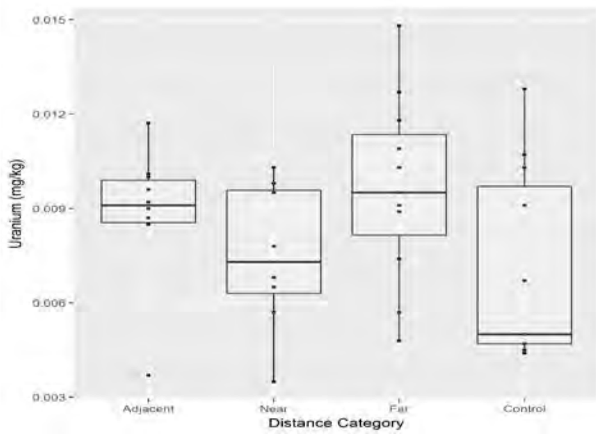


Figure 5-19. Uranium concentrations in lichen for the Coffee Area.

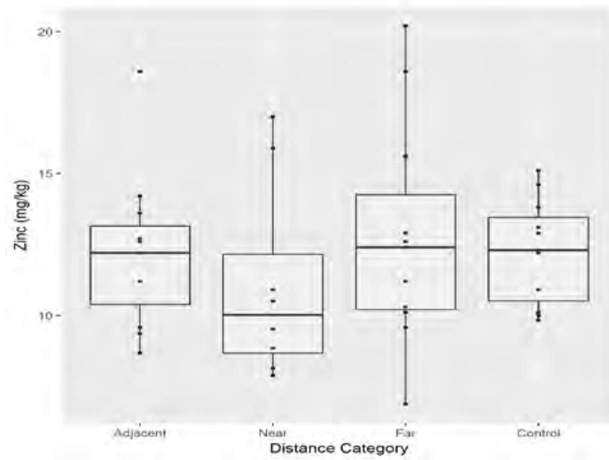


Figure 5-20. Zinc concentrations in lichen for the Coffee Area.

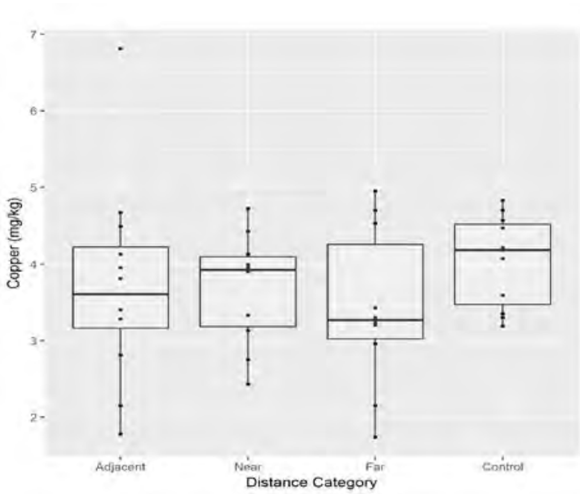


Figure 5-21. Copper concentrations in lowbush cranberry for the Coffee Area.

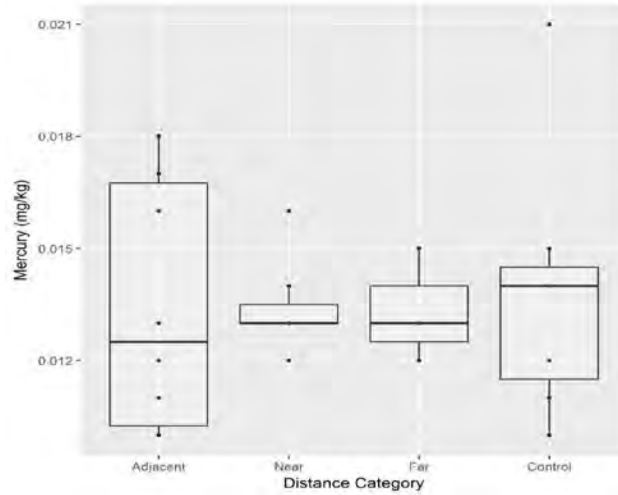


Figure 5-23. Mercury concentrations in lowbush cranberry for the Coffee Area.

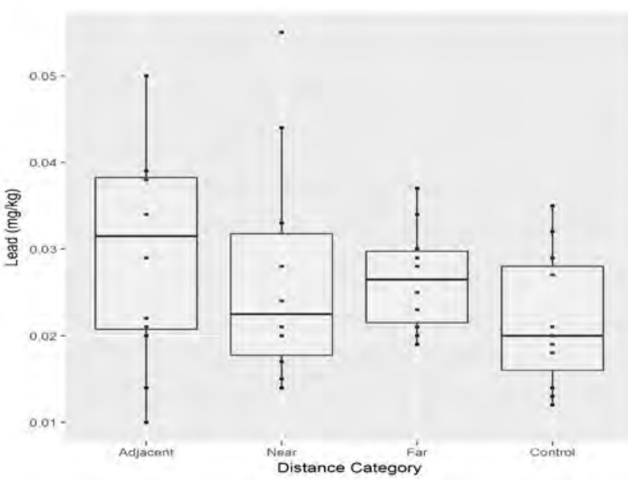


Figure 5-22. Lead concentrations in lowbush cranberry for the Coffee Area.

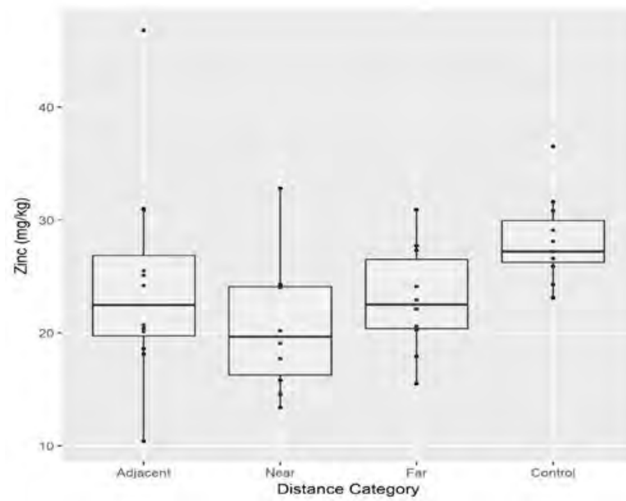


Figure 5-24. Zinc concentrations in lowbush cranberry for the Coffee Area.

5.2.1.1 Power Analysis

The results of the power analysis were used to revise the vegetation and soil trace metals study design in 2016 to improve statistical power to detect a change in median metal concentrations for CoPC in soil and vegetation. The power analysis determined that eight samples per distance category (adjacent (100 m), near (1000 m), far (5.5-7.5 km), and control (≥15 km)) would be sufficient to detect a change in median metal concentrations before exceeding the recommended threshold for most CoPC in soil and vegetation (Table 5-3).

Using the above sampling scheme, power to detect a change in median metal concentrations before exceeding the CCME Soil Quality guideline for industrial standards is possible for all CoPC, excluding arsenic in soil and zinc in willow. Based on 2014 sampling, there is no power to detect median metal concentrations of arsenic in soil before exceeding the threshold. Several samples were above the recommended threshold and it is unlikely that additional sampling will increase power to detect meaningful changes in metal concentrations. Similarly, 2014 sampling for zinc in willow presented an issue where power to detect a change in median metal concentration was low, due to 65% of the samples exceeding the baseline median zinc concentrations in willow (threshold for vegetation is 2014 baseline median plus two standard deviations).

Table 5-3. Results of the power analysis for trace metals in soil and vegetation

			Detectable Change			Threshold	
CoPC[1]	Substrate	Baseline Median[2]	Impacted Median[2]	Difference in Medians[2]	Percent Change (%)	CCME Ind[3]	Median +2 S.D.
Cu	Cranberry	2.670	5.073	2.403	190	25	5.19
Pb	Cranberry	0.027	0.075	0.048	280	20	0.09
Zn	Cranberry	15.678	28.221	12.542	180	100	28.95
As	Lichen	0.165	0.959	0.793	580	--	1.20
Cd	Lichen	0.031	0.062	0.031	200	30	0.07
Cr	Lichen	0.298	0.774	0.476	260	--	0.86
Cu	Lichen	1.463	2.926	1.463	200	15	3.00
Pb	Lichen	0.144	0.360	0.216	250	5	0.41
U	Lichen	0.007	0.029	0.021	390	--	0.03
Zn	Lichen	10.776	18.320	7.543	170	178	18.84
Cd	Willow	0.809	2.104	1.295	260	5	2.30
Cu	Willow	3.046	4.874	1.828	160	25	4.89
Pb	Willow	0.028	0.068	0.040	240	20	0.08
Zn	Willow	64.184	205.390	141.206	320	100	233.48
As	Soil	12.423	85.721	73.297	690	12	111.15
Cd	Soil	0.195	0.467	0.273	240	22	0.51
Cr	Soil	26.687	77.391	50.705	290	87	83.69
Cu	Soil	15.790	37.897	22.106	240	91	42.30
Pb	Soil	7.759	17.846	10.087	230	600	19.66
Zn	Soil	38.667	73.467	34.800	190	360	78.34

[1] CoPC with more than 50% of 2014 baseline samples above the RDL

[2] Total metals (units mg/kg dry weight) unless otherwise indicated

[3] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

5.2.2 NORTHERN ACCESS ROUTE AREA

A total of 12 sample sites were surveyed along the NAR in 2015 (Figure 5-25). Trace metals sampling along the NAR indicate low concentrations of all CoPC in soil with the exception of arsenic and zinc. Arsenic concentrations were above CCME soil quality guidelines at two sites (Table 5-4). Both sites were within 1000 m of existing anthropogenic disturbances. Zinc concentrations were well below CCME soil quality guidelines; however, two sites had higher than average concentrations and some of the highest recorded concentrations of zinc in soil across all sample sites. These sites also correspond to above average concentrations of zinc in willow (Table 5-4). Only four sites detected mercury and selenium above the RDL. pH was below the recommended range in nine (75%) samples at 100 m (adjacent) and 1000 m (near) distances from the proposed Project footprint. All other CoPC were well below CCME guidelines.

No CCME guidelines currently exist for trace metals in vegetation. All focal vegetation samples were below the RDL for selenium. Excluding selenium, all CoPC were detected in lichen at or below the average concentration across all sample sites. Similarly, all CoPC in lowbush cranberry were generally at or below the average concentration; a few lowbush cranberry samples were above the average concentration for copper, lead, zinc, and cadmium. In willow, zinc and cadmium were above the average concentration at two sites and were some of the highest concentrations for these metals across all sites. In contrast, zinc was average in lichen and just above average in lowbush cranberry. Cadmium was either below average or non-detect in lichen and lowbush cranberry. CoPC found at low concentrations or non-detect in willow and lowbush cranberry include arsenic, chromium, and uranium. Lichen samples had arsenic, chromium, and uranium; however, concentrations were at or below the average concentration across all sample sites. Mercury was low in all focal species of vegetation with average concentrations in lichen and lowbush cranberry and only one willow samples detect mercury above the RDL.

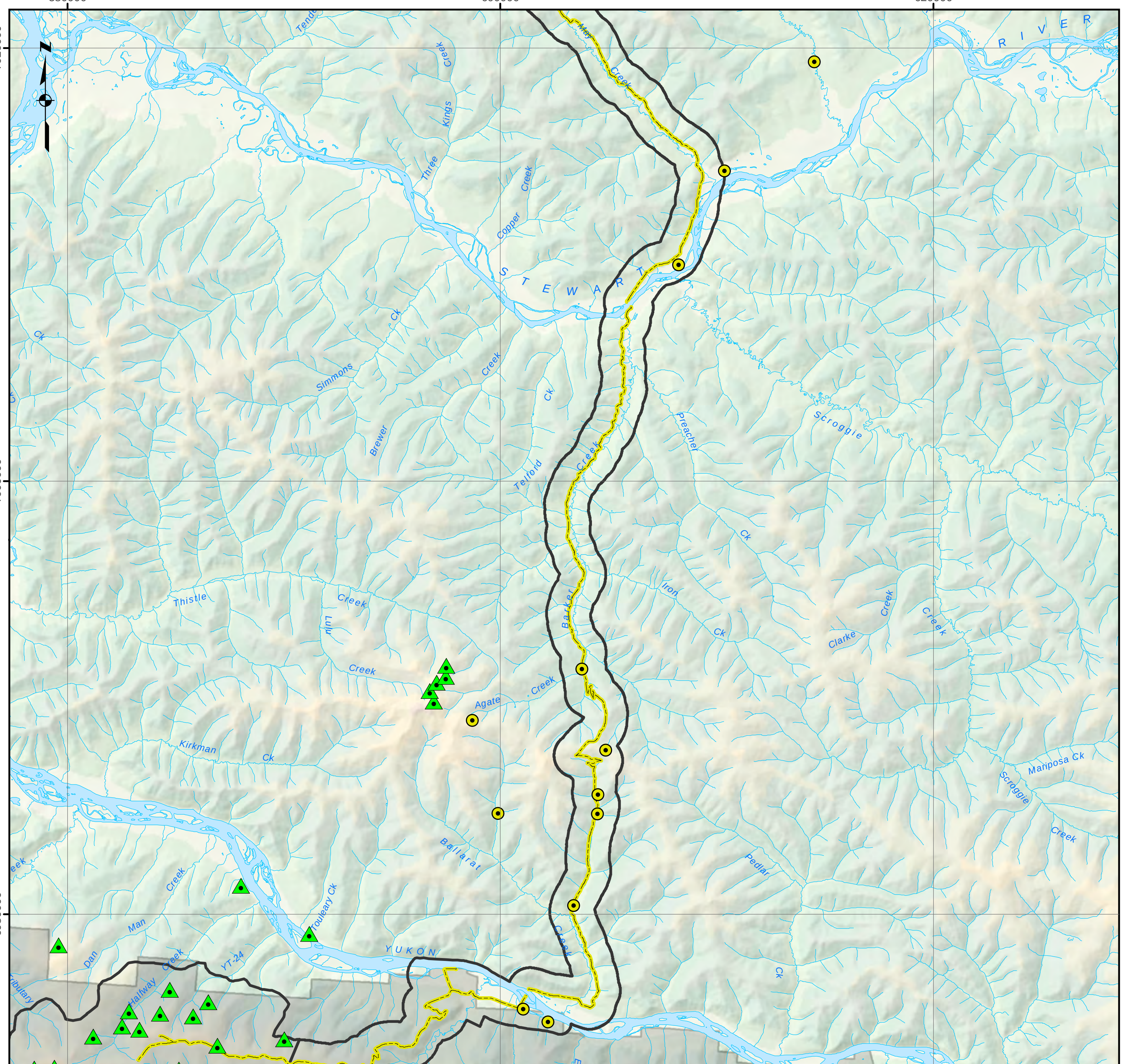
Further statistical analysis of trace metals along the NAR was not conducted due to insufficient sample size.

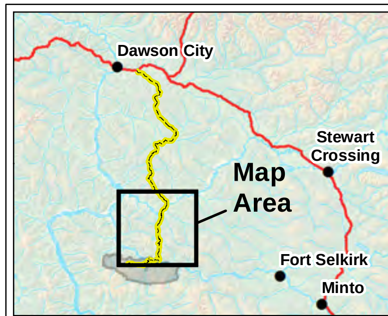
Table 5-4. Arsenic and zinc in soil and willow along the NAR, 2015

Parameter[1]	CCME Ind[2]	Site	Location	Metal Concentration (mg/kg dry weight) Soil	Metal Concentration (mg/kg dry weight) Willow
Arsenic	12	CCTM500	North shore of the Stewart River, near Maisy May Creek	17.7	--
		CCTM511	On the road between Barker Creek and Maisy May Creek	14.3	--
Zinc	360	CCTM500	North shore of the Stewart River, near Maisy May Creek	167	209
		CCTM511	On the road between Barker Creek and Maisy May Creek	133	267

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] Industrial soil quality guidelines provided by CCME





Legend

- Settlement/Community
- 2016 Trace Metals Sample Sites
- Trace Metal Sample Sites
- Proposed Route
- Coffee Property
- Local Study Area

FIGURE: 5-25

Trace metals sample sites along the Northern Access Route

Data Sources
Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

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5.3 DISCUSSION

Metals are common in the environment and can originate from both natural and anthropogenic sources (Spark 2005). Certain metals are essential for plant growth and development and can be safely consumed by wildlife and humans; however, at excessive concentrations these metals can become toxic to organisms. Other metals are non-essential for plant growth and development, which can affect vegetation health and survival (Sign *et al.* 2011). Plants play a significant role in the accumulation and transport of trace metals in the environment (Kabata-Pendias and Pendias 1984). Plants can uptake trace metals from soils, water, and air through fallout on the surface of leaves, shoots and/or root absorption. Native species have adaptations that allow them to survive in the environment where they are found; however, incremental additions of trace metals through anthropogenic sources such as dust emissions can pose a risk to vegetation through elevated metal concentrations in soil and vegetation tissues (Kabata-Pendias and Pendias 1984). Further, these plants have the potential to be ingested by wildlife and humans. Trace metals uptake in vegetation is largely dependent on factors such as plant species, soil type, soil texture, pH, reduction/oxidation potential, element solubility, and temperature which can affect the distribution, mobility, bioavailability, and speciation of certain metals (Sign *et al.* 2011).

Arsenic is a non-essential element for plants (Adriano 2001). Arsenic occurs as a component in complex ores that are commonly mined (CCME 1997). In Canada, gold ores are a known source of arsenic which explains the presence (27%) and above average concentration (20.2 mg/kg) of arsenic in baseline soil samples above CCME soil quality guidelines. These samples were mainly found within the adjacent (100 m) and near (1000 m) distance categories from the proposed Project footprint. Only soluble arsenic is available for plant uptake where solubility determines the amount of available arsenic (CCME 1997). The more soluble arsenic there is the more bioavailable it becomes for plant uptake. Speciation of arsenic determines the behaviour and the toxicity of arsenic. The amount of arsenic found in vegetation is rarely larger than the amount found in the associated soils (CCME 1997), and only some species of higher plants have recorded bioaccumulation of arsenic (Adriano 2001). During baseline sampling for the Coffee Project, lichen was the main focal plant with detectable concentrations of arsenic. Lowbush cranberry and willow had only one and three samples above the RDL. Arsenic transfer from plants and soil (mainly) to terrestrial mammals has been studied and found that direct ingestion was a major source of dietary arsenic in livestock (CCME 1997).

Cadmium is a non-essential element for plants (Adriano 2001). In Canada, background concentrations of cadmium in soil range from non-detectable (Whitby *et al.* 1978) to 8.1 mg/kg (Frank *et al.* 1986). Baseline cadmium concentrations in soil for the Coffee Project were low with an average of 0.28 mg/kg across all sites. For the Coffee Project, baseline samples detected low concentrations of cadmium in soil, lichen, and lowbush cranberry relative to willow. No soil samples were above CCME soil quality guidelines. The mobility of cadmium in soils is influenced by several processes, such as wind erosion, leaching, fluvial transport, and biotic uptake (CCME 1999a). Cadmium uptake by plants is not universal; instead it varies by species (CCME 1999a). Willow is a species of metal tolerance which can bioaccumulate in wildlife that consume willow (Gamberg 2000). Wildlife exposed to cadmium would most likely be from ingestion of forage and soil (CCME 1999a).

Chromium exists naturally in plant tissues; however, the necessity of chromium to plants is still unknown (CCME 1999b). In contrast, it is well known that chromium (III) is essential to animal nutrition (CCME 1999b). Whole plant concentrations of ≥ 3 mg/kg may indicate possible contamination; however, there are cases of plants growing in serpentine soils where chromium concentrations were as high as 100 mg/kg (Williams 1988; Brookes 1987). For the Coffee Project, average baseline chromium concentration in soil across all sites was 33 mg/kg. Four sites had chromium concentrations above CCME soil quality guidelines, indicating naturally high concentrations of chromium in the soil. The highest concentration in soil was detected at site CCTMRS-635 with 291 mg/kg. At the same site chromium was below the RDL in willow and lowbush cranberry, and below average concentration in lichen. Studies show that translocation of chromium in soils to plants is low; therefore, the amount of available chromium in edible portions of the plant are low, despite growing in soil with elevated chromium concentrations (CCME 1999b). Although studies on animal exposure to chromium from the soil are not available, wildlife exposed to elevated concentrations of chromium is likely from soil ingestion or food ingestion of prey other than vegetation (CCME 1999b).

Copper is an essential nutrient for plants and is required in low concentrations as a constituent in several plant enzymes (Adriano 2001). Copper is a natural component in the environment and concentrations vary widely with soil type, distance from natural ore sources and anthropogenic sources, bedrock, and parent material type (CCME1999c). Copper concentrations in the Cordilleran Region are known to contain the highest concentrations of copper in Canada at 46 mg/kg, although, concentrations can be up to 100 mg/kg (British Columbia Ministry of Environment 1992). For the Coffee Project, average baseline copper concentration in soil across all sites was 19 mg/kg. No soil samples were above the CCME guideline. Unlike other trace metals, copper binds to soil particles resulting in limited mobility (CCME 1999c). Beyond soils capacity to hold copper ions, leaching can occur. Bioaccumulation of copper in plants can occur, but is often on a small scale (CCME 1999c). Availability of copper is influenced by many factors such as soil pH, cation exchange capacity, and organic matter content (Adriano 1986). For examples, copper is more mobile and absorptive in soil at low pH and high cations exchange capacity (CCME 1999c). For the Coffee Project, baseline samples detected low concentrations of cadmium in focal plants relative to soil and no soil samples were above CCME soil quality guidelines; therefore, natural concentration of copper in baseline samples appears to be low.

Lead is a non-essential element for plants (CCME 1999d). For the Coffee Project, average baseline lead concentration in soil across all sites was 9.35 mg/kg, well below the CCME soil quality guideline of 600 mg/kg for lead considering industrial conditions. The amount of lead in soils depends first on the parent material naturally occurring in an area then anthropogenic input. The mobility of lead and uptake by plants is largely influenced by pH (Adriano 2001). For examples, low pH leads to higher mobility and availability of lead for uptake by plants (CCME 1999d). Uptake and accumulation of lead varies by plant species (Adriano 2001). High concentrations of lead in plants cause physical deformities such as stunted growth, blackened roots, and discoloring leaves and toxic concentration reduce photosynthesis, transpiration rates, and lower chlorophyll production to the point of necrosis (CCME 1999d). For the Coffee Project, baseline samples detected low concentrations of lead in focal plants relative to soil and soil lead concentrations were low compared to CCME guidelines. Lead toxicity in terrestrial organisms has been well studied and concludes that lead bioaccumulates in the food chain; exposure is mainly through ingestion, drinking water, or inhalation (CCME 1999d).

Mercury is a non-essential element for plants (Adriano 2001). Across Canada, the average concentration of mercury in the terrestrial environment is from 0.01 to 0.4 mg/kg except in areas of ore deposits, spills, landfills, and some metal-processing plants (Jonasson and Boyle 1972; Gracey and Stewart 1974; McKeague and Kloosterman 1974; Environment Canada 1979; OMEE 1994). Due to the presence of ore deposits at the Coffee Project, average baseline lead concentrations in soil were higher (0.09 mg/kg) than the Canadian average. The lowest soil concentrations where toxic effects of mercury in plants has been observed are 7 and 8 mg/kg, which resulted in a 50% reduction of turnip blooms (Sheppard et al. 1993). Major soil factors that influence the mobility and availability of mercury in soil include pH, organic matter, cation exchange capacity, redox potential, clay content, and soil texture (CCME 1999e). For example, mercury is more available for uptake at low pH and in high organic matter. For the Coffee Project, baseline samples detected low concentrations of mercury in focal plants and soil. No soil samples were above CCME soil quality guidelines; therefore, natural concentration of mercury in baseline samples appears to be low.

The role of selenium in plant growth and development is unknown (CCME 2009). A Canadian study representing all provinces and territories (except Manitoba) of 53 sites across a variety of soil types, found that background selenium concentrations ranged from 0.03 to 2 mg/kg with an average of 0.26 mg/kg (McKeague and Wolynetz 1980). A study from eastern Yukon found that vegetation grown on soils with underlying Paleozoic shales (seleniferous soils) contains selenium concentrations averaging 0.8 to 2.9 mg/kg (Fletcher *et al.* 1973). In contrast, vegetation grown on adjacent non-seleniferous soils was found to have selenium concentrations of less than 0.5 mg/kg. For the Coffee Project, average baseline selenium concentration in soil across all sites was 0.85 mg/kg indicating a higher average concentration, but this is still well below CCME soil quality guidelines and the upper range of selenium concentrations found in Canada. Similar to other metals, the mobility and availability of selenium is dependent on the form and concentration in the soil, as well as soil characteristics such as pH, organic matter, clay content, and soil type and texture (CCME 2009). Specifically, the oxidation state of selenium is dependent on these soil characteristics and under well-oxidized and high pH conditions selenium is more soluble and uptake by plants is possible. For the Coffee Project, baseline selenium concentrations were not detect in lichen, only one was above the RDL in lowbush cranberry, and three were above RDL in willow. Bioaccumulation of selenium appears to be possible in terrestrial organisms (CCME 2009). Although it is require by higher organisms in small doses, it can become toxic in greater quantities (Lemly 1997).

Uranium is not known to be essential for plants; however, there is some evidence that suggests plant growth is stimulated when exposed to uranium at low concentrations (Meyer *et al.* 1998; Gulati *et al.* 1980). These studies are limited to southern and mainly agronomic species. Uranium occurs naturally in the environment originating from mantle rocks and is released by weathering and erosion (CCME 2007). The average background concentration of uranium in surface soil across Canada is reported to be approximately

2 mg/kg (NCRP 1984). For the Coffee Project, baseline concentrations of uranium in soil averaged 1.99 mg/kg and concentrations in focal plants was very low (0.01 mg/kg) or below RDL, indicating normal concentrations. Uranium does not bioaccumulate in plants to a large degree (CCME 2007); therefore, uranium transfer to terrestrial mammals at present is low.

Zinc is an essential element for plants and is required in small amount to support biological processes in both plants and wildlife (CCME 1999f; Adriano 2001). Zinc concentrations in the Cordilleran Region average 73 mg/kg (McKeague and Wolynetz 1980). For the Coffee Project, baseline zinc concentrations in soil across all sites was 45.7 mg/kg; no soil samples were above the CCME guideline. In focal plants, the average zinc concentration was higher in willow (109.6 mg/kg) than lichen (12 mg/kg) and lowbush cranberry (23.8 mg/kg) and overall zinc was higher in willow than soil. Similar to cadmium in willow, this may be explained by species specific adaptions whereby willow can tolerate high concentrations of some metals. Zinc mobility and availability in soils is largely influenced by soil pH (Shuman 1975; Evans 1989; Duquette and Hendershot 1990; Davis-Carter and Shuman 1993). In low pH soils (below pH 5), zinc is more mobile and available for plant uptake (Duquette and Hendershot 1990). Although zinc can be toxic at high concentrations the required amount of zinc for wildlife growth and development depends on the site conditions in its natural environment (CCME 1999f).

CCME soil quality guidelines recommend a pH range of 6–8. More than half of the baseline samples (79%) were below this recommended range. Of these 71 samples all had a pH between 4 and 6. Four sites had a pH between 7 and 8. The normal pH range for highly productive soils is from 5.5 to 8, but can extend from 4 to 9 for all soils in the general environment (Langmuir *et al.* 2004). Soil with a pH outside of the identified range can affect the bioavailability of certain metals. Low pH can cause toxicity in soil and vegetation, due to greater bioavailability of certain metals (Chaney and Ryan 1993; Langmuir *et al.* 2004). It is known that acidic soils increase plant uptake of some metals such as zinc and cadmium and increase the potential for phytotoxicity (Chaney and Ryan 1993). Alternatively, alkaline soil pH increases the uptake of selenium.

In conclusion, trace metal concentrations in soils were low compared to CCME guidelines with the exception of arsenic and chromium. Arsenic samples above CCME guidelines were generally found within close proximity to the proposed mine site. Chromium samples above CCME guidelines were found close to the proposed mine site and at control sites ≥15 km relative to the proposed Project footprint. Few soil samples reported mercury and selenium above the RDL.

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APPENDIX A. LIST OF PLANT SPECIES OBSERVED DURING VEGETATION BASELINE SURVEYS

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List of plant species observed during baseline vegetation surveys in Coffee Project LSA, 2014-2016

Scientific name[1]	Common name[2]	Synonym[3]	Type
Abies lasiocarpa (Hook.) Nutt	subalpine fir		Tree
Abietinella abietina (Hedw.) Fleisch.	fir / prickly tamarisk-moss	*Thuidium abietinum* / *T. histricosum*	Moss
Achillea alpina L.	Siberian yarrow		Forb
Achillea millefolium L. s.l	common yarrow		Forb
Aconitum delphiniifolium DC.	northern monkhood		Forb
Aconogonon alaskanum (Small) Soják	Alaska wild-rhubarb	*Polygonum alaskanum* Wight ex Hulten	Forb
Actaea rubra (Aiton) Willd.	red baneberry		Shrub
Agrostis scabra Willd.	ticklegrass		Graminoid
Alectoria ochroleuca (Hoffm.) A. Massal.	two-toned witch's hair		Lichen
Alectoria sp.			Lichen
Alnus incana (Linnaeus) Moench	grey alder	*Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung	Shrub
Alnus viridis (Chaix) de Candolle	green alder	*Alnus crispa* (Drylander ex Ait.) Pursh ssp. *crispa*	Shrub
Amerorchis rotundifolia (Banks ex Pursh) Hulten	roundleaf orchid		Forb
Andromeda polifolia L.	bog-rosemary		Shrub
Androsace septentrionalis L.	pygmy-flower rock-jasmine		Forb
Anemone drummondii S. Wats. var. *lithophila* (Rydb.) C.L. Hitchc.	alpine anemone		Forb
Anemone multifida Poir.	cut-leaved anemone		Forb
Anemone parviflora Michx.	northern anemone		Forb
Anemone patens var. *multifida* Pritz.	pasqueflower	*Pulsatilla ludoviciana* (Nutt.) Heller	Forb
Anemone richardsonii Hook.	yellow anemone		Forb
Antennaria rosea Greene	rosy pussytoes		Forb
Anthoxanthum monticola (Bigelow) Veldkamp	alpine sweetgrass	*Hierochloe alpina* (Sw.) R. & S. ssp. *alpina*	Graminoid
Anticlea elegans var. *elegans* (Pursh) Rydb.	mountain death camas / elegant camas		Forb
Apocynum androsaemifolium L.	spreading dogbane		Forb
Aquilegia brevistyla Hook.	small-flower columbine		Forb
Arabidopsis lyrata ssp. *kamchatica* (Fisch. ex DC) O'Kane & Al-Shehbaz	Kamchatka rockcress	*Arabis kamchatica* (Fisch. ex DC.) Ledeb.	Forb

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Arctagrostis latifolia (R. Br.) Griseb.	polar grass		Graminoid
Arctostaphylos uva-ursi (L.) Spreng.	common bearberry/ kinnikinnick		Shrub
Arctous alpina (L.) Niedenzu	alpine bearberry		Shrub
Arctous rubra (Rehder & E.H. Wilson) Nakai	red bearberry	*Arctostaphylos rubra* (Linnaeus) Sprengel.	Shrub
Arnica griscomii ssp. *frigida* Fernald	snow arnica		Forb
Artemisia campestris L.	field sagewort		Forb
Artemisia frigida Willd.	fringed sage, prairie sagewort		Forb
Artemisia norvegica ssp. *saxatilis* Fries	mountain sagewort		Forb
Artemisia rupestris L.	Rock wormwood	*Absinthium viridifolium* var. *rupestre (Linnaeus) Besser*	Forb
Artemisia tilesii Ledeb.	alteutian mugwort		Forb
Aster sp.			Forb
Astragalus alpinus L.	alpine milk-vetch		Forb
Astragalus eucosmus B.L. Rob.	threadstalk milk-vetch	*Astragalus eucosmus* Robins. ssp. *eucosmus*	Forb
Astragalus laxmannii Jacq.	laxmann's milk-vetch	*Astragalus adsurgens* Pall. ssp. *viciifolius* (Hulten) Welsh	Forb
Astragalus williamsii Rydb.	Williams' milkvetch		Forb
Aulacomnium palustre (Hedw.) Schwaegr.	glow moss		Moss
Aulacomnium sp.			Moss
Aulacomnium turgidum (Wahlenb.) Schwaegr	swollen thread-moss		Moss
Barbarea orthoceras Ledeb.	winter cress		Forb
Barbilophozia sp.			Moss
Betula glandulosa Michx.	dwarf birch / scrub birch / shrub birch		Shrub
Betula neoalaskana Sarg.	alaska paper birch		Tree
Betula occidentalis Hook.	water birch		Shrub
Betula papyrifera Marshall	paper birch		Tree
Bistorta plumosa (Small) Greene	pink plumes / meadow bistort		Forb
Bistorta vivipara (L.) Delarbre	alpine bistort		Forb
Boechera retrofracta Graham	dangling suncress		Forb
Boechera spp.	boechera species		Forb
Boschniakia rossica (Chan. & Schlecht.) Fedtsch.	ground cone / broom rape		Forb

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Brachytheciastrum sp.			Moss
Brachythecium sp.	brachythecium moss		Moss
Bromus inermis Leyss.[5]	smooth brome		Graminoid
Bromus pumpellianus Scrib. var. *pumpellianus*	pumpelly brome		Graminoid
Bryocaulon divergens (Ach.) Karnef.			Lichen
Bryophyte sp.			Moss
*Bupleurum americanum*J.M. Coult. & Rose	american thorow wax		Forb
Calamagrostis canadensis (Michx.) P. Beauv.	bluejoint reedgrass		Graminoid
Calamagrostis purpurascens R. Br.	purple reed grass		Graminoid
Calla palustris L.	wild calla		Aquatic
Calliergon giganteum (Schimp.) Kindb.	giant water moss		Moss
Calliergon sp.			Moss
Callitriche palustris L.	vernal water-starwort	*Callitriche verna* L.	Aquatic
Calypso bulbosa (L.) Oakes	calypso / fairy-slipper		Forb
Campanula lasiocarpa Cham.	alpine harebell / bellflower		Forb
Campanula uniflora L.	Arctic harebell / one-flowered harebell		Forb
Capsella bursa-pastoris (L.) Medik.[5]	shepherd's-purse		Forb
Caragana arborescens Lam. [5]	Siberian peashrub		Shrub
Cardamine oligosperma Nutt.	few-seed bitter-cress		Forb
Cardamine pensylvanica Muhl. ex Willd.	Pennsylvania bitter-cress		Forb
Carex aquatilis Wahlenb.	water sedge		Graminoid
Carex atherodes Spreng.	awned sedge		Graminoid
Carex bigelowii ssp. *lugens* (T. Holm) T.V. Egorova	bigelow's sedge	*Carex lugens* Holm, *C. consimilis* Holm	Graminoid
Carex brunnescens (Pers.) Poir.	brownish sedge		Graminoid
Carex canescens L.	silvery sedge		Graminoid
Carex concinna R. Br.	Low northern sedge		Graminoid
Carex crawfordii Fern.	crawford sedge		Graminoid
Carex deflexa Hornem.	short-stemmed sedge		Graminoid
Carex diandra Schrank	lesser-paniocled sedge		Graminoid
Carex disperma Dewey	softleaf sedge		Graminoid
Carex franklinii Boott	rock dwelling sedge		Graminoid

Scientific name[1]	Common name[2]	Synonym[3]	Type
Carex lugens Holm	stiff sedge		Graminoid
Carex macloviana d'Urv.	Falkland Island sedge		Graminoid
Carex media R. Br.	Scandinavian sedge		Graminoid
Carex membranacea Hook.	shiner sedge		Graminoid
Carex pellita Willd.	wooly sedge		Graminoid
Carex podocarpa R.Br.	graceful mountain sedge		Graminoid
Carex praticola Rydb.	meadow sedge		Graminoid
Carex saxatilis L.	russet sedge		Graminoid
Carex scirpoidea Michx.	single-spike sedge		Graminoid
Carex siccata Dewey[4]	dry-spike sedge	*Carex foenea* Willd.	Graminoid
Carex sp.	sedge		Graminoid
Carex tenuiflora Wahlenb.	sparse-flowered sedge		Graminoid
Carex utriculata Boott	beaked sedge		Graminoid
Cassiope mertensiana (Bong.) D.Don	white mountain heather		Shrub
Cassiope tetragona (L.) D. Don	arctic white heather		Shrub
Castilleja raupii Pennell	raup's paintbrush		Forb
Cerastium beeringianum Cham. & Schlecht.	bering mouse-ear chickweed		Forb
Cerastium maximum L.	great mouse-ear chickweed		Forb
Ceratodon purpureus (Hedw.) Brid.	fire-moss		Moss
Cetraria ericetorum Opiz	hyphenated Iceland moss		Lichen
Cetraria islandica (L.) Ach.	true Iceland lichen		Lichen
Cetraria sp.			Lichen
Chamaedaphne calyculata (L.) Moench	leatherleaf		Shrub
Chamerion angustifolium ssp. *angustifolium* (L.) Holub	fireweed	*Epilobium angustifolium* L. s.I.	Forb
Chamerion latifolium (L.) Holub	river beauty	*Epilobium latifolium* L.	Forb
Chenopodium album L.[5]	lamb's quarters		Forb
Chenopodium capitatum L.	goosefoot		Forb
Cicuta virosa L.	European water-hemlock		Forb
Circaea alpina L.[4]	small enchanter's nightshade		Forb
Cladina mitis (Sandst.) Hustich	green reindeer lichen		Lichen
Cladina rangiferina (L.) Nyl.	gray reindeer lichen		Lichen

Scientific name[1]	Common name[2]	Synonym[3]	Type
Cladina sp.			Lichen
Cladina stellaris (Opiz) Brodo	star-tipped reindeer lichen		Lichen
Cladonia arbuscular ssp mitis (Sandst.) Ruoss			Lichen
Cladonia crispata (Ach.) Flotow	cup lichen		Lichen
Cladonia gracilis (L.) Willd.	pixie		Lichen
Cladonia multiformis G. Merr.	shape-shifting pixie		Lichen
Cladonia sp.			Lichen
Claytonia sarmentosa C.A.Mey.	spring beauty		Forb
Climacium dendroides (Hedw.) F. Weber & D. Mohr	tree climacium moss		Moss
Cnidium cnidiifolium (Turcz.) Schischk.	northern hemlock-parsley	*Conioselinum cnidiifolium* (Turcz.) A.E. Porsild	Forb
Comarum palustre L.	marsh cinquefoil	*Potentilla palustris* (L.) Scop.	Forb
Conocephalum conicum (L.) Lindb	snake liverwort		Liverwort
Coptidium lapponicum (L.) Gandog.	Lapland-crowfoot		Forb
Corallorhiza trifida Chatelain	northern coral root		Forb
*Cornus canadensis*L.	bunchberry		Forb
Cornus sericea ssp. *sericea* L.	red-osier dogwood	*Cornus stolonifera* Michx.	Shrub
Crepis tectorum L. [5]	narrow-leaf hawksbeard		Forb
Cypripedium guttatum Sw. [4]	spotted lady's slipper		Forb
Cypripedium sp.	hardy orchid species		Forb
Cystopteris fragilis (L.) Bernh.	fragile fern		Fern and Fern Allies
Cystopteris montana (Lam.) Bernh.	mountain bladder fern		Fern and Fern Allies
Dactylina arctica (Richardson) Nyl.	butterfingers		Lichen
Dasiphora fruticosa (L.) Rydb.	shrubby cinquefoil	Potentilla fruticosa ssp. *floribunda* (Pursh) Elkington	Shrub
Delphinium glaucum S. Wats.	mountain larkspur / tall delphinium		Forb
Deschampsia caespitosa (L.) P. Beauv.	tufted hairgrass		Graminoid
Descurainia sophioides (Fisch. ex Hook.) O.E. Schulz	northern tansy-mustard		Forb
Dicranum sp.	dicranum moss		Moss
Diphasiastrum alpinum (L.) Holub	alpine clubmoss	*Lycopodium alpinum* L.	Fern and Fern

Scientific name[1]	Common name[2]	Synonym[3]	Type
			Allies
Diphasiastrum complanatum (L.) Holub	northern running-pine		Fern and Fern Allies
Dodecatheon frigidum Cham. & Schltdl	western arctic shootingstar		Forb
Draba fladnizensis Wulfen	austrian draba, arctic draba		Forb
Dracocephalum parviflorum Nutt.	american dragonhead		Forb
Drepanocladus sp.	drepanocladus moss		Moss
Drosera rotundifolia L.	roundlfeaf sundew		Forb
Dryas ajanensis Juz.	white dryad		Shrub
Dryas alaskensis A.E. Porsild	alaskan mountain-avens	Dryas octopetala L. ssp. *alaskensis* (A.E. Porsild) Hulten	Shrub
Dryas hookeriana Juz.	white mountain-avens		Shrub
Dryas integrifolia Vahl	entire-leaved mountain-avens		Shrub
Dryas sp.			Shrub
Dryopteris fragrans (L.) Schott	fragrant wood fern		Fern and Fern Allies
Elymus repens (L.) Gould[5]	quackgrass		Graminoid
Elymus trachycaulus (Link) Gould ex Shinners	slender wheatgrass		Graminoid
Empetrum nigrum L. ssp. *hermaphroditum* (Lge.) Böcher	crowberry / mossberry		Shrub
Epilobium anagallidifolium Lam.	willowherb / fireweed		Forb
Epilobium ciliatum Raf.	fringed willowherb		Forb
Equisetum arvense L.	field horsetail		Fern and Fern Allies
Equisetum fluviatile L.	river horsetail		Fern and Fern Allies
Equisetum pratense Ehrh.	meadow horsetail		Fern and Fern Allies
Equisetum scirpoides Michx.	dwarf scouring rush		Fern and Fern Allies
Equisetum sylvaticum L.	wood horsetail		Fern and Fern Allies
Equisetum variegatum Schleicher	variegated scouring rush		Fern and Fern Allies

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Erigeron acris var. kamtschaticus (DC.) Herder	bitter fleabane	*Erigeron acris* ssp. *politus* (Fries) Schniz & Keller	Forb
Erigeron caespitosus Nutt.	tufted fleabane		Forb
Erigeron compositus Pursh	dwarf mountain fleabane		Forb
Erigeron glabellus Nutt. ssp. *pubescens* (Hook.) Cronq.	streamside fleabane		Forb
Eriophorum angustifolium Honck.	tall cottongrass		Graminoid
Eriophorum brachyantherum Trautv. & C.A. Mey.	northland cottonsedge		Graminoid
Eriophorum chamissonis C.A. Mey.	Chamisso's cottongrass		Graminoid
Eriophorum sp.			Graminoid
Eriophorum vaginatum L.	cotton grass		Graminoid
Erysimum cheiranthoides L.	wormseed mustard		Forb
Erysimum coarctatum Fernald	small-flower prairie wallflower		Forb
Euphrasia subarctica Raup	Arctic eyebright		Forb
Eurhynchiastrum pulchellum	elegant feathermoss	*Eurhynchium pulchellum* (Hedw.) Jenn.	Moss
Eurybia sibirica (L.) G. L. Nesom	arctic aster		Forb
Festuca altaica Trin.	northern rough fescue		Graminoid
Festuca saximontana var. *saximontana* Rydb.	northern rough fescue		Graminoid
Festuca sp.			Graminoid
Flavocetraria cucullata (Bellardi) Karnefelt & Thell	whirling dervish		Lichen
Flavocetraria nivalis (L.) Karnefelt & Thell	ballroom dervish		Lichen
Flavocetraria spp.			Lichen
Fragaria virginiana Duchesne	wild strawberry		Forb
*Galium boreale*L.	northern bedstraw		Forb
Galium trifidum L.	small bedstraw		Forb
Gentianella amarelle (L.) Borner	felwort		Forb
Gentianella propinqua (Richards.) J.M.Gillett	four petalled gentian		Forb
Gentianella propinqua ssp. *propinqua* (Richardson) J.M. Gillett	fourpart dwarf gentian		Forb
Geocaulon lividum (Richards.) Fern.	false toadflax		Forb
Geranium erianthum DC.	woolly geranium		Forb
Geum macrophyllum ssp. *perincisum* (Rydb.) Hult.	large-leaved avens		Forb

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Glyceria grandis S. Watson	tall mannagrass		Graminoid
Glyceria sp.			Graminoid
Goodyera repens (L.) R.Br.	northern rattlesnake plantain		Forb
Gymnocarpium jessoense (Koidzumi) Koidzumi	northern oak fern		Fern and Fern Allies
Hedysarum alpinum L.	liquorice root / bear root		Forb
Hedysarum boreale Nutt. ssp. *mackenzii* (Richards.) Welsh	northern hedysarum		Forb
Heracleum maximum Bartram	cow-parsnip		Forb
Hieracium umbellatum L.	umbellate hawkweed		Forb
Hordeum jubatum L.	foxtail		Graminoid
Huperzia haleakalae (B.) Holub	alpine fir-moss	*Lycopodium selago* L.	Fern and Fern Allies
Huperzia selago (L.) Bernh. ex Schrank & Mart.	fir clubmoss		Fern and Fern Allies
Hylocomium splendens (Hedw.) B.S.G.	step moss		Moss
Icmadophila ericetorum (L.) Zahlbr.	spraypaint lichen		Lichen
Juncus biglumis L.	two-flowered rush		Graminoid
Juncus castaneus Sm.	chestnut rush		Graminoid
Juncus drummondii E. Mey.	drummond rush		Graminoid
Juniperus communis L.	common juniper		Shrub
Linnaea borealis ssp. *americana*(Forbes) Hultén ex R.T. Clausen	twinberry	*Linnaea borealis* L. ssp. *americana* (Forbes) Hulten var. americana (Forbes) Rehd.	Shrub
Lupinus arcticus S. Watson	arctic lupin		Forb
Luzula arctica Blytt	arctic wood rush		Graminoid
Luzula confusa Lindeb.	northern wood rush		Graminoid
Luzula parviflora (Ehrh.) Desv.	small-flowered wood rush		Graminoid
Luzula rufescens Fisch. ex E. Mey.	hairy wood rush		Graminoid
Lycopodium annotinum L.	bristly club-moss		Fern and Fern Allies
Lycopodium clavatum L.	common club-moss		Fern and Fern Allies
Lycopodium sp.			Fern and Fern

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			Allies
Maianthemum sp.			Forb
Marchantia polymorpha L.	green-tongue lichen		Liverwort
Masonhalea richardsonii (Hook.) Karnefelt	arctic tumbleweed		Lichen
*Matricaria discoidea*DC. [5]	pineapple weed	*Matricaria matricariodes* (Less.) Porter	Forb
Melanelia sp.			Lichen
Melilotus albus Medik. [5]	white sweetclover		Forb
Melilotus officinalis (L.) Pall. [5]	yellow sweetclover		Forb
Menyanthes trifoliata L.	buckbean		Forb
Mertensia paniculata (Aiton) G. Don	tall bluebells		Forb
Micranthes nelsoniana var. *nelsoniana (D. Don) Small*	dotted saxifrage	*Saxifraga nelsoniana* D. Don ssp. *nelsoniana*	Forb
Micranthes nivalis (L.) Small	alpine saxifrage	*Saxifraga rufopilosa* (Hultén) A.E. Porsild	Forb
Micranthes reflexa (Hook.) Small	reflexed saxifrage	*Saxifraga reflexa* Hook.	Forb
Minuartia dawsonensis (Britt.) House	rock stitchwort		Forb
Minuartia obtusiloba (Rydb.) House	twin-flower sandwort		Forb
Mitella nuda L.	naked mitrewort		Forb
Mnium sp.			Moss
Moehringia lateriflora (L.) Fenzl	blunt-leaved sandwort		Forb
Moneses uniflora (L.) A. Gray	single delight		Forb
Myosotis asiatica (Vestergr.) Schischk. & Serg	mountain forget-me-not	*Myosotis alpestris* Schm. ssp. *asiatica* Vestergr.	Forb
Nephroma arcticum (L.) Torss.	arctic kidney lichen		Lichen
Nephroma sp.			Lichen
Orthilia secunda (L.) House	one-sided wintergreen		Forb
Oxytropis campestris (L.) DC	field locoweed		Forb
Oxytropis nigrescens (Pall.) Fisch.	blackish crazyweed		Forb
Oxytropis sp.			Forb
Paludella squarrosa (Hedw.) Brid.	angled paludella moss		Moss
Papaver lapponicum (Tolm.) Nordh.	Lapland poppy		Forb
Papaver radicatum Rottb.	arctic poppy		Forb
Parmelia spp.	shield lichens		Lichen

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Parmeliopsis sp.			Lichen
Parnassia palustris L.	northern grass-of-parnassus / bog star		Forb
Parrya nudicaulis L.	northern parrya		Forb
Pedicularis capitata M.F. Adams	capitate lousewort		Forb
Pedicularis labradorica Wirsing	labrador lousewort		Forb
Pedicularis lanata Cham. & Schltdl	woolly lousewort		Forb
Pedicularis langsdorffii Fisch.	Langsdorf's lousewort		Forb
Pedicularis lapponica L.	Lapland lousewort		Forb
Pedicularis sp.	lousewort		Forb
Peltigera aphthosa (L.) Willd.	common freckle pelt		Lichen
Peltigera canina (L.) Willd.	dog-lichen		Lichen
Peltigera neopolydactyla (Gyelnik) Gyelnik	frog pelt/finger felt lichen		Lichen
Peltigera sp.			Lichen
Penstemon gormanii Greene	gorman's beardtongue		Forb
Persicaria amphibia (L.) S.F. Gray	water smartweed / water knotweed		Forb
Petasites frigidus (L.) Fries s.l.	arctic sweet coltsfoot		Forb
Petasites saggitatus (Banks ex Pursh) Gray	arrowleaf		Forb
Phacelia mollis J.F. Macbr. [4]	Coffee Creek scorpionweed		Forb
Phleum pratense L.	timothy		Graminoid
Picea glauca (Moench) Voss	white spruce		Tree
Picea mariana (Mill.) Britton, Sterns & Poggenb.	black spruce		Tree
Pinguicula villosa L.	butterwort		Forb
Plantago major L. [5]	common plantain		Forb
Platanthera aquilonis Sheviak	northern green rein orchid		Forb
Platanthera dilatata (Pursh) Lindl.	tall white bog orchid		Forb
Platydictya jungermannioides (Brid.) H.A. Crum	Jungermann's platydictya moss		Moss
Pleurozium schreberi (Brid.) Mitt.	red-stem feathermoss		Moss
Poa alpina L.	alpine blue grass		Graminoid
Poa arctica ssp. *arctic* R. Br.	arctic bluegrass		Graminoid
Poa glauca Vahl	glaucous bluegrass		Graminoid
Poa interior Rydb.	Interior bluegrass, inland bluegrass		Graminoid

Scientific name[1]	Common name[2]	Synonym[3]	Type
Poa palustris L.	fowl bluegrass		Graminoid
Poa pratensis ssp. *pratensis* [5]	Kentucky bluegrass		Graminoid
Poa sp.	blue grass		Graminoid
Polemonium acutiflorum Willd. ex Roem. & Schult.	tall Jacob's-ladder		Forb
Polemonium boreale M.F. Adams	northern jacob's-ladder		Forb
Polemonium pulcherrimum Hook.	showy jacob's-ladder		Forb
*Polygonum achoreum*S.F. Blake	blake's knotweed		Forb
Polygonum aviculare L.	prostrate knotweed		Forb
Polygonum viviparum L.	alpine bistort		Forb
Polytrichum commune Hedw.	common haircap moss		Moss
Polytrichum juniperinum Hedw.	juniper haircap moss		Moss
Polytrichum piliferum Hedw.	awned haircap moss		Moss
Polytrichum sp.	Haircap moss		Moss
*Polytrichum strictum*Brid.	bog haircap moss		Moss
Populus balsamifera L.	balsam poplar		Tree
Populus tremuloides Michx.	trembling aspen		Tree
Potentilla anserina L.	common silverweed		Forb
Potentilla bimundorum Sojak	divided cinquefoil		Forb
Potentilla diversifolia Lehm.	diverse-leaved cinquefoil		Forb
Potentilla nivea L.	snow cinquefoil		Forb
Potentilla norvegica L.	Norwegian cinquefoil		Forb
Potentilla pensylvanica L.	pennsylvania cinquefoil		Forb
Potentilla sp.	cinquefoil		Forb
Potentilla uniflora Ledeb.	one-flowered cinquefoil		Forb
Ptilium crista-castrensis Hedw.	knight's plume moss		Moss
Puccinellia rupestris (With.) Fernald & Weath.	sandberg's bluegrass	*Poa secunda* Zea ex Roem. & Schult.	Graminoid
Pyrola asarifolia Michx.	liver-leaf, pink wintergreen		Forb
Pyrola chlorantha Sw.	greenish flowered wintergreen		Forb
Pyrola grandiflora Radius	arctic wintergreen		Forb
Pyrola sp.	wintergreen		Forb
Racomitrium lanuginosum (Hedw.) Brid.	Racomitrium moss		Moss

Scientific name[1]	Common name[2]	Synonym[3]	Type
Racomitrium spp.	racomitrium moss		Moss
Ranunculus eschscholtzii Schelecht.	subalpine buttercup / crowfoot		Forb
Ranunculus lapponicus	lapland buttercup		Forb
Ranunculus sp.	buttercup		Forb
Rhinanthus minor L.	little yellow rattle	*Rhinanthus crista-galli* L., *Rhinanthus minor* ssp. *borealis* (Sterneck) Á. Löve, *Rhinanthus borealis* (Sterneck) Chabert	Forb
Rhizocarpon geographicum (L.) DC.	green map lichen		Lichen
Rhododendron groenlandicum(Oeder) Kron & Judd	labrador-tea	*Ledum groenlandicum* Oeder	Shrub
Rhododendron tomentosum Harmaja	trappers tea	*Ledum decumbens* (Ait.) Lodd.	Shrub
Rhytidiadelphus triquetrus (Hedw.) Warnst.	electrified cat's tail moss		Moss
Rhytidium rugosum (Hedw.) Kindb.	crumpled-leaf moss		Moss
Ribes hudsonianum Richardson	northern black currant		Shrub
Ribes lacustre (Pers.) Poir.	black gooseberry, prickly currant		Shrub
Ribes triste Pallas	wild red currant		Shrub
Rorippa barbareifolia (DC.) Kitag.	hoary yellow cress		Forb
Rorippa palustris (L.) Bess.	marsh yellow cress		Forb
Rosa acicularis Lindl.	prickly rose		Shrub
Rosa woodsia Lindl.	wood rose		Shrub
Rubus arcticus L.	nagoonberry		Shrub
Rubus chamaemorus L.	cloudberry / baked apple		Shrub
Rubus ideaus L.	common red raspberry	*Rubus ideaus* L. s.l. (=R. strigosus Michx.)	Shrub
Rubus pubescens Raf.	dwarf red raspberry		Shrub
Rumex arcticus Trautv.	arctic dock		Forb
Rumex occidentalis S.Wats.	western dock		Forb
Rumex triangulivalvis (Danser) Rech. f.	triangular-valved dock		Forb
Salix alaxensis var. *alaxensis* (Andersson) Coville	felt-leaf willow		Shrub
Salix alaxensis var. *longistylis* (Rydb.) C.K. Schneid.	alaska willow		Shrub
Salix arbusculoides Andersson	northern bush willow		Shrub
Salix arctica Pall.	arctic willow		Shrub
Salix barclayi Anderss.	barclay's willow		Shrub

Scientific name[1]	Common name[2]	Synonym[3]	Type
*Salix barrattiana*Hook.	barratt's willow		Shrub
Salix bebbiana Sarg.	bebb's willow		Shrub
Salix exigua Nutt.	sandbar willow		Shrub
Salix glauca L.	gray-leaf willow		Shrub
Salix lasiandra Benth.	Pacific willow		Shrub
Salix monticola Bebb	serviceberry willow	*Salix pseudomonticola* Ball	Shrub
Salix myrtillifolia Anderss.	low blueberry willow		Shrub
Salix planifolia Pursh	tea-leaf willow		Shrub
Salix polaris Wahlenb.	polar willow		Shrub
Salix pulchra Cham.	diamond leaf willow		Shrub
Salix reticulata L.	net-leaf willow		Shrub
Salix scouleriana Barratt ex Hook.	scouler's willow		Shrub
Salix sp.	willow		Shrub
Sanguisorba sp.	burnett		Forb
Saxifraga tricuspidata Rottb.	prickly saxifrage / three toothed saxifrage		Forb
Senecio lugens Richardson	black-tipped groundsel		Forb
Shepherdia canadensis (L.) Nutt.	soopolallie / soapberry / buffalo berry		Shrub
Silene involucrata (Chamisso & Schlechtendal) ssp. *involucrata*	arctic campion		Forb
Silene repens Patrin ex Pers.	pink campion		Forb
Silene vulgaris (Moench) Garcke[5]	bladder campion		Forb
Sinapis alba L.[5]	white mustard		Forb
Solidago canadensis L.	Canada goldenrod		Forb
Solidago lepida DC.	western Canada goldenrod		Forb
Solidago multiradiata Ait.	alpine goldenrod		Forb
Solidago simplex Kunth	sticky goldenrod		Forb
Sonchus arvensis L.[5]	perennial sow-thistle		Forb
Sparganium angustifolium Michx.	narrow-leaved bur-reed		Graminoid
Sphagnum spp.	sphagnum moss		Moss
Spiraea beauverdiana Schneid.	Beauverd's spiraea		Shrub
Spiraea stevenii (C.K. Schneid.) Rydb.	steven's spirea	*Spirea beauverdiana* Schneid.	Shrub

Scientific name[1]	Common name[2]	Synonym[3]	Type
Spiranthes romanzoffiana Cham.	hooded ladies' tresses		Forb
Stellaria borealis Bigelow	boreal starwort		Forb
Stellaria calycantha (Ledeb.) Bong.	northern stitchwort		Forb
Stellaria *crassifolia* Ehrh.	fleshy stitchwort		Forb
Stellaria longifolia Muhl.	long-leaved starwort		Forb
Stellaria longipes ssp. *longipes* Goldie	doldie's starwort	*Stellaria laeta* Richards.	Forb
Stereocaulon alpinum Laurer ex Funck	Alpine snow lichen		Lichen
Stereocaulon sp.	foam lichens		Lichen
Symphyotrichum boreale (Torr. & Gray) A. & D. Löve	boreal aster	*Aster borealis* (Torr. & A. Gray) Prov.	Forb
Taraxacum ceratophorum (Ledeb.) DC.	horned dandelion		Forb
Taraxacum officinale G.H. Weber ex Wiggers[5]	common dandelion		Forb
Tephroseris lindstroemii (Ostenf.) A. Löve & D. Löve	northern groundsel	*Senecio tundricola* Tolm.	Forb
Thalictrum occidentale Gray	western meadowrue		Forb
Thalictrum sparsiflorum Turcz. ex Fisch. & Mey.	mountain meadow-rue		Forb
Thamnolia vermicularis (Sw.) Ach. Ex Schaerer	universal whiteworm		Lichen
Thlaspi arvense L.[5]	field penny-cress		Forb
Timmia sp.			Moss
Tofieldia pusilla (Michx.) Pers.	false asphodel / scotch asphodel		Forb
Tomenthypnum nitens (Hedw.) Loeske	tomenthypnum moss		Moss
Tomenthypnum sp.			Moss
Trifolium hybridum L.[5]	alsike clover		Forb
Trifolium pratense L.[5]	red clover		Forb
Trisetum spicatum (L.) Richt.	spike trisetum		Graminoid
Umbilicaria spp.	rock tripes		Lichen
Vaccinium caespitosum Michx.	dwarf blueberry / dwarf billberry		Shrub
Vaccinium oxycoccos L.	small cranberry	*Oxycoccus microcarpus* Turcz.	Shrub
Vaccinium uliginosum L.	bog blueberry / bog bilberry / blueberry		Shrub
Vaccinium vitis-idaea L.	lowbush cranberry / lingonberry / mountain cranberry		Shrub
Valeriana capitata Pall.	capitate valerian / mountain heliotrope		Forb
Veronica scutellata L.	skullcap speedwell		Forb

Scientific name[1]	Common name[2]	Synonym[3]	Type
Viburnum edule (Michx.) Raf.	highbush-cranberry		Shrub
Viola epipsela Ledeb. ssp. *repens* (Turcz.) Becker	northern marsh violet		Forb
Viola sp.	violet		Forb
Vulpicida tilesii (Ach.) J.-E. Mattsson & Lai	limestone sunshine lichen		Lichen
Wilhelmsia physodes (Fisch. ex Ser.) McNeill	merckia		Forb
Woodsia alpina (Bolton) S.F. Gray	alpine cliff fern		Fern and Fern Allies
Xanthoparmelia sp.	rock-shield lichens		Lichen
Zygadenus elegans Pursh	mountain death camas	*Anticlea elegans* var. *elegans* (Pursh) Rydb.	Forb

[1] Primary reference flora used was the online version of the Flora of North America (2014, 2015, 2016). Where species information was not available online, Integrated Taxonomic Information System (IT IS 2015) was used. Reference flora for Bryophyte species was the online version of Bryophyte Flora of North America (2014). Lichen species were referenced using Lichens of North America (Brodo *et al.* 2011).

[2] Common names not provided by 1) Flora of North America (2014, 2015. 2016), or 2) Flora of the Yukon Territory (Cody 2000) are from Klinkenberg (2015).

[3] Synonyms are provided for the Flora of the Yukon Territory (Cody 2000).

[4] Watch-list plant species found in the LSA (Yukon CDC 2016).

[5] Invasive plant species found in the LSA

APPENDIX B. ELC MAPPING AND BEM DESCRIPTIONS AND CODES

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Soil Moisture Regimes:

Lists the code, class and description of soil moisture regime classes, adapted from Table 1.1 in Field Manual for Describing Yukon Ecosystems (Draft).

Site soil moisture codes and descriptions

Code	Class	Description
1	Xeric	Water is removed very rapidly in relation to supply; soil is moist for brief periods following precipitation.
2	Subxeric	Water is removed rapidly in relation to supply; soil is moist for short periods following precipitation.
3	Submesic	Water is removed readily in relation to supply; water available for moderately short periods following precipitation.
4	Mesic	Water is removed somewhat slowly in relation to supply; soil may remain moist for a significant, but sometimes short period of the year.
5	Subhygric	Water is removed slowly enough to keep soil wet for a significant part of the growing season; some temporary seepage and possibly mottling below 20 cm.
6	Hygric	Water is removed slowly enough to keep soil wet for most of the growing season; permanent seepage and mottling; gleyed colours common.
7	Subhydric	Water is removed slowly enough to keep water table at or near the surface for most of the year; gleyed mineral or organic soils; permanent seepage < 30 cm below surface.
8	Hydric	Water is removed so slowly that water table is at or above soil surface all year; gleyed mineral or organic soils.

Site Modifiers:

The mapped site modifiers, adapted from Table 3.2 in the Standard for Terrestrial Ecosystem mapping in BC, are listed below.

Site modifiers codes and descriptions

Modifier[1]	Code	Criteria
Gentle slope	j	site occurs on gently sloping topography (less than 15%)
Cool	k	site sites occurs on cool, northerly aspects (315°-45°), on moderately steep slopes (15%-65%)
Warm	w	site series occurs on warm, southerly aspects (135°-270°), on moderately steep slopes (15-65%)
Steep cool	q	site series occurs on steep slopes (>65%) with cool, northerly aspects (315°-45°)
Steep warm	z	site series occurs on steep slopes (>65%) with warm, southerly aspects (135°-270°)
Shallow	s	site series occurs where soils are considered to be shallow to bedrock
Deep	d	site series occurs on soils are not considered to deep
Coarse-textured soils	c	site series occurs on soils with a coarse texture, including sand and loamy sand; and also sandy loam, loam and sandy clay loam with greater than 70% coarse fragment volume

[1] Slope and aspect class criteria defined by ecosystem mapper

Structural Stage:

The mapped structural stages, adapted from Field Manual for Describing Yukon Ecosystems (Environment Yukon 2014), are described below.

Structural stage codes and descriptions

Structural stage[1]	Code	Description
Non-vegetated	1	No vegetation or less than 5% established vegetation; often due to recent disturbance (e.g., placer mining) or unvegetated rock.
Sparse/cryptogram	2	Either the initial stages of primary and secondary succession or a cryptogram community maintained by environmental conditions; sparsely-vegetated or dominated by bryophytes and lichens; may be prolonged where there is little or no soil development (e.g., bedrock).
Sparse	2a	5 – 10% vegetation cover
Bryoid	2b	Bryophyte-dominated
Lichen	2c	Lichen-dominated
Herb	3	Early successional stage or herbaceous communities maintained by environmental conditions or disturbance (e.g., wetlands, post-fire forest succession); herb dominated, including forbs, graminoids and ferns; some invading or residual shrubs and trees may be present but are usually sparse or absent; many herbaceous communities are continually maintained in this stage.
Forb-dominated	3a	Herbaceous communities dominated (greater than 1/2 of the total herb cover) by non-graminoid herbs, including ferns.
Graminoid-dominated	3b	Herbaceous communities dominated (greater than 1/2 of the total herb cover) by grasses, sedges, reeds and rushes.
Aquatic	3c	Herbaceous communities dominated (greater than 1/2 of the total herb cover) by floating or submerged aquatic plants; does not include sedges growing in marshes with standing water.
Dwarf shrub	3d	Communities dominated (greater than 1/2 of the total herb cover) by dwarf woody species, such as kinnikinnick or dwarf willows.
Shrub[2]	4	Early successional stage or shrub communities maintained by environmental conditions or disturbance (e.g., wetlands, flooding, post-fire forest succession); dominated by shrubby vegetation; either dominated by shrubby vegetation, including tree seedlings/saplings, or if sparsely vegetated overall, the dominance of shrubs characterizes the community as a shrubland.
Tall shrub[2]	4a	Communities dominated by tall shrub layer vegetation - woody plants > 2m and ≤ 7 cm dbh; may be in this stage perpetually due to environmental conditions or disturbance.
Low shrub[2]	4b	Communities dominated by low shrub layer vegetation - woody plants < 2m; may be in this stage perpetually due to environmental conditions or disturbance.
Pole sapling[3]	5	Trees > 5m tall and > 7 cm dbh, typically densely stocked. Self-thinning and vertical structure are not yet evident in the canopy. Younger stands are vigorous (usually > 15–20 years old); older stagnated stands (up to 100 years old) are also included; time since disturbance usually < 40 years; up to 100+ years for dense (5000 – 15000+ stems per ha) stagnant stands.
Young forest[3]	6	Self-thinning has become evident and the forest canopy has begun to differentiate into distinct layers. A more open stand than the pole/sapling stage.
Mature forest[3]	7	Trees established after the last stand-replacing disturbance have matured; a second cycle of shade tolerant trees may have become established; shrub and herb understories become well developed as the canopy opens up.
Old forest[3]	8	Stands of old age with complex structure; patchy shrub and herb understories are typical; regeneration is usually of shade-tolerant species with composition similar to the overstory. Fire-maintained stands may have a 'single-storied' appearance. Very old stands having complex structure with abundant large-sized trees, snags and coarse woody debris (CWD); snags and CWD occurring in all stages of decomposition; stands are comprised entirely of shade-tolerant overstory species with well-established canopy gaps.

[1] In the assessment of structural stage, structural features and age criteria should be considered together. Broadleaf stands will generally be younger than coniferous stands belonging to the same structural stage.

[2] Substages 4a and 4b may, for example, include very old, low productivity stands (e.g., treed wetlands) less than 5m tall, respectively.

[3] Structural stages 4-7 will typically be estimated from a combination of attributes based on forest inventory maps and aerial photography.

Stand Modifiers:

The mapped stand composition modifiers, adapted from Table 3.5 in the Standard for Terrestrial Ecosystem Mapping in BC, and the mapped stand-influencing site disturbance modifiers, are listed below.

Stand composition modifiers[1, 2] and stand influencing site disturbance modifiers[3]

Stand modifier	Code	Description
Canopy Composition[1]		
Coniferous	C	Greater than 3/4 of total tree layer cover is coniferous[2]
Deciduous	D	Greater than 3/4 of total tree layer cover is broadleaf[2]
Mixed	M	Neither coniferous or broadleaf account for greater than 3/4 of total tree layer cover[2]
Site Disturbance[3]		
Fires	F	Areas influenced by wildfire

[1] Adapted from RIC, 1997

[2] Stand composition modifiers emphasize overstory and intermediate tree layers, since these are the most visible on aerial photographs.

[3] Site disturbance code from Field Manual for Describing Yukon Ecosystems (Draft)

<u>Ecosystem units (including non-vegetated units)</u>:

All ecosystem units mapped within the Local Study Area are reported in the tables below, by Bioclimate Zone. Tables include assumed modifiers, site descriptions, mapped atypical modifiers and mapped structural stages.

Mapped ecosites within the Boreal Bioclimate Zones

Ecosite	Veg assoc	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
20	Capu	Purple reedgrass - lichen	w	forb and graminoid dominated grassland; moderate to steep, south-facing slopes; medium to rich nutrient regime	xeric - subxeric	s, z	3, 3b, 4
20	Aruv	Kinnikinnick	w	ground shrub dominated 'grassland'; moderate to steep, south-facing slopes; tree cover <10%; medium to rich nutrient regime	xeric - subxeric	s, z	3, 3d
21		Aspen - kinnikinnick-purple reedgrass	d, w	dry aspen-dominated forest; mid to upper slope position, predominently southerly aspect; commonly medium nutrient regime	subxeric - submesic	c, s, z	4, 4a, 5, 6, 7
01	A	Aspen - soapberry - purple reedgrass	d, j	mesic aspen-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime	submesic - mesic	k, w	6, 7
01	W	Alaska birch - Labrador tea - tall bluebells - step moss	d, j	mesic alaska birch-dominated forest; lower to upper slopes across a range of aspects; medium nutrient regime	submesic - mesic	k, q, s, w, z	4a, 4b, 5, 6, 7
01	WSw	Alaska birch - white spruce - Labrador tea - lowbush cranberry - feathermoss	d, j	mesic mixedwood forest; lower to upper slopes across a range of aspects; medium in nutrient regime	submesic - mesic	k, q, s, w, z	4, 4a, 5, 6, 7, 8
01	Sw	White spruce - rose - bastard toadflax - feathermoss	d, j	mesic white spruce-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime	submesic - mesic	k, s, w	4, 4b, 5, 6, 7, 8
01	Sw(Sb)	Spruce - Labrador tea - lowbush cranberry - feathermoss	d, j	mesic coniferous forest, spruce (primarily white) dominated; lower to upper slopes across a range of aspects; medium nutrient regime	submesic - mesic	k, q, w, z	4, 4a, 4b, 5, 6, 7, 8

Ecosite	Veg assoc	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
01		Spruce - feathermoss (Fire)	d, j	mesic forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime. (note: mapped in burned areas that are currently dominated by shrub, for which a canopy association cannot be determined)	submesic - mesic	k, q, s, w	3, 4, 4a, 4b
30		Black spruce - Labrador tea - reindeer lichen	d, k	black spruce-dominated forest; predominately on northerly lower to upper slopes; high lichen cover; poor nutrient regime.	submesic - mesic	q	4, 4a, 4b, 5, 6, 7, 8
31		Spruce - birch - lowbush cranberry - feathermoss	d, j	sparse coniferous forest near Subalpine Bioclimate boundary, spruce-dominated; high shrub cover; predominantly upper slope with variable aspect; medium nutrient regime	mesic	k, q, s, w, z	4, 4a, 4b, 5, 6, 7, 8
32	Sb1	Black spruce - scrub birch - labrador tea - cloudberry	d, k	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with scrub birch, Labrador tea and cloudberry in the understory; poor nutrient regime	subhygric - hygric	w	4, 4a, 4b, 7
32	Sb2	Black spruce - ladrador tea - cottongrass	d, k	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea, and cottongrass in the understory; poor nutrient regime	subhygric - hygric	q, w	4, 4a, 4b, 7
32		Black spruce - Labradror tea - cloudberry - sedge	d, k	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea and lowbush cranberry in the understory; poor nutrient regime (note: mapped in areas where vegetation association for ecosite is unknown)	subhygric - hygric	q, w	4, 4a, 4b, 5, 6, 7
33		Black spruce - Labrador tea - sedge - brownmoss - reindeer lichen	d, j	gentle-to-moderate, lower and toe slopes underlain by permafrost; black spruce dominated, spruce typically stunted; poor to medium nutrient regime	hygric	k, w	4, 4a, 4b, 6, 7, 8
40		White spruce - horsetail	d, j	spruce (predominately white) dominated riparian stands; floodplains and gullies; with horsetail and feathermoss	mesic to subhygric	c, k, w	4, 4a, 4b, 6, 7, 8
41		Balsam poplar - rose - horsetail	d, j	balsam poplar-dominated midbench floodplain; rose and horsetials common in the understory; located along the banks of rivers and larger creeks; rich nutrient regime	subhygric	c	4, 5, 6, 7

Ecosite	Veg assoc	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
42		Alaska birch - alder - reedgrass	d, j	alaska birch-dominated riparian community; located along sideslope gullies and associated receiving areas; medium to rich nutrient regime	subhygric	k, w, q	4, 4a, 5, 6, 7
43		Tall shrub Balsam poplar - willow	d, j	balsam poplar and willow dominated low bench floodplain; located along the banks of the Yukon and Stewart Rivers; tall shrub structural stage	subhygric	c	4, 4a, 4b
F1		Spruce - willow - labrador tea - sedge	d, j	poor treed fen; open spruce canopy, spruce often stunted and in the shrub layer; located on level valley bottom terrain on fluvial parent materials; poor to medium nutrient regime; underlain by permafrost	subhydric	-	4, 4a, 4b, 5, 6, 7, 8
F2		Spruce - red bearberry - brownmoss	d, j	treed fen; open spruce canopy, spruce can be stunted; located on level valley bottom terrain on fluvial parent materials; medium nutrient regime; underlain by permafrost	subhydric	-	4, 4a, 6, 5, 8
F3		Birch - leatherleaf - sedge	d, j	shrubby birch dominated fen, with leathleaf, willows and labrador tea; level to depressionl sites; medium nutrient regime; underlain by permafrost	subhydric	-	4, 4a, 4b
S1		Willow - horsetail	d, j	willow-dominated shrubby riparian community; found along streams and sideslope creeks; medium to rich nutrient regime	hygric	k, w	4, 4a, 4b
S2		Willow - reedgrass	d, j	willow and reedgrass dominated swamp; level, typically surrounding marshes or ponds on old fluvial plains; medium to rich nutrient regime.	hygric - subhydric	-	4a, 4b
M1		Beaked sedge marsh	d, j	sedge-dominated marsh; fluctuating water table; rich nutrient regime	subhydric - hydric	-	3b
M2		Horsetail - sedge marsh	d, j	horsetail-dominated marsh; fluctuating water table; rich nutrient regime	subhydric - hydric	-	3a
M		Marsh	d, j	sedge and/or herb dominated marsh; fluctuating water table; rich nutrient regime (note: mapped when dominate marsh vegetation unknown)	subhydric - hydric	-	3
An		Anthropogenic	-	an area of athropogenic disturbance, including areas cleared for camps, homesteads and air-strips	-	-	1, 3, 4

Ecosite	Veg assoc	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
Gb		Gravel bar	-	An elongated landform generated by waves and currents and usually running parallel to the shore. It is composed of unconsolidated small rounded cobbles, pebbles, stones and sand	-	-	1, 2
Mp		Placer mine	-	an area cleared and disturbed through placer mine activity, includes unvegetated areas and areas undergoing revegetation, primarly shrub-dominated	-	-	1, 2, 4
Pd		Pond	-	small body of water greater than 2 m deep, but not large enough to be classified as a lake	-	-	-
Rd		Road surface	-	an area cleared and compacted for the purpose of transporting goods and services by vehicles	-	-	1
Ri		River	-	watercourse formed when water flows between continuous, definable banks; the flow may be intermittent or perennial	-	-	-
Ro		Rock	-	gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover	-	k, w, z	1, 2, 4, 7
Rt		Talus	-	active and inactive talus and scree; typically have a low herb layer cover because of mobile substrates or lack of soil.	-	k, q, z	1, 2

Mapped ecosites within the Subalpine and Alpine Bioclimate Zones

Ecosite	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
10	Tors	c	protruding bedrock outcrops on mountain crests; vegetation growth is mainly restricted to fractures and crevices where soil has accumulated.	very xeric - xeric	-	1, 2
11	Felsenmeer	c	veneer of angular rock fragments/boulders fields over sloping ground, typically upper-slope to crest position; vegetative cover is typically <40% and includes dwarf shrubs, graminoids, mosses and lichens.	xeric - subxeric	k, q, w, z	2, 2a, 3, 3a
12	Scrub birch - mountain avens - lichen	j, s	plateaus and gentle crests at high elevations; vegetation community dominated by mountain avens, low-growing dwarf birch and lichens; poor to mediume nutrient regime	subxeric	k, w	3d, 4b, 2c
13	Scrub birch - crowberry - lowbush cranberry	k, s	moderatly sloping, northerly aspect, upper slope; low shrub and ground shrub dominated sites with exposed boulder channels; poor nutrient regime	subxeric - submesic	q, w	3d, 4b
14	Scrub birch - willow - mountain avens	j, s	low stature shrub-dominated sites with scrub birch, willows, labrador tea, and lowbush cranberry; commonly upper slope or crest; medium nutrient regime	subxeric - submesic	k, w, z	3d, 4b
01	Scrub birch - lowbush cranberry - feathermoss	d, j	shrub-dominated ecosystem with scrub birch, willows, labrador tea, lowbush cranberry, and bog blueberry; predominantly mid to upper slopes; typically poor to medium nutrient regime	submesic - mesic	k, q, s, w, z	4, 4b
31	Spruce - scrub birch - feathermoss	d, j	sparsely treed areas often near the boundary with the Boreal Bioclimate zone; conifers with ≤15% cover, high shrub cover; predominantly upper and mid slopes; medium nutrient regime	mesic	k, s, w, z	4, 4a, 4b, 5, 6, 7, 8

Ecosite	Name	Assumed modifiers	Description and typical situation	Moisture regime	Mapped modifiers	Mapped structural stage
30	Scrub birch - sedge - feathermoss	d, j	mid to lower slopes; predominantly cool and neutral aspects; scrub birch, willows, Labrador tea, sedge and feathermoss common; permafrost and seepage typically present; poor to medium nutrient regime	subhygric	k, w	4, 4b
32	Black spruce - Labrador tea - lowush cranberry - sedge	d, k	stunted black spruce (black spruce in shrub structural stage) and shrub dominated; predominantly on cool, moderate mid to lower slopes; permafrost and seepage present; poor nutrient regime	subhygric - hygric	w	4, 4a, 4b, 7
40	Willow - horsetail - peatmoss	d, j	willow-dominated riparian sites; located along sideslope creeks and drainage channels; shrub layer predominately medium stature; medium to rich nutrient regime	hygric - subhydric	k, w	4, 4a, 4b
An	Anthropogenic	-	areas of athropogenic disturbance, including areas cleared for camps, homesteads and air-strips	-	-	1
Rd	Road surface	-	an area cleared and compacted for the purpose of transporting goods and services by vehicles	-	-	1
Ro	Rock	-	gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover	-	k, w	2

Broad Ecosystem Mapping (BEM):

ELC Ecosite descriptions and corresponding Broad Ecosystem Mapping (BEM) categories

Ecosite code	Veg assoc	Ecosite Name	Ecosite Description and typical situation	BEM code	BEM Category	BEM Canopy modifier
Boreal Bioclimate Zones						
20	**Capu**	Purple reedgrass - lichen	forb and graminoid dominated grassland; moderate to steep, south-facing slopes; medium to rich nutrient regime	**Gg**	Grassland	-
20	**Aruv**	Kinnikinnick	ground shrub dominated 'grassland'; moderate to steep, south-facing slopes; tree cover <10%; medium to rich nutrient regime	**Gg**	Grassland	-
21		Aspen - kinnikinnick- purple reedgrass	dry aspen-dominated forest; mid to upper slope position, predominently southerly aspect; commonly medium nutrient regime	**UpF**	Upland / Closed Canopy Forest	Deciduous
01	**A**	Aspen - soapberry - purple reedgrass	mesic aspen-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime	**UpF**	Upland / Closed Canopy Forest	Deciduous
01	**W**	Alaska birch - Labrador tea - tall bluebells - step moss	mesic alaska birch-dominated forest; lower to upper slopes across a range of aspects; medium nutrient regime	**UpF**	Upland / Closed Canopy Forest	Deciduous
01	**WSw**	Alaska birch - white spruce - Labrador tea - lowbush cranberry - feathermoss	mesic mixedwood forest; lower to upper slopes across a range of aspects; medium in nutrient regime	**UpF**	Upland / Closed Canopy Forest	Mixedwood
01	**Sw**	White spruce - rose - bastard toadflax - feathermoss	mesic white spruce-dominated forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime	**UpF**	Upland / Closed Canopy Forest	Coniferous
01	**Sw(Sb)**	Spruce - Labrador tea - lowbush cranberry - feathermoss	mesic coniferous forest, spruce (primarily white) dominated; lower to upper slopes across a range of aspects; medium nutrient regime	**UpF**	Upland / Closed Canopy Forest	Coniferous
01		Spruce - feathermoss (Fire)	mesic forest; lower to upper slopes across a range of aspects; low elevations only; medium regime regime. (note: mapped in burned areas that are currently dominated by shrub, for which a canopy association cannot be determined)	**UpF**	Upland / Closed Canopy Forest	-

Ecosite code	Veg assoc	Ecosite Name	Ecosite Description and typical situation	BEM code	BEM Category	BEM Canopy modifier
30		Black spruce - Labrador tea - reindeer lichen	black spruce-dominated forest; predominately on northerly lower to upper slopes; high lichen cover; poor nutrient regime.	**UpF**	Upland / Closed Canopy Forest	Coniferous
31		Spruce - birch - lowbush cranberry - feathermoss	sparse coniferous forest near Subalpine Bioclimate boundary, spruce-dominated; high shrub cover; predominantly upper slope with variable aspect; medium nutrient regime	**Fcs**	High Elevation Sparse Coniferous Forest	Coniferous
32	**Sb1**	Black spruce - scrub birch - labrador tea - cloudberry	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with scrub birch, Labrador tea and cloudberry in the understory; poor nutrient regime	**Stcs**	Stunted Coniferous Forest	Coniferous
32	**Sb2**	Black spruce - ladrador tea - cottongrass	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea, and cottongrass in the understory; poor nutrient regime	**Stcs**	Stunted Coniferous Forest	Coniferous
32		Black spruce - Labradror tea - cloudberry - sedge	moderate-to-steep northerly slopes underlain by permafrost; lower-to-mid slope; stunted black spruce canopy with Labrador tea and lowbush cranberry in the understory; poor nutrient regime (note: mapped in areas where vegetation association for ecosite is unknown)	**Stcs**	Stunted Coniferous Forest	Coniferous
33		Black spruce - Labrador tea - sedge - brownmoss - reindeer lichen	gentle-to-moderate, lower and toe slopes underlain by permafrost; black spruce dominated, spruce typically stunted; poor to medium nutrient regime	**Stcs**	Stunted Coniferous Forest	Coniferous
40		White spruce - horsetail	spruce (predominately white) dominated riparian stands; floodplains and gullies; with horsetail and feathermoss	**RF**	Riparian Forest	Coniferous, Mixedwood
41		Balsam poplar - rose - horsetail	balsam poplar-dominated midbench floodplain; rose and horsetials common in the understory; located along the banks of rivers and larger creeks; rich nutrient regime	**RF**	Riparian Forest	Deciduous, Mixedwood
42		Alaska birch - alder - reedgrass	alaska birch-dominated riparian community; located along sideslope gullies and associated receiving areas; medium to rich nutrient regime	**RF**	Riparian Forest	Deciduous

Ecosite code	Veg assoc	Ecosite Name	Ecosite Description and typical situation	BEM code	BEM Category	BEM Canopy modifier
43		Tall shrub Balsam poplar - willow	balsam poplar and willow dominated low bench floodplain; located along the banks of the Yukon and Stewart Rivers; tall shrub structural stage	**LSr**	Low Elevation Shrubby Riparian	-
F1		Spruce - willow - labrador tea - sedge	poor treed fen; open spruce canopy, spruce often stunted and in the shrub layer; located on level valley bottom terrain on fluvial parent materials; poor to medium nutrient regime; underlain by permafrost	**F**	Fen	Coniferous
F2		Spruce - red bearberry - brownmoss	treed fen; open spruce canopy, spruce can be stunted; located on level valley bottom terrain on fluvial parent materials; medium nutrient regime; underlain by permafrost	**F**	Fen	Coniferous
F3		Birch - leatherleaf - sedge	shrubby birch dominated fen, with leathleaf, willows and labrador tea; level to depressionl sites; medium nutrient regime; underlain by permafrost	**F**	Fen	-
S1		Willow - horsetail	willow-dominated shrubby riparian community; found along streams and sideslope creeks; medium to rich nutrient regime	**LSr**	Low Elevation Shrubby Riparian	-
S2		Willow - reedgrass	willow and reedgrass dominated swamp; level, typically surrounding marshes or ponds on old fluvial plains; medium to rich nutrient regime.	**S**	Swamp	-
M1		Beaked sedge marsh	sedge-dominated marsh; fluctuating water table; rich nutrient regime	**M**	Marsh	-
M2		Horsetail - sedge marsh	horsetail-dominated marsh; fluctuating water table; rich nutrient regime	**M**	Marsh	-
Subalpine and Alpine Bioclimate Zones						
10		Tors	protruding bedrock outcrops on mountain crests; vegetation growth is mainly restricted to fractures and crevices where soil has accumulated.	**-**	-	-
11		Felsenmeer	veneer of angular rock fragments/boulders fields over sloping ground, typically upper-slope to crest position; vegetative cover is typically <40% and includes dwarf shrubs, graminoids, mosses and lichens.	**Fe**	Felsenmeer	-

Ecosite code	Veg assoc	Ecosite Name	Ecosite Description and typical situation	BEM code	BEM Category	BEM Canopy modifier
12		Scrub birch - mountain avens - lichen	plateaus and gentle crests at high elevations; vegetation community dominated by mountain avens, low-growing dwarf birch and lichens; poor to mediume nutrient regime	**Ss**	Subalpine / Alpine Shrub	-
13		Scrub birch - crowberry - lowbush cranberry	moderatly sloping, northerly aspect, upper slope; low shrub and ground shrub dominated sites with exposed boulder channels; poor nutrient regime	**Ss**	Subalpine / Alpine Shrub	-
14		Scrub birch - willow - mountain avens	low stature shrub-dominated sites with scrub birch, willows, labrador tea, and lowbush cranberry; commonly upper slope or crest; medium nutrient regime	**Ss**	Subalpine / Alpine Shrub	-
01		Scrub birch - lowbush cranberry - feathermoss	shrub-dominated ecosystem with scrub birch, willows, labrador tea, lowbush cranberry, and bog blueberry; predominantly mid to upper slopes; typically poor to medium nutrient regime	**Ss**	Subalpine / Alpine Shrub	-
31		Spruce - scrub birch - feathermoss	sparsely treed areas often near the boundary with the Boreal Bioclimate zone; conifers with ≤15% cover, high shrub cover; predominantly upper and mid slopes; medium nutrient regime	**Fcs**	High Elevation Sparse Coniferous Forest	Coniferous
30		Scrub birch - sedge - feathermoss	mid to lower slopes; predominantly cool and neutral aspects; scrub birch, willows, Labrador tea, sedge and feathermoss common; permafrost and seepage typically present; poor to medium nutrient regime	**Ss**	Subalpine / Alpine Shrub	-
32		Black spruce - Labrador tea - lowush cranberry - sedge	stunted black spruce (black spruce in shrub structural stage) and shrub dominated; predominantly on cool, moderate mid to lower slopes; permafrost and seepage present; poor nutrient regime	**Stcs**	Stunted Coniferous Forest	Coniferous
40		Willow - horsetail - peatmoss	willow-dominated riparian sites; located along sideslope creeks and drainage channels; shrub layer predominately medium stature; medium to rich nutrient regime	**HSr**	High Elevation Shrubby Riparian	-

Field Data Collection:

The information collected at each plot type is listed below:

Full Plots

- Project ID, plot number, Polygon number, date, surveyors, UTM, GPS Accuracy
- Plot Representing – short description
- Ecosite/phase, Soil moisture and nutrient regime, Elevation, Slope, Aspect, Surface Shape, Mesoslope Position, Microtopography type and intensity, Exposure Type, Site Disturbance, Structural Stage, Flood regime
- Soils information, including soil drainage, soil texture and coarse fragment percentage, soil horizon information, root-restricting layers, rooting depth and humus form type.
- Vegetation information: the majority of species, % cover by species.
- Tree mensuration: trees measured from one quarter of the plot - describe species, diameter at breast height (DBH), approximate height and relevant tree health information. At least one age at DBH was determined.
- Site Diagram
- Photos – minimum of N, E, S, W, ground, and a soil pit photo

Ground Inspections

- Project ID, plot number, plot type, date, surveyors, UTM, GPS Accuracy
- Plot Representing – short description
- Ecosite/phase, Soil moisture and nutrient regime, Elevation, Slope, Aspect, Surface Shape, Mesoslope Position, Exposure Type, Site Disturbance, Structural Stage
- Soils information: drainage, soil texture and coarse fragment percentage, root-restricting layers, rooting depth, and humus form type.
- Vegetation: indicator species and everything over 1% cover, % cover by species and by layer (tree, shrub, herb and moss/lichen).
- Site Diagram if appropriate
- Photos – N, E, S, W, ground, and a soil photo

Visual Inspections

- Project ID, plot number, date, surveyors, UTM, GPS Accuracy
- Photos – N, E, S, W, ground
- Biogeoclimatic zone, Structural Stage, Soil Moisture Regime, Soil Nutrient Regime, Elevation, Slope, Aspect, Mesoslope Position, Canopy Composition, Structural Stage
- Minimal soils information: drainage, humus form, soil texture.
- Vegetation: top 10 species across the layers, % cover by species and by layer (tree, shrub, herb and moss/lichen).

APPENDIX C. COFFEE PROJECT ECOSYSTEM FACTSHEETS

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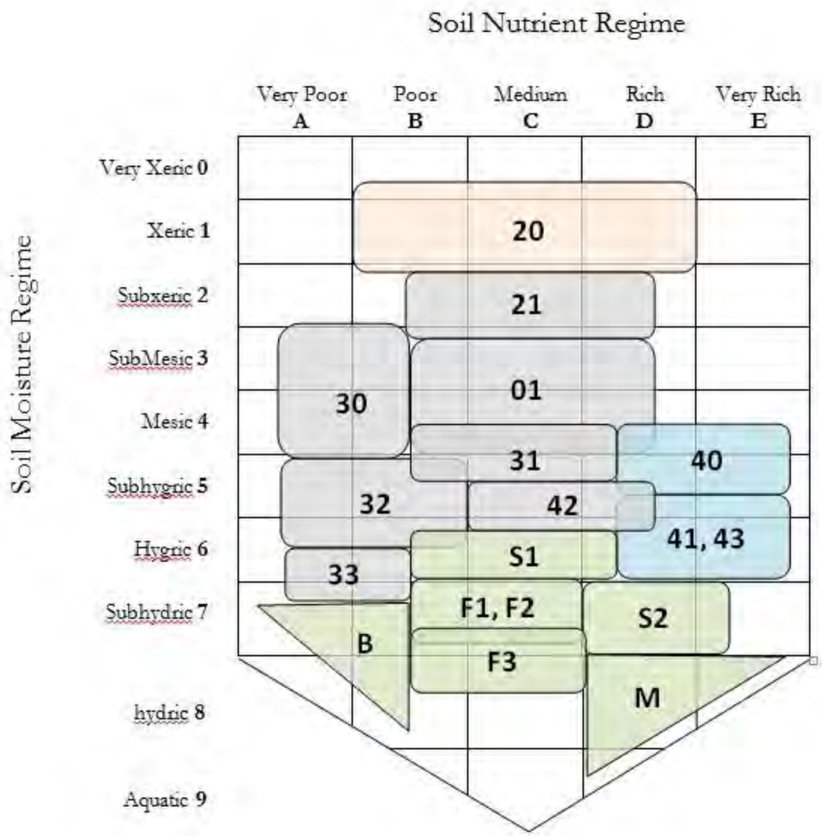
Ecosite Factsheet Overview

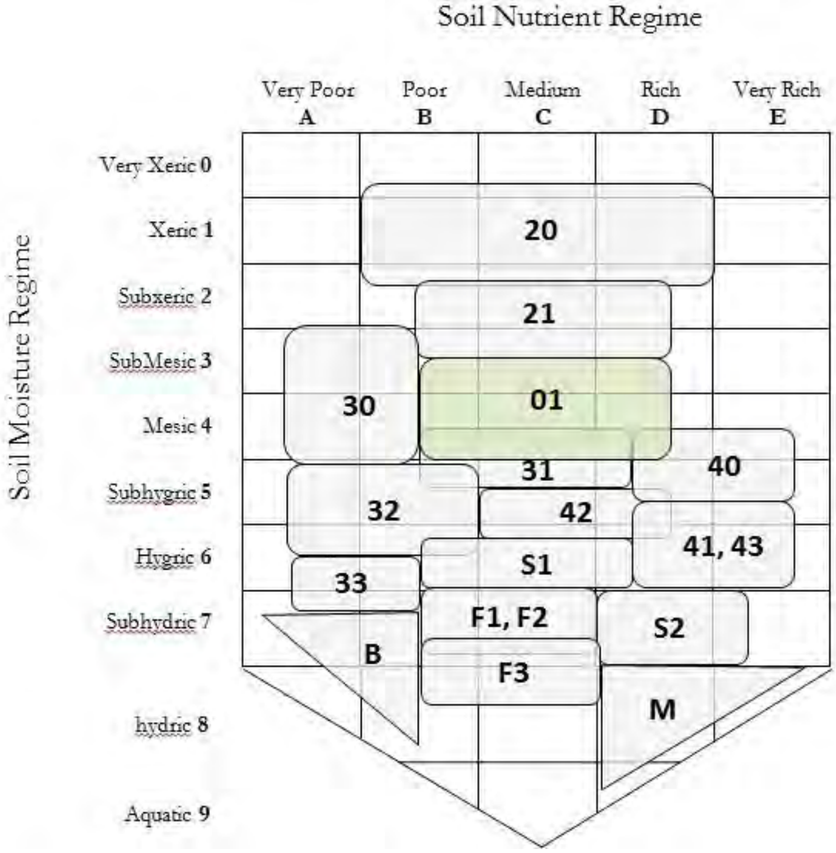
The ecosite and vegetation association names and codes are displayed at the top of each factsheet page. An edatopic grid is used to graphically depict the range of moisture and nutrient regimes typical of each ecosite (including associated vegetation associations). A description of the ecosite and the number of plots used to define the ecosite are listed below the edatopic grid. On the second page of each factsheet, the mean percent cover of plant species characteristic of the ecosite phase are presented for each layer (tree, shrub, herb and moss/lichen). Characteristic plant species are those that were either present in a minimum of 60% of the sample plots (Jennings *et al.* 2004) or had a prominence value of 20 or greater (prominence value $=\sqrt{\%\ frequncy\ x\ \%\ cover}$; Beckingham and Archibald 1996). Site and soil characteristics of the ecosite, including moisture regime, topographic position and rooting zone soil texture, are also presented. The superscript numbers attached to specific site and soil characteristics indicate the number of plots identified to have that characteristic. The presence or absence of permafrost in an ecosite refers to near-surface permafrost (within 75 cm of the ground surface). The entire survey extent occurred in the Extensive Discontinous Permafrost zone (which ranges between 50–90% permafrost presence; Burn 2004). Near-surface permafrost is common on north-facing slopes, toe-slopes and wet, poorly-drained valley bottoms throughout the Project area.

Boreal Bioclimate Zones



20-Capu	Purple reedgrass – Lichen
20-Aruv	Kinnikinnick
21	Aspen – Kinnikinnick – Purple reedgrass
01-A	Aspen – soapberry – Purple reedgrass
01-W	Alaska birch – Labrador – Tall bluebells – Step moss
01-WSw	Alaska birch – White spruce – Labrador tea – Lowbush cranberry - Feathermoss
01-Sw	White spruce – Rose – Bastard toadflax
01-Sw(Sb)	Spruce – Labrador tea – Lowbush cranberry – Feathermoss
30	Black spruce – Labrador tea – Reindeer lichen
31	Spruce – Labrador tea – Lowbush cranberry – Feathermoss
32-Sb1	Black spruce – Scrub birch – Labrador tea – Cloudberry
32-Sb2	Black spruce – Labrador tea – Cottongrass
33	Blacks spruce – Labrador tea – sedge – brownmoss – Lichen
40	White spruce – Horsetail
41	Balsam poplar – Rose – Horsetail
42	Alaska birch – Alder – Reedgrass
43	Tall shrub Balsam poplar – Willow
F1	Spruce – Willow – Labrador tea – Sedge
F2	Spruce – Red bearberry – Brown moss
F3	Birch – Leatherleaf – Sedge
S1	Willow – Horsetail
S2	Willow – Reedgrass
M1	Beaked sedge
M2	Horsetail – Sedge

Aspen – Soapberry – Purple reedgrass (01-A)



Ecosite Association Description

The Aspen – Soapberry – Purple reedgrass association occurs on gentle-to-steep, middle-to-lower slopes, primarily in the Boreal Low Bioclimate zone. In the survey extent, this association was only found at low elevations along the proposed access road. The deciduous canopy is typically dominated by trembling aspen (*Populus tremuloides*); however a minor component of white spruce (*Picea glauca*) and balsam poplar (*Populus balsamifera*) can occur. The shrub layer is dominated by soapberry (*Shepherdia canadensis*) and prickly rose (*Rosa acicularis*), but a low ground shrub cover (*Linnaea borealis, Vaccinium vitis-idaea,* and *Arctostaphylos uva-ursi*) is also commonly present. The herb layer is dominated by a low cover of purple reedgrass (*Calamagrostis purpurascens*), with tall bluebells (*Mertensia paniculata*), and fireweed (*Chamerion angustifolium*) typically present in lesser amounts. The moss and lichen cover is sparse or absent.

The soil moisture regime of the Aspen – Soapberry – Purple reedgrass association ranges from submesic-to-mesic with a medium nutrient regime. Soils are well drained and parent material is typically colluvial.

Sample Plots: 3

Full	[0]
Ground	[2]
Visual	[1]

Characteristic Vegetation

Tree Layer:

[30] Trembling aspen (*Populus tremuloides*)

[6] White spruce (*Picea glauca*)

[4] Balsam poplar (*Populus balsamifera*)

Shrub Layer:

[6] Soapberry (*Shepherdia canadensis*)

[6] Prickly rose (*Rosa acicularis*)

[4] Trembling aspen (*Populus tremuloides*)

[3] Lowbush cranberry (*Vaccinium vitis-idaea*)

[3] Willow (*Salix* spp.)

[3] Twinflower (*Linnaea borealis*)

[2] Kinnikinnick (*Arctostaphylos uva-ursi*)

[2] White spruce (*Picea glauca*)

Herb Layer:

[7] Purple reedgrass (*Calamagrostis purpurascens*)

[2] Tall bluebells (*Mertensia paniculata*)

[2] Fireweed (*Chamerion angustifolium*)

[1] One-sided wintergreen (*Orthilia secunda*)

Moss/Lichen Layer:

[2] Step moss (*Hylocomium splendens*)

Site Characteristics

Moisture Regime: submesic[2], mesic[1]

Nutrient Regime: medium[3]

Slope Gradient: 10-50 %

Aspect: easterly[1], south-westerly[1], south-easterly[1]

Slope Position: midslope[3]

Soil Characteristics

Organic Thickness: 5-7 cm

Humus Form: moder[2], mor[1]

Drainage: well[3]

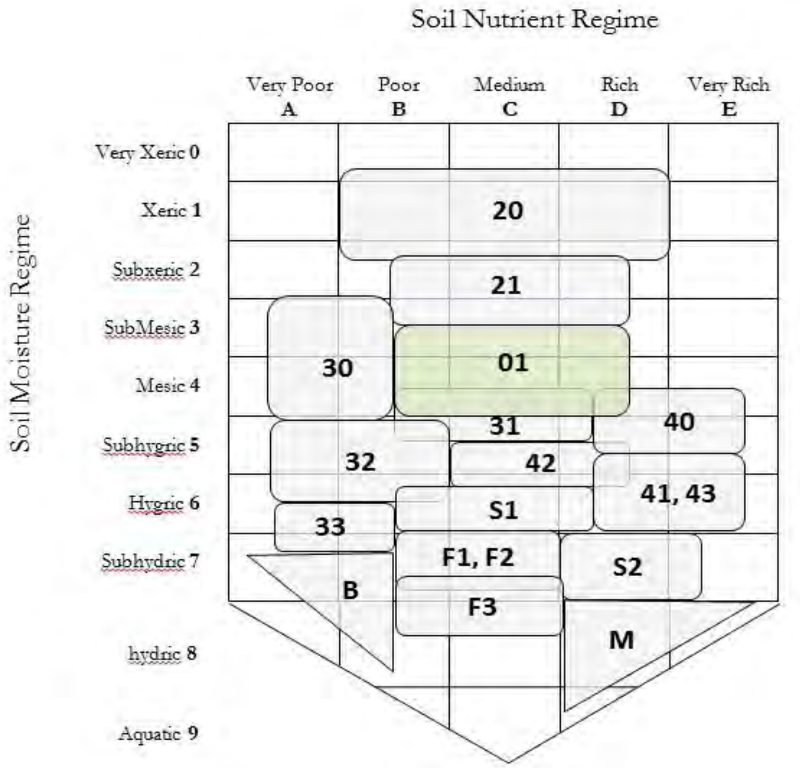
Seepage Water: absent

Permafrost: absent

Parent Material: C, D, F

Soil Texture: SiL[2], SiCL[1]

Alaska birch – Labrador tea – Tall bluebells – Step moss (01-W)



Ecosite Association Description

The Alaska birch – Labrador tea –Tall bluebells – Step moss association occurs on gentle-to-steep (predominantly moderate), middle-to-upper slopes, ranging in elevation from 450-1050 m. This association occurs across all aspects; however neutral aspects are common. The deciduous dominated canopy is typically dominated by Alaska birch (*Betula neoalaskana*). The shrub layer is often dominated by Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*), but prickly rose (*Rosa acicularis*) and green alder (*Alnus viridis*) are also commonly present. The herb layer is dominated by bluejoint reedgrass (*Calamagrostis canadensis*), tall bluebells (*Mertensia paniculata*), fireweed (*Chamerion angustifolium*) and clubmosses (*Lycopodium annotinum* and *Diphasiastrum complanatum*). Step moss dominates the moss layer, which is variable in extent due largely to the cover of deciduous leaf litter. Lichen cover is sparse or absent.

The soil moisture regime of the Alaska birch – Labrador tea –Tall bluebells – Step moss association ranges from submesic-to-mesic with a poor-to-medium nutrient regime. The dominant rooting zone texture is silty loam commonly overlaying colluvial parent material. Permafrost is absent in this ecosite and soils are well-drained.

Sample Plots: 20

Full	[1]
Ground	[8]
Visual	[11]

Characteristic Vegetation

Tree Layer:

[42] Alaska birch (*Betula neoalaskana*)
[4] White spruce (*Picea glauca*)

Shrub Layer:

[16] Labrador tea (*Rhododendron groenlandicum*)
[15] Lowbush cranberry (*Vaccinium vitis-idaea*)
[6] Willows (*Salix* spp.)
[6] Green alder (*Alnus viridis*)*
[5] Prickly rose (*Rosa acicularis*)

Herb Layer:

[6] Bluejoint reedgrass (*Calamagrostis canadensis*)
[3] Tall bluebells (*Mertensia paniculata*)
[2] Clubmoss (*Lycopodium annotinum*, *Diphasiastrum complanatum*)
[1] Fireweed (*Chamerion angustifolium*)

Moss/Lichen Layer:

[30] Step moss (*Hylocomium splendens*)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: mesic[13], submesic[7]

Nutrient Regime: medium[17], poor[3]

Slope Gradient: 8-60 %, generally >20 %

Aspect: easterly[12], westerly[4], southerly[3], northerly[1]

Slope Position: midslope[16], upper slope[3]

Soil Characteristics

Organic Thickness: 4-15 cm

Humus Form: mor[19], moder[1]

Drainage: well[20]

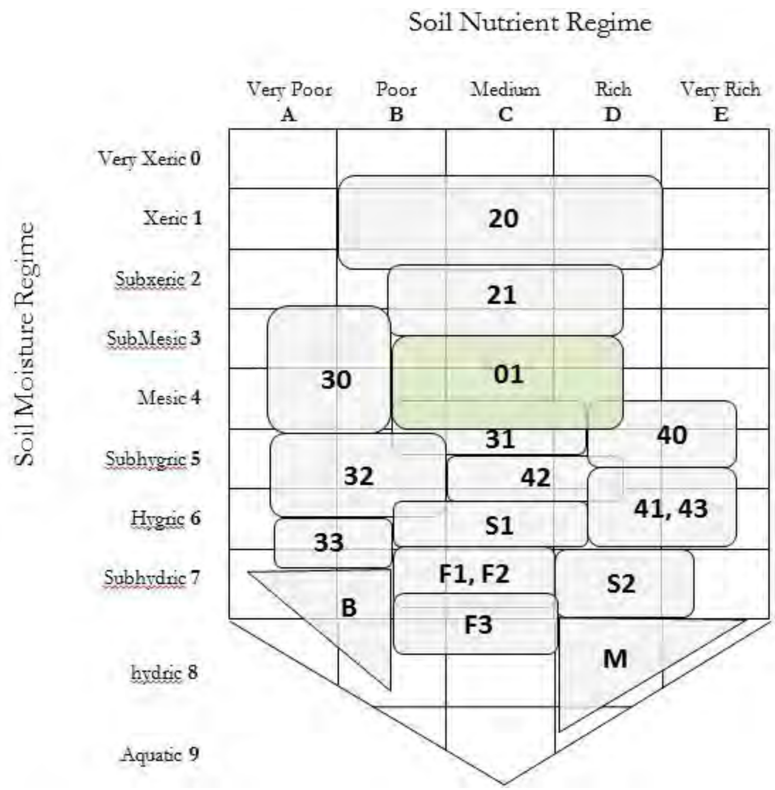
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SiL[13], SL[2], L[4], LS[1]

Alaska birch–White spruce–Labrador tea–Lowbush cranberry–Feathermoss (01-Wsw)



Ecosite Association Description

The Alaska birch – White spruce – Labrador tea – Lowbush cranberry – Feathermoss association occurs on gentle-to-moderate, predominantly middle slopes; however it does occur across a range of slope positions. The association occurs on slopes across a range of aspects and ranges in elevation from approximately 400 to 1100 m. The canopy is co-dominated by white spruce (*Picea glauca*) and Alaska birch (*Betula neoalaskana*); however in some areas black spruce (*Picea mariana*) forms a minor component. The shrub layer is dominated by Labrador tea (*Rhododendron groenlandicum*), lowbush cranberry (*Vaccinium vitis-idaea*) and green alder (*Alnus viridis*), with a lesser component of willows (including *Salix alaxensis, S. glauca*, *S. planifolia* and *S. scouleriana*) and prickly rose (*Rosa acicularis*). The herb layer is variable and is typically sparse, with tall bluebells (*Mertensia paniculata*), bastard toadflax (*Geocaulon lividum*) and bluejoint reedgrass (*Calamagrostis canadensis*) most commonly present. The cover of the moss and lichen layer is variable and is dominated by feathermosses (*Hylocomium splendens* and *Pleurozium schreberi*), with a minor lichen component.

The soil moisture regime of the association ranges from submesic-to-subhygric (predominantly mesic), with typically a poor-to-medium nutrient regime. The dominant rooting zone textures are silty loam, loam and sandy loam overlaying predominantly colluvial parent material. Permafrost is absent in this ecosite and soils are well drained.

Sample Plots: 28

Full	[1]
Ground	[16]
Visual	[11]

Characteristic Vegetation

Tree Layer:

[23] Alaska Birch (*Betula neoalaskana*)

[15] White spruce (*Picea glauca*)

Shrub Layer:

[18] Labrador tea (*Rhododendron groenlandicum*)

[14] Lowbush cranberry (*Vaccinium vitis-idaea*)

[8] Green alder (*Alnus viridis*)

[4] Willows (*Salix* spp.)

[4] Alaska Birch (*Betula neoalaskana*)

[3] Prickly rose (*Rosa acicularis*)

Herb Layer:

[4] Bastard toadflax (*Geocaulon lividum*)

[2] Tall bluebells (*Mertensia paniculata*)

[2] Bluejoint reedgrass (*Calamagrostis canadensis*)*

Moss/Lichen Layer:

[48] Step moss (*Hylocomium splendens*)

[20] Red-stemmed feathermoss (*Pleurozium schreberi*)*

[5] Reindeer lichens (*Cladina* spp.)

[2] Pelt lichens (*Peltigera* spp.)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: mesic[20], submesic[7], subhygric[1]

Nutrient Regime: medium[16], poor[12]

Slope Gradient: 0-60 %, generally >12%

Aspect: variable

Slope Position: midslope[22], upper slope[1], lower slope[2], toe[1], level[1], crest[1]

Soil Characteristics

Organic Thickness: 8-30 cm

Humus Form: mor[23], moder[5]

Drainage: well[26], rapidly[1]

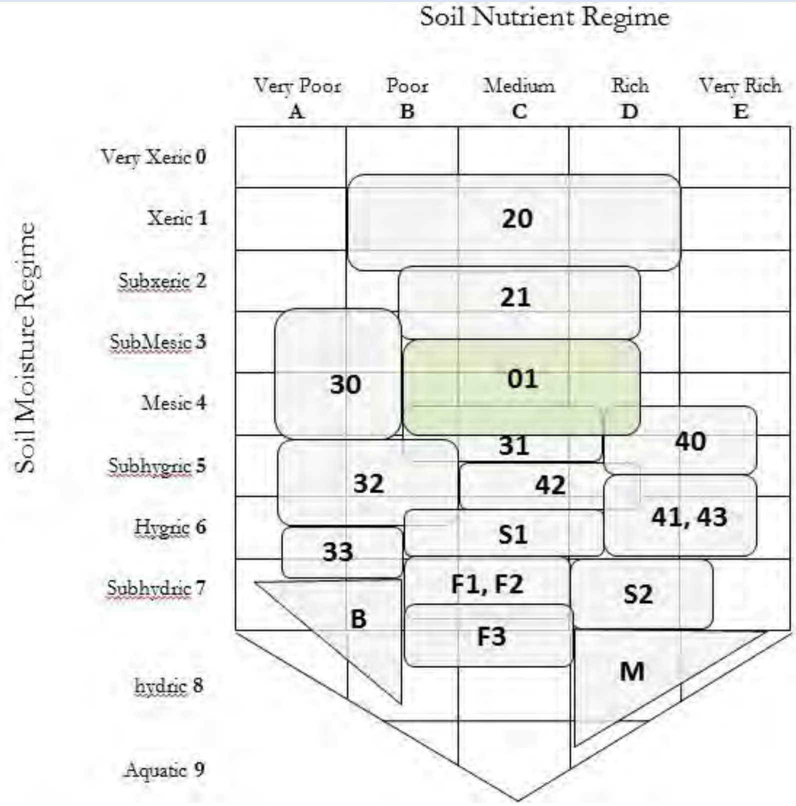
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SiL[16], SL[7], L[4], FSL[2]

White spruce – Rose – Bastard toadflax – Feathermoss (01-Sw)



Ecosite Association Description

The White spruce – Rose – Bastard toadflax – Feathermoss association occurs on gentle-to-moderate, predominately middle-to-toe slopes. The association is occurs primarily in the Boreal Low Bioclimate zone on level areas or slopes with warm or neutral aspects below approximately 550 m in elevation. The canopy is dominated by white spruce (*Picea glauca*), which also typically forms a low to moderate shrub cover. The shrub layer typically consists of prickly rose (*Rosa acicularis*), willows (including *S. planifolia* and *S. scouleriana*) and lowbush cranberry (*Vaccinium vitis-idaea*), with lesser components of soapberry (*Shepherdia canadensis*) and twinflower (*Linnaea borealis*). The herb layer is variable, sparse and typically contains bastard toadflax (*Geocaulon lividum*) and tall bluebells (*Mertensia paniculata*). The moss and lichen layer is dominated by feathermosses, predominantly step moss (*Hylocomium splendens*), but also typically contains a low cover of freckle pelt (*Peltigera aphthosa*).

The soil moisture regime of the White spruce – Rose – Bastard toadflax – Feathermoss association ranges from submesic-to-mesic and the soil nutrient regime ranges from poor-to-medium. The rooting zone soil texture is variable but sandy and silt loams are common. The association lacks permafrost and is predominantly well-drained.

Sample Plots: 8

Full	[0]
Ground	[3]
Visual	[5]

Characteristic Vegetation

Tree Layer:

[32] White spruce (*Picea glauca*)

[5] Trembling aspen (*Populus tremuloides*)*

Shrub Layer:

[8] White spruce (*Picea glauca*)

[4] Willows (*Salix* spp.)

[3] Prickly rose (*Rosa acicularis*)

[3] Lowbush cranberry (*Vaccinium vitis-idaea*)

[1] Twinflower (*Linnaea borealis*)

[1] Soapberry (*Shepherdia canadensis*)

Herb Layer:

[3] Bastard toadflax (*Geocaulon lividum*)

[1] Tall bluebells (*Mertensia paniculata*)

Moss/Lichen Layer:

[60] Step moss (*Hylocomium splendens*)

[8] Red-stemmed feathermoss (*Pleurozium schreberi*)*

[2] Freckle pelt (*Peltigera aphthosa*)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: mesic[7], submesic[1]

Nutrient Regime: medium[4], poor[4]

Slope Gradient: 0-65 %, generally <20%

Aspect: southerly[2], easterly[2], westerly[1]

Slope Position: level[3], midslope[2], lower slope[2], toe[1]

Soil Characteristics

Organic Thickness: 8-15 cm

Humus Form: mor[5], moder[3]

Drainage: well[6], moderately well[2]

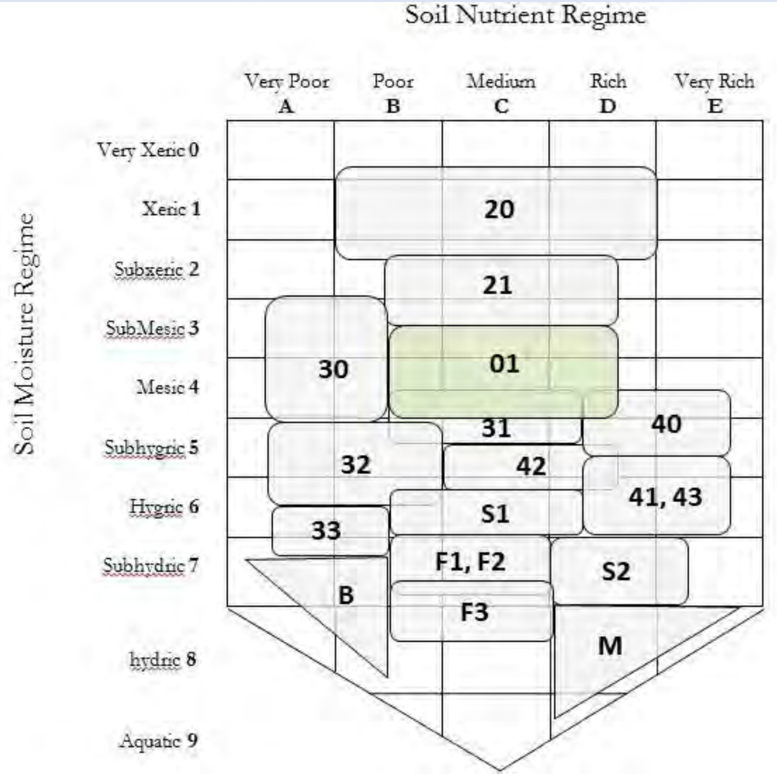
Seepage Water: absent

Permafrost: absent

Parent Material: C, D, F

Soil Texture: SiL[3], LS[2], FSL[1], SL[1], SiCL[1]

Spruce – Labrador tea – Lowbush cranberry – Feathermoss (01-Sw(Sb))



Ecosite Association Description

The Spruce – Labrador tea – Lowbush cranberry – Feathermoss association occurs on gentle-to-moderate, predominately middle-to-upper slopes; however slope position is variable. The association occurs primarily on slopes with warm or neutral aspects and ranges in elevation from approximately 450 to 1100 m. The canopy is typically dominated by white spruce (*Picea glauca*); however white and black spruce (*Picea mariana*) co-dominated canopies also occur. A minor Alaska birch (*Betula neoalaskana*) component in both the canopy and tree regeneration layer is common. The shrub layer is dominated by Labrador tea (*Rhododendron groenlandicum*), lowbush cranberry (*Vaccinium vitis-idaea*) and willows (including *Salix alaxensis, S. glauca*, *S. planifolia, S. reticulata* and *S. scouleriana*), with lesser components of crowberry (*Empetrum nigrum*) and bog blueberry (*Vaccinium uliginosum*). The herb layer is variable, sparse and typically contains tall bluebells (*Mertensia paniculata*) and bastard toadflax (*Geocaulon lividum*). The moss and lichen layer is dominated by step moss (*Hylocomium splendens*) and red-stemmed feathermoss (*Pleurozium schreberi*) with a lesser reindeer lichen (*Cladina mitis* and *C. rangiferina*) and pelt lichen (*Peltigera* spp.) component.

The soil moisture regime of the association ranges from submesic-to-subhygric and the soil nutrient regime ranges from poor-to-rich. The dominant rooting zone textures are sandy loam and silt loam, overlaying predominantly colluvial parent material. The association typically lacks permafrost and is predominantly well drained.

Sample Plots: 12

Full	[1]
Ground	[7]
Visual	[5]

Characteristic Vegetation

Tree Layer:

[25] White spruce (*Picea glauca*)

[5] Alaska birch (*Betula neoalaskana*)*

Shrub Layer:

[14] Labrador tea (*Rhododendron groenlandicum*)

[12] Lowbush cranberry (*Vaccinium vitis-idaea*)

[6] Willows (*Salix* spp.)

[5] Bog blueberry (*Vaccinium uliginosum*)

[4] Crowberry (*Empetrum nigrum*)

Herb Layer:

[2] Tall bluebells (*Mertensia paniculata*)

[2] Bastard toadflax (*Geocaulon lividum*)

Moss/Lichen Layer:

[56] Step moss (*Hylocomium splendens*)

[15] Red-stemmed feathermoss (*Pleurozium schreberi*)*

[6] Reindeer lichens (*Cladina* spp.)

[2] Pelt lichens (*Peltigera* spp.)

Site Characteristics

Moisture Regime: mesic[6], submesic[3], subhygric[3]

Nutrient Regime: medium[9], rich[2], poor[1]

Slope Gradient: 2-50 %

Aspect: southerly[7], easterly[4], westerly[1]

Slope Position: midslope[6], upper slope[3], lower[1], toe[1], level[1]

Soil Characteristics

Organic Thickness: 3-30 cm

Humus Form: mor[7], moder[5]

Drainage: well[10], moderately[1]

Seepage Water: absent

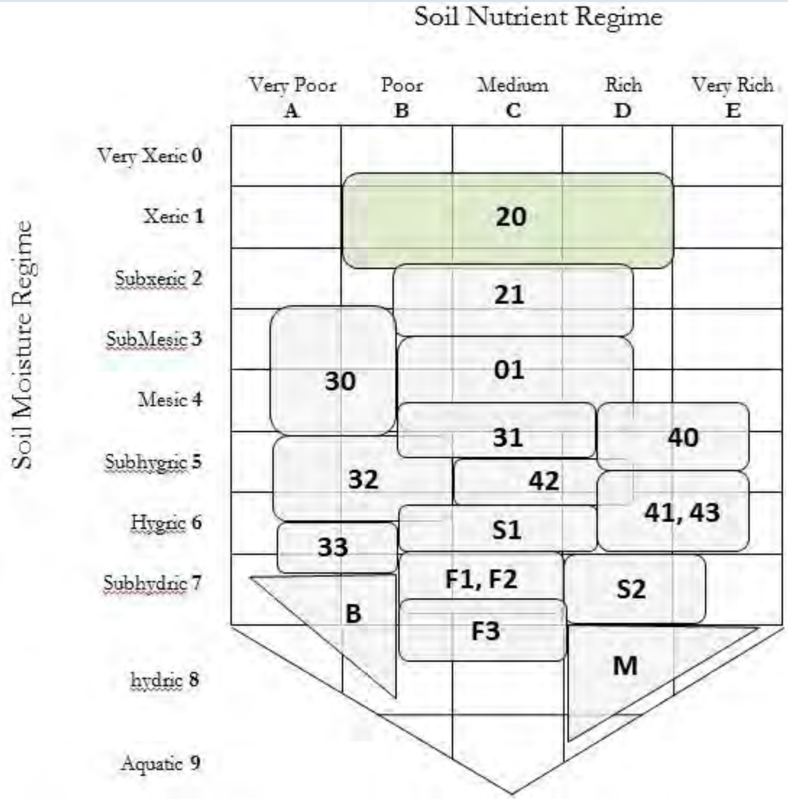
Permafrost: absent

Parent Material: C, D

Soil Texture: SiL[7], L[2], SL[1], FSL[1], SiCL[1]

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Kinnikinnick (20-Aruv)



Ecosite Association Description

The Kinnikinnick association occurs on moderate-to-steep, primarily south-facing slopes at low to middle elevations (400-800 m). Within the ELC survey extent, this association has limited extent and is found on warm sideslopes near the Yukon and Stewart Rivers, Maisy May Creek and Barker Creek. Due to the topography, the dominant vegetation species found in this association are resilient to dry conditions and eroding soils. A high ground shrub cover of kinnikinnick (*Arctostaphylos uva-ursi*) is characteristic of this association. Other shrub species typically present in low cover are prickly rose (*Rosa acicularis*) and soapberry (*Shepherdia canadensis*). Trembling aspen (*Populus tremuloides*) is often present in the shrub layer as a regenerating tree species, but the cover is sporadic and commonly low. The herb, moss and lichen layers are sparse but can include purple reedgass (*Calamagrostis purpurascens*), northern bedstraw (*Galium boreale*), spikelike goldenrod (*Solidago simplex*) and *Cladonia* spp. This association is often closely associated with the Aspen – Kinnikinnick – Purple reedgrass ecosite.

The soil moisture regime of the Kinnikinnick ecosite is xeric to subxeric and the soil nutrient regime is typically medium. Rapidly drained, sandy soils typically overlay colluvial parent material. This association may be found on slightly cooler aspects or on site better protected from winter snow cover than other grassland associations.

Sample Plots: 4

Full	[0]
Ground	[1]
Visual	[0]

Characteristic Vegetation

Shrub Layer:

[65] Kinnikinnick (*Arctostaphylos uva-ursi*)

[8] Trembling aspen (*Populus tremuloides*)

[5] Rose (*Rosa acicularis, R. woodsii*)

[2] Soapberry (*Shepherdia canadensis*)

Herb Layer:

[5] Purple reedgrass (*Calamagrostis purpurascens*)

[1] Northern bedstraw (*Galium boreale*)

[1] Tall larkspur (*Aconitum delpiniifolium*)

[.5] Spikelike goldenrod (*Solidago simplex*)

Moss/Lichen Layer:

[2] Cladonia lichens (*Cladonia* spp.)

Site Characteristics

Moisture Regime: subxeric[1]

Nutrient Regime: medium[1]

Slope Gradient: 30-75%

Aspect: southerly[1]

Slope Position: midslope[1] to upper slope

Exposure: insolation

Soil Characteristics

Organic Thickness: 1 – 5 cm

Humus Form: mull[1]

Drainage: rapidly[1]

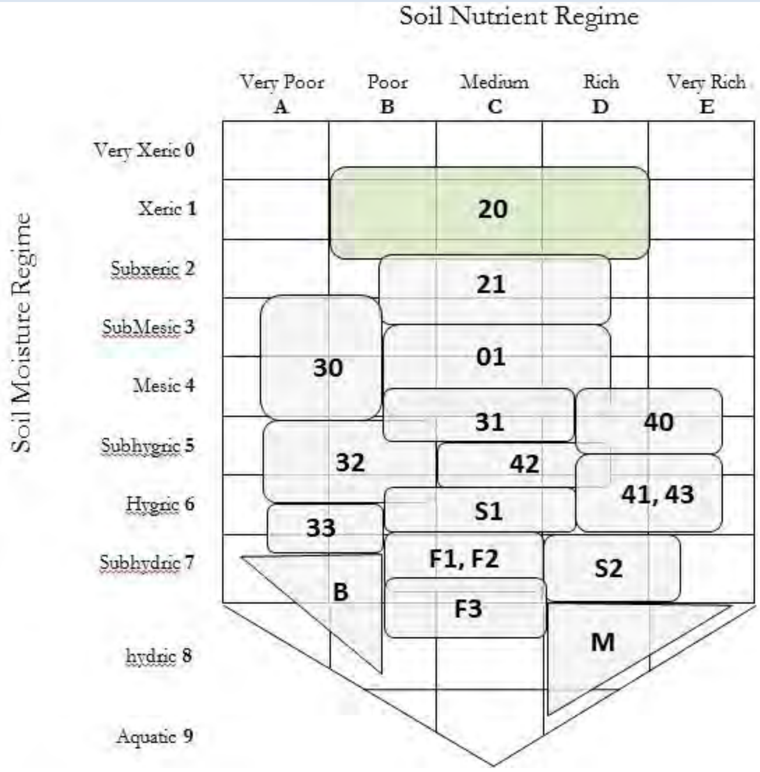
Seepage Water: absent

Permafrost: absent

Parent Material: C

Soil Texture: SL[1]

Purple reedgrass – Lichen (20-Capu)



Ecosite Description

The Purple reedgrass – Lichen ecosite occurs on moderate-to-steep, south-facing slopes at low to middle elevations (400-800 m). Within the survey extent, the ecosite is found along the steep, warm slopes above Coffee Creek, near the Yukon River, and near the Maisy May Creek and Stewart River junction. Due to the topography, the dominant vegetation species found in this ecosite are resilient to dry conditions and eroding soils. The sparse to moderate shrub layer is dominated by rose (*Rosa acicularis,* and *R. woodsii*), soapberry (*Shepherdia canadensis*) and kinnikinnick (*Arctostaphylos uva-ursi*). Trembling aspen (*Populus tremuloides*) is often present in the shrub layer as a regenerating tree species, but the cover is sporadic and typically low. The herb layer is dominated by purple reedgass (*Calamagrostis purpurascens*); however a number of other species are typically present, including pasture sage (*Artemisia frigida*), prickly saxifrage (*Saxifraga tricuspidata*), yarrow (*Achillea millefolium*), spikelike goldenrod (*Solidago simplex*), and cut leaf anemone (*Anemone multifida*). A lichen crust, of varying cover, is typical in this ecosite and is commonly dominated by *Cladonia* spp. Exposed mineral soil and decaying organic matter comprises much of the ground cover on these sites.

The soil moisture regime of the Purple reedgrass – Lichen ecosite is xeric to subxeric and the soil nutrient regime is typically medium. Rapidly drained, sandy soils overlay colluvial parent material. Due to the unstable conditions of these slopes (steep, dry, south facing) topsoil is susceptible to frost heave and wind and water erosion.

Sample Plots: 4

Full	[1]
Ground	[1]
Visual	[1]

Characteristic Vegetation

Shrub Layer:

[6] Rose (*Rosa acicularis, R. woodsii*)

[3] Soapberry (*Shepherdia canadensis*)

[2] Kinnikinnick (*Arctostaphylos uva-ursi*)

Herb Layer:

[17] Purple reedgrass (*Calamagrostis purpurascens*)

[4] Pasture sage (*Artemisia frigida*)

[2] Spikelike goldenrod (*Solidago simplex*)

[2] Prickly saxifrage (*Saxifraga tricuspidata*)

[1] Yarrow (*Achillea millefolium*)

[1] Northern bedstraw (*Galium boreale*)

[1] Sedges (*Carex* spp.)

[.5] Cut Leaf anemone (*Anemone multifida*)

[.5] Redhair saxifrage (*Saxifraga rufopilosa*)

Moss/Lichen Layer:

[10] Lichen crust (commonly *Cladonia* spp.)

Site Characteristics

Moisture Regime: subxeric^{4}

Nutrient Regime: medium^{3}, poor^{1}

Slope Gradient: 40-75%

Aspect: southerly^{3}, south-easterly^{1}

Slope Position: upper slope^{2}, midslope^{2}

Exposure: insolation

Soil Characteristics

Organic Thickness: 1 – 5 cm

Humus Form: mull^{3}, moder^{1}

Drainage: rapidly^{4}

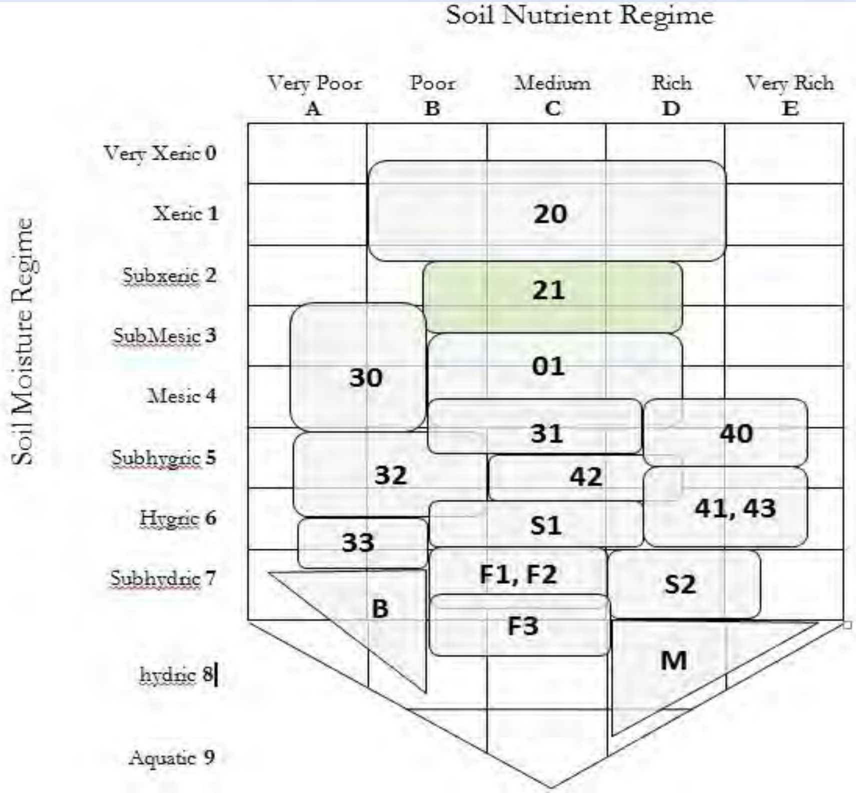
Seepage Water: absent

Permafrost: absent

Parent Material: C

Soil Texture: SL^{2}, FS^{1}, FSL^{1}

Aspen – Kinnikinnick – Purple reedgrass (21)



Ecosite Description

The Aspen – Kinnikinnick – Purple reedgrass ecosite occurs on gentle-to-steep (predominately moderate) slopes with south- or west-facing aspects. The ecosite is found on middle-to-upper slopes, ranging in elevation from approximately 385-900 m. The canopy is generally dominated by trembling aspen (*Populus tremuloides*); however most stands have a minor white spruce (*Picea glauca*) component. Similarly, the regenerating tree layer is largely composed of aspen and white spruce. Ground shrubs, including kinnikinnick (*Arctostaphylos uva-ursi*) and lowbush cranberry (*Vaccinium vitis-idaea*), commonly dominate the shrub layer; however prickly rose (*Rosa acicularis*) and soapberry (*Shepherdia canadensis*) are also characteristic components. The herb layer is typically dominated by purple reedgrass (*Calamagrostis purpurascens*) and bastard toadflax (*Geocaulon lividum*), with tall bluebells (*Mertensia paniculata*), and fireweed (*Chamerion angustifolium*) commonly occurring in minor amounts. The moss and lichen layer is sparse, variable and sporadically distributed. Due to the slope and aspect position, this ecosite is prone to dry conditions, which increases the potential for fire.

The soil moisture regime of the Aspen – Kinnikinnick – Purple reedgrass ecosite ranges from subxeric-to-submesic and the soil nutrient regime ranges from poor-to-medium. The rooting zone soil texture is variable, though often sandy, and soils are rapidly-to-well drained. The parent material is primarily colluvial.

Sample Plots: 15

Full	[1]
Ground	[8]
Visual	[6]

Characteristic Vegetation

Tree Layer:

[27] Trembling aspen (*Populus tremuloides*)

[6] White spruce (*Picea glauca*)

Shrub Layer:

[37] Kinnikinnick (*Arctostaphylos uva-ursi*)

[7] Soapberry (*Shepherdia canadensis*)

[6] Trembling aspen (*Populus tremuloides*)

[5] Lowbush cranberry (*Vaccinium vitis-idaea*)

[4] Twinflower (*Linnaea borealis*)

[3] Prickly rose (*Rosa acicularis*)

Herb Layer:

[7] Purple reedgrass (*Calamagrostis purpurascens*)

[5] Bastard toadflax (*Geocaulon lividum*)

[2] Arctic lupine (*Lupinus arcticus*)*

[1] Tall bluebells (*Mertensia paniculata*)

[1] Fireweed (*Chamerion angustifolium*)

Moss/Lichen Layer:

[5] Step moss (*Hylocomium splendens*)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: submesic[11], subxeric[4]

Nutrient Regime: medium[9], poor[6]

Slope Gradient: 5-80 %, generally <20%

Aspect: southerly[3], westerly[1], north-westerly[1]

Slope Position: midslope[9], upper slope[3], lower slope[1]

Soil Characteristics

Organic Thickness: 1-9 cm

Humus Form: mor[9], moder[6]

Drainage: well[10], rapidly[5]

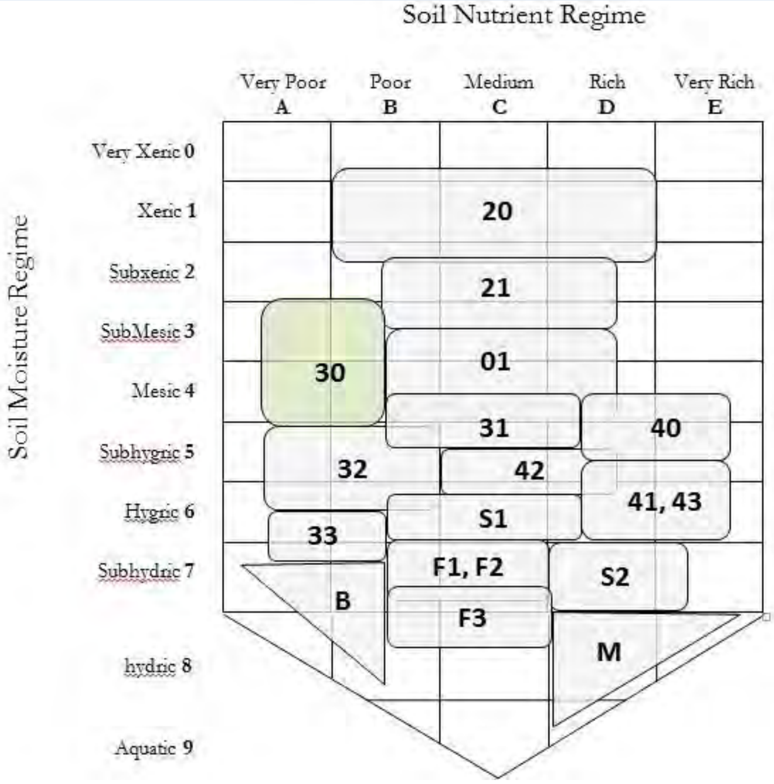
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SL[5], SiCL[2], SiL[2], FSL[2], S[1]

Black spruce – Labrador tea – Reindeer lichen (30)



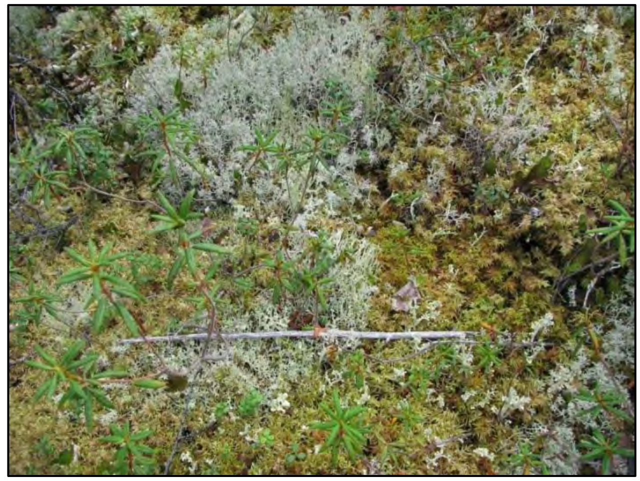
Ecosite Description

The Black spruce – Labrador tea – Reindeer lichen ecosite occurs on gentle-to-moderate, lower-to-upper slopes with a northerly aspect. Within the LSA, the ecosite ranges in elevation from approximately 400 to 1000 m. The canopy is dominated by black spruce (*Picea mariana*); however a minor Alaska birch (*Betula neoalaskana*) or white spruce (*Picea glauca*) component is common. The shrub layer is not as diverse as other forested ecosystems within the Boreal High Bioclimate zone and is dominated by Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*). The relatively sparse herb layer is typically dominated by bastard toadflax (*Geocaulon lividum*). The moss and lichen layer of this ecosite is well-developed, generally comprising over 85% cover, dominated by reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*), red-stemmed feathermoss (*Pleurozium schreberi)*, and step moss (*Hylocomium splendens*).

The soil moisture regime of the Black spruce – Labrador tea – Reindeer lichen ecosite ranges from submesic-to-mesic with a poor nutrient regime. The dominant rooting zone texture is silt loam overlaying colluvial or weathered bedrock parent material. Permafrost is absent in this ecosite and soils are rapidly-to-well drained.

Sample Plots: 7

Full	[0]
Ground	[3]
Visual	[4]



Characteristic Vegetation

Tree Layer:

[18] Black spruce (*Picea mariana*)

[4] Alaska Birch (*Betula neoalaskana*)

Shrub Layer:

[15] Black spruce (*Picea mariana*)

[3] Alaska birch (*Betula neoalaskana*)

[24] Labrador tea (*Rhododendron groenlandicum*)

[13] Lowbush cranberry (*Vaccinium vitis-idaea*)

[2] Willows (*Salix* spp.)

Herb Layer:

[5] Bastard toadflax (*Geocaulon lividum*)

[1] Common horsetail (*Equisetum arvense*)*

Moss/Lichen Layer:

[42] Reindeer lichen (*Cladina* spp.)

[31] Red-stemmed feathermoss (*Pleurozium schreberi*)

[18] Step moss (*Hylocomium splendens*)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: mesic^{3}, submesic^{2}, subhygric^{2}

Nutrient Regime: poor^{7}

Slope Gradient: 8-40%

Aspect: northerly^{5}, north-westerly^{1}, easterly^{1}

Slope Position: midslope^{2}, upper slope^{3}, lower slope^{1}

Soil Characteristics

Organic Thickness: 10-25 cm

Humus Form: mor^{7}

Drainage: well^{4}, rapidly^{1}, moderately well^{1}

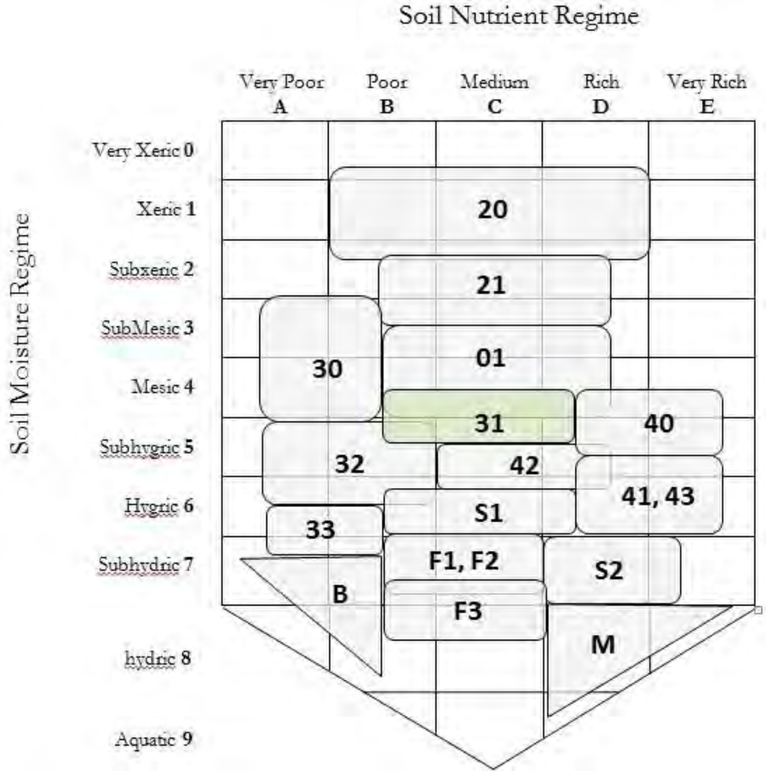
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SiL^{4}, LS^{1}, S^{1}

Spruce – Birch – Lowbush cranberry – Feathermoss (31)



Ecosite Description

The Spruce – Birch – Lowbush Cranberry – Feathermoss ecosite occurs on gentle-to-moderate, mid-to-upper slopes across a range of aspects. Within the ELC survey extent, the ecosite typically ranges from 900-1150 m. This ecosite is commonly found near the Subalpine Bioclimate zone boundary and is transitional between forested and shrub dominated ecosystems. A sparse conifer dominated canopy (~15% cover), composed of white and black spruce (*Picea glauca* and *P. mariana*) is characteristic. The shrub layer is well developed and is dominated by scrub birch (*Betula glandulosa*), water birch (*B. occidentalis*), Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*). Willows (including *Salix glauca* and *S. plainfolia*), Bog blueberry (*Vaccinium uliginosum*) and crowberry (*Empetrum nigrum*) are also common in the shrub layer. The herb layer is sparse and variable, but typically spruce muskeg sedge (*Carex lugens*) and grasses are present. The well-developed moss and lichen layer is dominated by red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*) and reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*).

The soil moisture regime of the Spruce – Birch – Lowbush Cranberry – Feathermoss ecosite is typically mesic and the soil nutrient regime ranges from poor-to-medium. The dominant rooting zone textures are silt loam and sandy loam and soils are commonly well-drained. The parent material is weathered bedrock or colluvial.

Sample Plots: 24

Full	[1]
Ground	[11]
Visual	[12]

Characteristic Vegetation

Tree Layer:

[8] Black spruce (*Picea mariana*)

[8] White spruce (*Picea glauca*)

Shrub Layer:

[18] Scrub birch (*Betula glandulosa*)

[18] Labrador tea (*Rhododendron groenlandicum*)

[13] Lowbush cranberry (*Vaccinium vitis-idaea*)

[13] Water birch (*Betula occidentalis*)

[8] Willows (*Salix* spp.)

[6] Crowberry (*Empetrum nigrum*)

[5] Bog blueberry (*Vaccinium uliginosum*)

Herb Layer:

[2] Spruce muskeg sedge (*Carex lugens*)*

[2] Grasses (Poaceae spp.)*

Moss/Lichen Layer:

[36] Red-stemmed feathermoss (*Pleurozium schreberi*)

[20] Reindeer lichen (*Cladina* spp.)

[19] Step moss (*Hylocomium splendens*)

[5] Pelt lichens (*Peltigera* spp.)

[4] Haircap mosses (*Polytrichum* spp.)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: mesic[19], submesic[4], subhygric[1]

Nutrient Regime: medium[13], poor[10]

Slope Gradient: 2-40 %, generally >10%

Aspect: variable

Slope Position: midslope[12], upper slope[9], lower slope[1], level[1], crest[1]

Soil Characteristics

Organic Thickness: 5-29 cm

Humus Form: mor[15], moder[8], fibric[1]

Drainage: well[19], moderately well[2], rapidly[2], imperfectly[1]

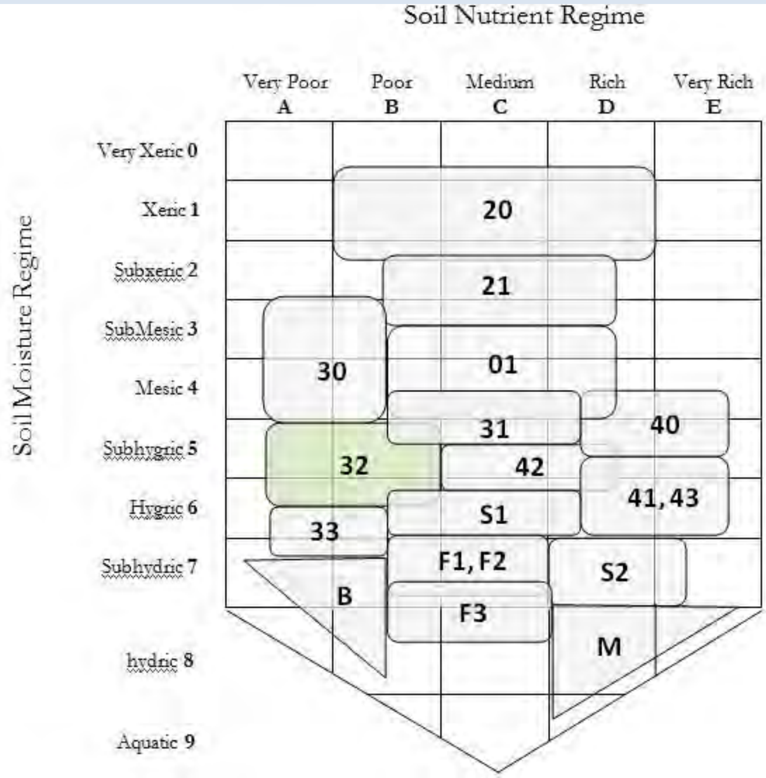
Seepage Water: absent

Permafrost: absent

Parent Material: D, C

Soil Texture: SiL[13], SL[7], L[2], FSL[1], SCL[1]

Black spruce – Scrub birch – Labrador tea – Cloudberry (32-Sb1)



Ecosite Association Description

The Black spruce – Scrub birch – Labrador tea – Cloudberry association occurs on moderate-to-steep, lower-to-middle slopes on primarily cool aspects. Within the LSA, the association ranges in elevation from approximately 550 to 1100 m. Black spruce (*Picea mariana*) is the dominant tree species, but it tends to be stunted with a moderate-to-sparse canopy and is present in both the shrub and tree layers. The shrub layer is dominated by Labrador tea (*Rhododendron groenlandicum*) and/or Northern Labrador tea (*Rhododendron tomentosum*), lowbush cranberry (*Vaccinium vitis-idaea*) and scrub birch (*Betula glandulosa*). Bog blueberry (*Vaccinium uliginosum*) and crowberry (*Empetrum nigrum*) are also commonly present in lesser amounts. The herb layer commonly contains cloudberry (*Rubus chamaemorus*), sweet coltsfoot (*Petasites frigidus*) and spruce muskeg sedge (*Carex lugens*). The moss and lichen layer is an important constituent of this ecosite phase, often with greater than 80% cover. A combination of mosses and lichens is typical, including red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*), peat moss (*Sphagnum* spp.), and reindeer lichen (*Cladina mitis, C. rangiferina*, and *C. stellaris*).

The soil moisture regime of the association ranges is subhygric-to-hygric and the nutrient regime is typically poor. The dominant rooting zone soil textures are silt loam and loam, overlaying predominantly colluvial parent material. Permafrost is often present within 50cm of the soil surface and soils are typically moderately well-to-poorly drained.

Sample Plots: 16

Full	[0]
Ground	[8]
Visual	[10]

Characteristic Vegetation

Tree Layer:

[6] Black spruce (*Picea mariana*)*

Shrub Layer:

[21] Black spruce (*Picea mariana*)

[28] Labrador tea (*Rhododendron groenlandicum* and *R. tomentosum*)

[11] lowbush cranberry (*Vaccinium vitis-idaea*)

[9] Scrub birch (*Betula glandulosa*)

[6] Bog blueberry (*Vaccinium uliginosum*)

[6] Willows (including *Salix glauca* and *S. planifolia)*

[5] Crowberry (*Empetrum nigrum*)

Herb Layer:

[6] Spruce muskeg sedge (*Carex lugens*)*

[4] Cloudberry (*Rubus chamaemorus*)

[1] Sweet coltsfoot (*Petasites frigidus*)

Moss/Lichen Layer:

[30] Step moss (*Hylocomium splendens*)

[26] Red-stemmed feathermoss (*Pleurozium schreberi*)

[25] Peat mosess (*Sphagnum* spp.)

[15] Reindeer lichens (*Cladina* spp.)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: subhygric^{8}, hygric^{4}, mesic^{3}

Nutrient Regime: poor^{11}, medium^{4}

Slope Gradient: 10-55 %

Aspect: northerly^{7}, north-westerly^{3}, esterly^{2}, westerly^{2} north-easterly^{1}

Slope Position: midslope^{9}, lower slope^{3}, upper slope^{3}

Soil Characteristics

Organic Thickness: 10-40 cm

Humus Form: fibric^{8}, mor^{6}, moder^{2}

Drainage: imperfectly^{8}, poorly^{-3}, moderately well^{3}

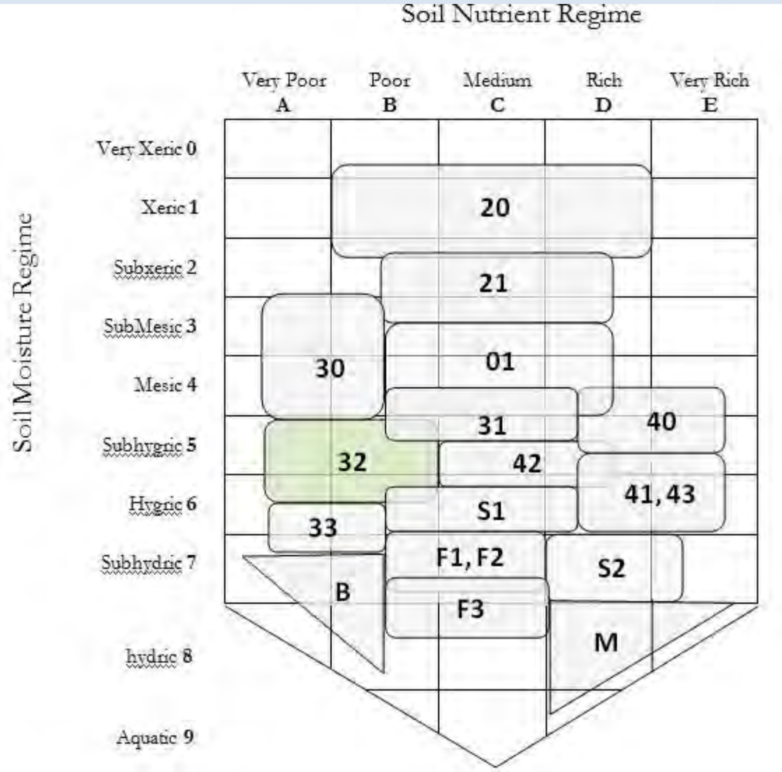
Seepage Water: sometimes present

Permafrost: typically present

Parent Material: C, D

Soil Texture: SiL^{10}, L^{3}, SiCL^{1}

Black spruce – Labrador tea – Cottongrass (32-Sb2)



Ecosite Association Description

The Black spruce – Labrador tea – Cottongrass association occurs on moderate-to-steep, lower-to-middle slopes on primarily cool aspects. Within the LSA, the association ranges in elevation from approximately 450 to 1050 m. Black spruce (*Picea mariana*) is the dominant tree species, but it tends to be stunted with a moderate-to-sparse canopy and is present in both the shrub and tree layers. The shrub layer is dominated by Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*), with bog blueberry (*Vaccinium uliginosum*), green alder (*Alnus viridis*) and Northern Labrador tea (*Rhododendron tomentosum*) commonly present in lesser amounts. Sheathed cottongrass (*Eriophorum vaginatum*) characteristically dominates the herb layer; however cloudberry (*Rubus chamaemorus*) and bog cranberry (*Vaccinium oxycoccos*) are also typically present. The moss and lichen layer is an important constituent of this association, often with greater than 80% cover. A combination of mosses and lichens is typical, including red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*), peat mosses (*Sphagnum* spp.), and reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*).

The soil moisture regime of the association ranges from subhygric-to-hygric and the nutrient regime ranges from poor-to-medium. The dominant rooting zone soil texture is silt loam, overlaying predominantly colluvial parent material. Permafrost is typically present within 50cm of the soil surface and soils are consequently imperfectly-to-poorly drained.

Sample Plots: 14

Full	[2]
Ground	[8]
Visual	[4]

Characteristic Vegetation

Tree Layer:

[3] Black spruce (*Picea mariana*)

Shrub Layer:

[23] Black spruce (*Picea mariana*)

[16] Labrador tea (*Rhododendron groenlandicum*)

[8] Lowbush cranberry (*Vaccinium vitis-idaea*)

[4] Bog blueberry (*Vaccinium uliginosum*)

[3] Green alder (*Alnus viridis*)

[2] Alaska birch (*Betula neoalaskana*)

[2] Northern Labrador tea (*Rhododendron tomentosum*)

Herb Layer:

[11] Sheathed cottongrass (*Eriophorum vaginatum*)

[3] Cloudberry (*Rubus chamaemorus*)

[1] Bog cranberry (*Vaccinium oxycoccos*)

Moss/Lichen Layer:

[25] Red-stemmed feathermoss (*Pleurozium schreberi*)

[20] Step moss (*Hylocomium splendens*)

[23] Peat mosses (*Sphagnum* spp.)

[12] Reindeer lichens (*Cladina* spp.)

[5] Cetraria lichens (*Cetraria* spp.)

Site Characteristics

Moisture Regime: hygric[8], subhygric[6]

Nutrient Regime: poor[11], medium[3]

Slope Gradient: 8-65 %

Aspect: northerly[11], north-westerly[1], north-easterly[1], westerly[1]

Slope Position: midslope[8], lower slope[5], toe[1]

Soil Characteristics

Organic Thickness: 20-45 cm

Humus Form: fibric[11], mor[2], moder[1]

Drainage: poorly[9], imperfectly[5]

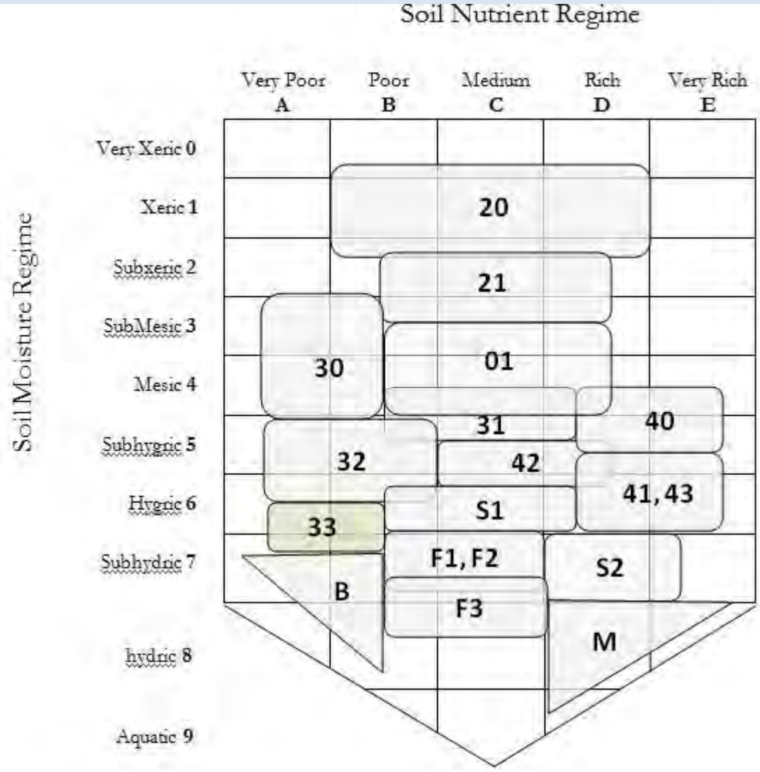
Seepage Water: sometimes present

Permafrost: present

Parent Material: C, D

Soil Texture: SiL[11], SL[1]

Black spruce – Labrador tea – Sedge – Brown moss – Reindeer lichen (33)



Ecosite Description

The Black spruce – Labrador tea – Sedge – Brown moss – Reindeer lichen association occurs on gentle-to-moderate, lower-to-toe slopes on primarily cool and neutral aspects. Within the survey extent, the association ranges in elevation from approximately 400 to 950 m and is often found in the lower-to-toe slope position leading to valley bottom drainages. Black spruce (*Picea mariana*) is the dominant tree species, but it tends to be stunted with a moderate-to-sparse canopy and is present in both the shrub and tree layers. The shrub layer is dominated by Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*), with willows (including *Salix glauca, S. planifolia, S. myrtillifolia,* and *S. scouleriana*) commonly present in lesser amounts. Spruce muskeg sedge (*Carex lugens*), red bearberry (*Arctous rubra*), and sweet coltsfoot (*Petasites frigidus*) are typically present in the herb layer. The moss and lichen layer is an important constituent of this association, often with greater than 80% cover. The combination of feather mosses, brown mosses and lichens is characteristic, and includes step moss (*Hylocomium splendens*), glow moss (*Aulacoumnium* spp.) and reindeer lichen (*Cladina mitis, C. rangiferina*, and *C. stellaris*).

The soil moisture regime of the association ranges from subhygric-to-hygric and the nutrient regime ranges from poor-to-medium. The rooting zone soil texture is variable, primarily sandy and silt loams, overlaying primarily colluvial and fluvial parent material. Permafrost is typically present within 50 cm of the soil surface and soils are consequently imperfectly-to-poorly drained.

Sample Plots: 11

Full	[0]
Ground	[5]
Visual	[6]

Characteristic Vegetation

Tree Layer:

[8] Black spruce (*Picea mariana*)

Shrub Layer:

[16] Black spruce (*Picea mariana*)

[11] Labrador tea (*Rhododendron groenlandicum*)

[7] Lowbush cranberry (*Vaccinium vitis-idaea*)

[2] Willows (*Salix* spp.)

Herb Layer:

[7] Spruce muskeg sedge (*Carex lugens*)

[6] Red bearberry (*Arctous rubra*)

[2] Sweet coltsfoot (*Petasites frigidus*)

[2] Dwarf scouring rush (*Equisetum scirpoides*)

Moss/Lichen Layer:

[45] Step moss (*Hylocomium splendens*)

[18] Reindeer lichens (*Cladina* spp.)

[13] Brown mosses (*Aulacomnium/Tomenthypnum*)

[1] Pelt lichens (*Peltigera* spp.)

Site Characteristics

Moisture Regime: hygric^{7}, subhygric^{4}

Nutrient Regime: poor^{7}, medium^{4}

Slope Gradient: 2-50 %, typically <20%.

Aspect: variable

Slope Position: lower slope^{6}, toe^{4}, level^{1}

Soil Characteristics

Organic Thickness: 20-45 cm

Humus Form: fibric^{6}, mesic^{2}, moder^{2}

Drainage: poorly^{6}, imperfectly^{4}, moderately well^{1}

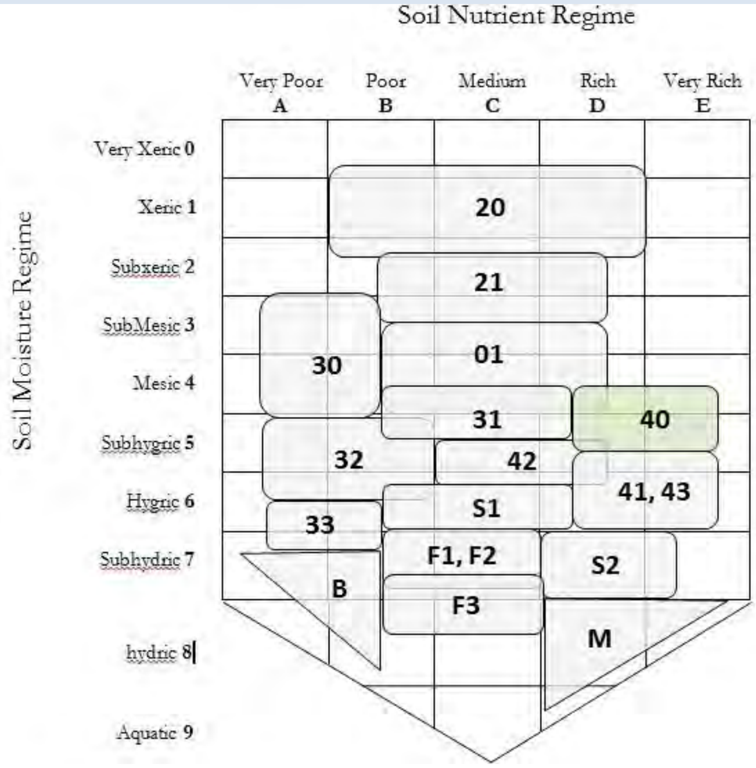
Seepage Water: typically present

Permafrost: present

Parent Material: C, F

Soil Texture: SiL^{2}, SL^{2}, L^{2}, LS^{1}

White spruce – Horsetail (40)



Ecosite Description

The White spruce – Horsetail ecosite is a coniferous riparian ecosystem that occurs on broad, level floodplains and along the banks of streams and sideslope creeks. The ecosite occurs from approximately 380 to 1000 m, along the Yukon and Stewart Rivers, smaller creeks (e.g., Coffee Creek), and side slope drainages within the survey extent. The canopy is dominated by white spruce (*Picea glauca*); however a minor Alaska birch (*Betula neoalaskana*) or black spruce (*Picea mariana*) component can occur. Prickly rose (*Rosa acicularis*), green alder (*Alnus viridis*) and willow species (including *S. arbusculoides, S. barclayi, S. glauca, S. lasiandra,* and *S. scouleriana*) dominate the shrub layer, with highbush cranberry (*Viburnum edule*) and lowbush cranberry (*Vaccinium vitis-idaea*) often present in lesser amounts. The herb layer is dominated by common horsetail (*Equisetum arvense*) and bluejoint reedgrass (*Calamagrostis canadensis*). Other species often present in the herb layer include twinberry (*Linnaea borealis*) and tall bluebells (*Mertensia paniculata*). The moss layer is variable but step moss (*Hylocomium splendens*) is commonly the dominant species. Due to the increased moisture and nutrient regime of these riparian areas, the canopy is often more productive than other forested ecosites within the survey extent.

The soil moisture regime of the White spruce – Horsetail ecosite ranges from mesic-to-hygric and the nutrient regime is medium-to-rich. Soils are well-to-imperfectly drained with variable rooting zone soil texture. The parent material is typically fluvial.

Sample Plots: 9

Full	[1]
Ground	[6]
Visual	[2]

Characteristic Vegetation

Tree Layer:

[34] White spruce (*Picea glauca*)

[6] Alaska birch (*Betula neoalaskana*)

Shrub Layer:

[14] Prickly rose (*Rosa acicularis*)

[10] Green alder (*Alnus viridis*)

[8] Highbush cranberry (*Viburnum edule*)

[7] Willows (*Salix* spp.)

[3] Lowbush cranberry (*Vaccinium vitis-idaea*)

Herb Layer:

[10] Common horsetail (*Equisetum arvense*)

[5] Bluejoint reedgrass (*Calamagrostis canadensis*)

[3] Tall bluebells (*Mertensia paniculata*)

[2] Twinflower (*Linnaea borealis*)

Moss/Lichen Layer:

[50] Step moss (*Hylocomium splendens*)

Site Characteristics

Moisture Regime: subhygric^{6}, mesic^{2}, hygric^{1}

Nutrient Regime: rich^{5}, medium^{4}

Slope Gradient: 0-30 %

Aspect: variable

Slope Position: level^{7}, gully^{2}

Soil Characteristics

Organic Thickness: 5-20 cm

Humus Form: moder^{6}, mor^{3}

Drainage: well^{6}, moderately well^{1}, imperfect^{2}

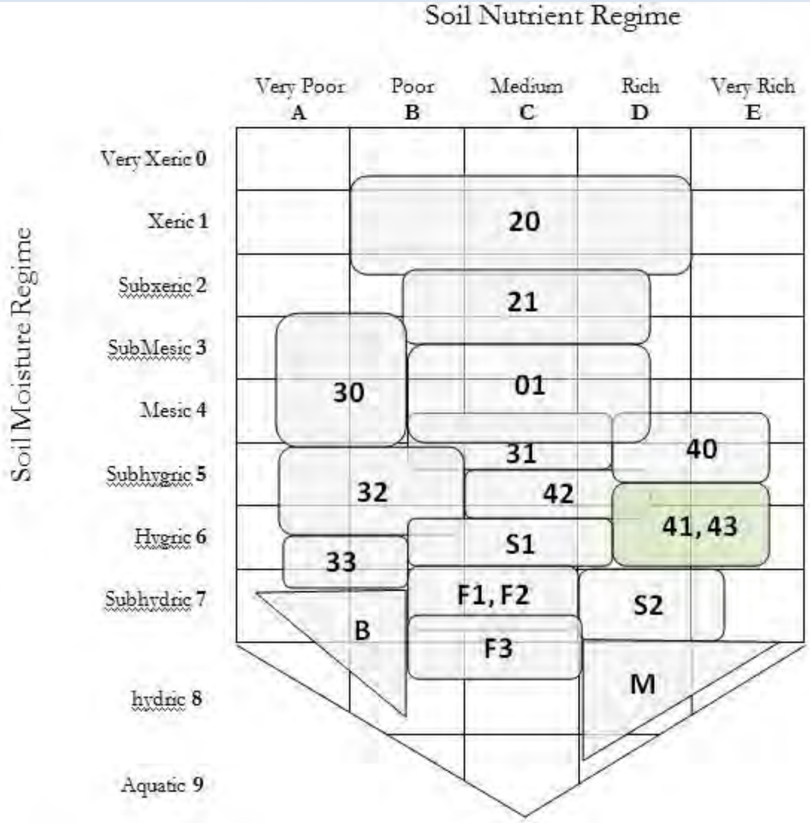
Seepage Water: typically absent

Permafrost: absent

Parent Material: F, C

Soil Texture: SiL^{4}, LS^{2}, FSL^{1}, cS^{1}

Balsam poplar – Prickly rose – Horsetail (41)



Ecosite Description

The Balsam poplar – Prickly rose – Horsetail ecosite is a deciduous riparian ecosystem that occurs on broad, level floodplains and along the banks of rivers and creeks. The ecosite occurs at lower elevations within the survey extent, from approximately 350 to 450 m, along the Yukon and Stewart Rivers and along smaller streams and creeks (e.g., Coffee Creek). The canopy is often dominated by balsam poplar (*Populus balsamifera*), but mixed balsam poplar/Alaska birch (*Betula neoalaskana*) and Alaska birch dominated stands do occur. The well-developed shrub layer is dominated by prickly rose (*Rosa acicularis*), red-osier dogwood (*Cornus stolonifera*) and willows (including *Salix bebbiana*, *S. alaxensis*, and *S. planifolia*). Common horsetail (*Equisetum arvense*) dominates the herb layer; however tall bluebells (*Mertensia paniculata*) and northern bedstraw (*Galium boreale*) are also typically present. The moss layer is sparse due to a high cover of deciduous leaf litter and periodic flooding.

The soil moisture regime of Balsam poplar – Prickly rose – Horsetail ecosite is subhygric and the nutrient regime is rich-to-very rich. Soils are well drained with variable rooting zone soil texture. The parent material is fluvial.

Sample Plots: 4

Full	[1]
Ground	[3]
Visual	[0]

Characteristic Vegetation

Tree Layer:

[32] Balsam poplar (*Populus balsamifera*)
[15] Alaska birch (*Betula neoalaskana*)†
[3] White spruce (*Picea glauca*)

Shrub Layer:

[20] Prickly rose (*Rosa acicularis*)
[7] Red-osier dogwood (*Cornus stolonifera*)
[8] Highbush cranberry (*Viburnum edule*)*
[5] Willows (*Salix* spp.)

Herb Layer:

[15] Common horsetail (*Equisetum arvense*)
[8] Bluejoint reedgrass (*Calamagrostis canadensis*)*
[3] Tall bluebells (*Mertensia paniculata*)
[2] Northern bedstraw (*Galium boreale*)

Moss/Lichen Layer:

[3] Ragged mosses (*Brachythecium* spp.)

† Tree may be dominant in some plots

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: subhygric[4]

Nutrient Regime: rich[3], very rich[1]

Slope Gradient: 0-2%

Aspect: N/A

Slope Position: level[4]

Soil Characteristics

Organic Thickness: 3-12 cm

Humus Form: mor[3], moder[1]

Drainage: well[3], moderately well[1]

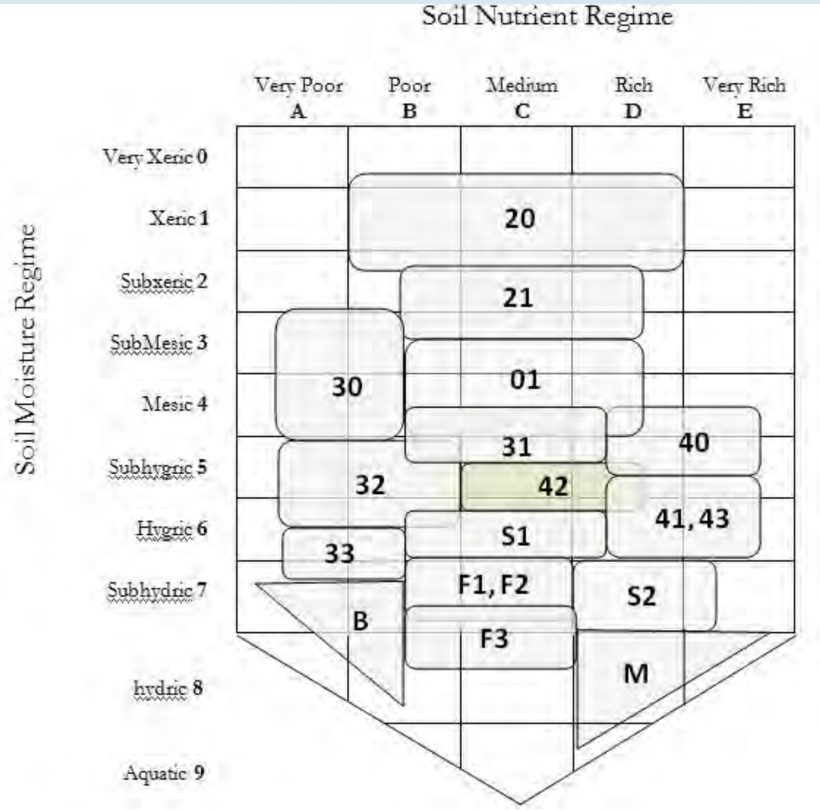
Seepage Water: absent

Permafrost: absent

Parent Material: F

Soil Texture: SiL[2], L[1], LS[1], S[1]

Alaska birch – Alder – Reedgrass (42)



Ecosite Description

The Alaska birch – Alder – Reedgrass ecosite is a deciduous dominated riparian ecosystem that occurs primarily along sideslope creeks and receiving areas. Within the survey extent, the ecosite occurs from approximately 450 to 1000 m. The canopy is dominated by Alaska birch (*Betula neoalaskana*), often with a minor spruce component. The well-developed shrub layer is dominated by tall shrub alder (*Alnus* spp.) and prickly rose (*Rosa acicularis*), with Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*) often present in lesser amounts. Common horsetail (*Equisetum arvense*) and Bluejoint reedgrass (*Calamagrostis canadensis*) dominate the herb layer; however tall bluebells (*Mertensia paniculata*) is also typically present. The sparse-to-moderate moss layer is dominated by step moss (*Hylocomium splendens*); however deciduous leaf litter cover is often high.

The soil moisture regime of Alaska birch – Alder – Reedgrass ecosite is subhygric-to-mesic and the nutrient regime is medium-to-rich. Soils are well-to-moderately well drained with variable rooting zone soil texture. The parent material is commonly colluvial or fluvial.

Sample Plots: 6

Full	[0]
Ground	[2]
Visual	[4]

Characteristic Vegetation

Tree Layer:

[27] Alaska birch (*Betula neoalaskana*)
[5] White spruce (*Picea glauca*)

Shrub Layer:

[26] Alder (*Alnus* spp.)
[16] Prickly rose (*Rosa acicularis*)
[4] Labrador tea (*Rhododendron groenlandicum*)
[4] Alaska birch (*Betula neoalaskana*)
[2] Mtn. cranberry (*Vaccinium vitis-idaea*)

Herb Layer:

[10] Common horsetail (*Equisetum arvense*)
[8] Bluejoint reedgrass (*Calamagrostis canadensis*)
[1] Tall bluebells (*Mertensia paniculata*)

Moss/Lichen Layer:

[20] Step moss (*Hylocomium splendens*)
[4] Peat mosses (*Sphagnum* sp.)

Site Characteristics

Moisture Regime: subhygric[5], mesic[1]

Nutrient Regime: medium[5], rich[1]

Slope Gradient: 2-30 %

Aspect: northerly[4], easterly[1], westerly[1]

Slope Position: gully[4], lower[1], level[1]

Soil Characteristics

Organic Thickness: 4-28 cm

Humus Form: mor[3], moder[3]

Drainage: moderately well[4], well[1], imperfectly[1]

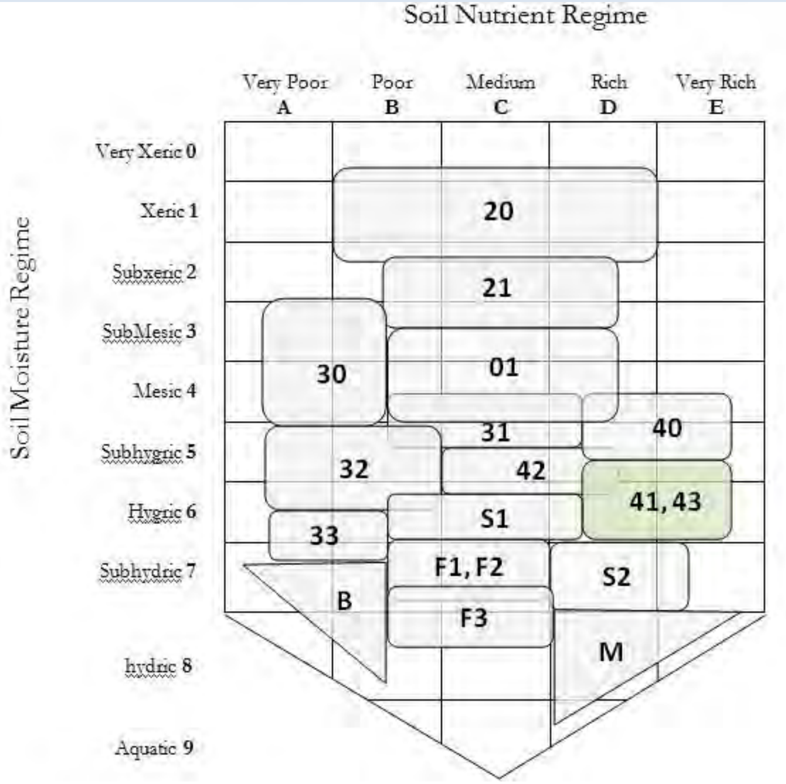
Seepage Water: absent

Permafrost: absent

Parent Material: C, F

Soil Texture: SiL[3], L[1], LS[1], S[1]

Tall shrub Balsam poplar – Willow (43)



Ecosite Description

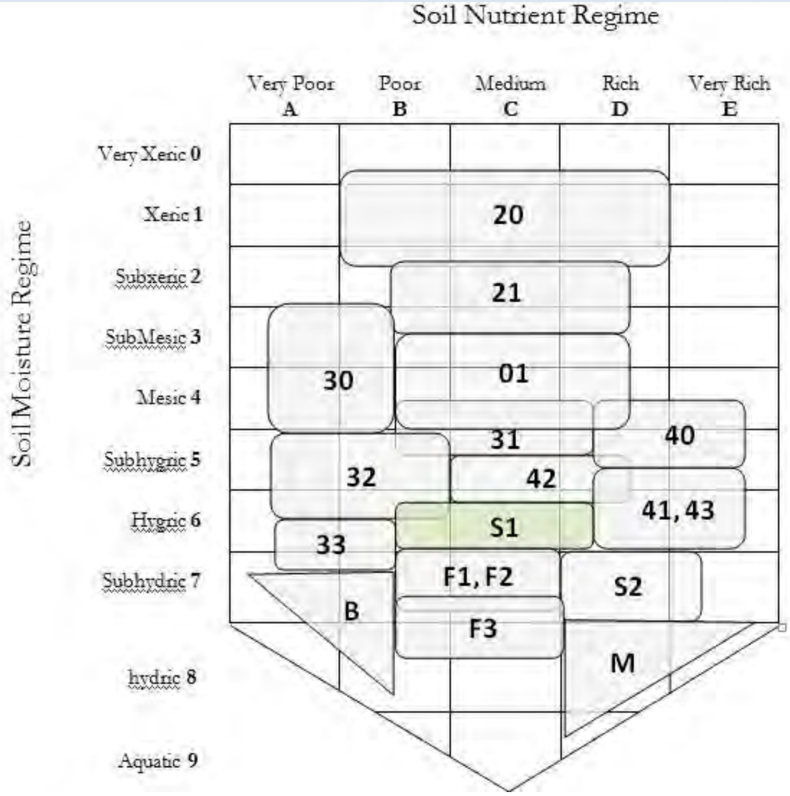
The Tall shrubs Balsam poplar - Willow ecosite is a low-bench floodplain community found on fluvial parent materials. The ecosite is dominated by young balsam poplar (*Populus balsamifera*) and willows and likely has limited understory due to frequent flooding. Within the ELC survey extent the ecosite only found along the edges of the Yukon and Stewart rivers.

The soil moisture regime of the Tall shrubs Balsam poplar - Willow ecosite is subhygric-to-hygric and the nutrient regime is rich-to-very rich. Soils are commonly coarse-texture fluvial deposits that are and rapidly-to-well drained.

Sample Plots: 0

Full	[0]
Ground	[0]
Visual	[0]

Willow – Horsetail (Swamp/S1)



Ecosite Description

The Willow – Horsetail ecosite occurs within the side channels of riverine habitats and side slope drainages where seasonal flooding is common. Within the survey extent, this association is found from approximately 550 to 1150 m. Willow species (including *Salix alaxensis, S. arbusculoides, S. glauca, S. planifolia, S. pulchra* and *S. reticulata*) are abundant and typically account for more than 60 % of the shrub cover within these ecosystems. A sparse conifer cover (<5%) is occasionally present. Other common shrub species include bog blueberry (*Vaccinium uliginosum*), and shrubby penstemon (*Dasiphora fruticosa*). The herb layer beneath the dense shrub layer is variable in composition, but bluejoint reedgrass (*Calamagrostis canadensis*) and horsetails (including *Equisetum arvense, E. pratense, E. scirpoides* and *E. variegatum*) commonly dominated by. The moss layer is also variable but is commonly dominated by peat moss (*Sphagnum* spp.), with hook mosses (*Drepanocladus* spp.) and leafy mosses (*Mnium* spp.) commonly present in lesser amounts.

The soil moisture regime of the Willow – Horsetail ecosite is subhygric-to-hygric and the soil nutrient regime is commonly medium or rich. Drainage ranges from moderately well-to-imperfectly with seepage often occurring within 60 cm of the soil surface. The parent material is fluvial and the rooting zone soil texture is variable.

Sample Plots: 11

Full	[1]
Ground	[1]
Visual	[9]

Characteristic Vegetation

Shrub Layer:

[58] Willows (*Salix* spp.)

[11] Bog blueberry (*Vaccinium uliginosum*)

[3] Shrubby penstemon (*Dasiphora fruticosa*)

Herb Layer:

[6] Bluejoint reedgrass (*Calamagrostis canadensis*)

[4] Common horsetail (*Equisetum arvense*)

[1] Dwarf scouring rush (*Equisetum scirpoides*)

[3] Sedges (*Carex* spp.)*

Moss/Lichen Layer:

[38] Peat mosses (*Sphagnum* spp.)

[18] Hook mosses (*Drepanocladus* spp.)

[5] Leafy mosses (*Mnium* spp.)

Site Characteristics

Moisture Regime: subhygric[7], hygric[4]

Nutrient Regime: medium[6], rich[4], poor[1]

Slope Gradient: 3-15 %

Aspect: variable

Slope Position: gully[11]

Soil Characteristics

Organic Thickness: 5-40 cm

Humus Form: moder[2], mor[2], fibric[2], mesic[1]

Drainage: moderately well[5], imperfectly[2], well[1]

Seepage Water: typically present

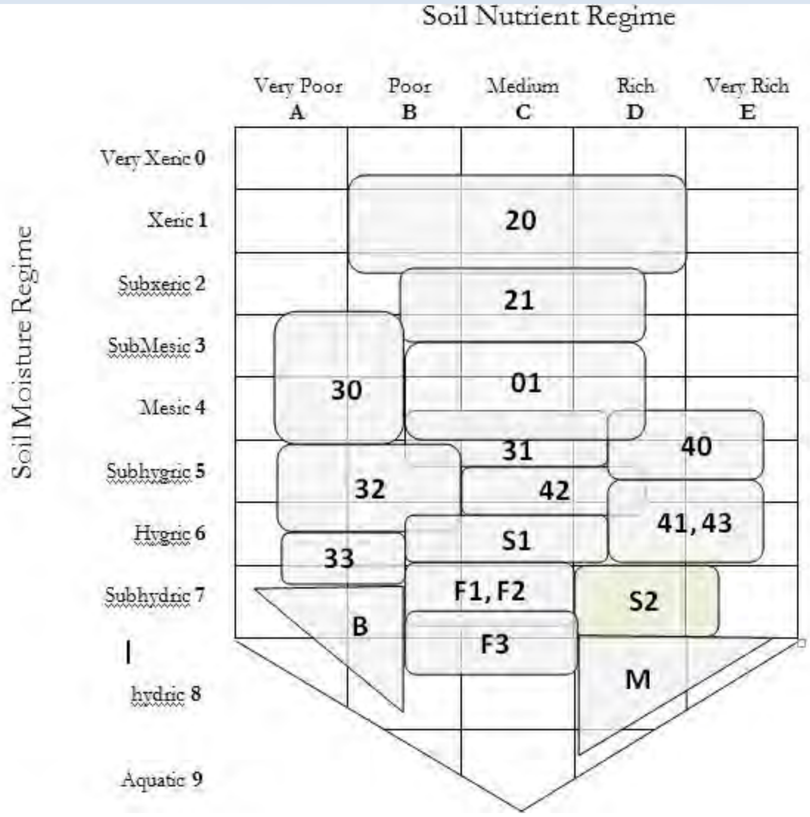
Permafrost: absent

Parent Material: F

Soil Texture: LS[2], SL[1], S[1], SiL[1], SiCL[1]

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Willow – Reedgrass (Swamp/S2)



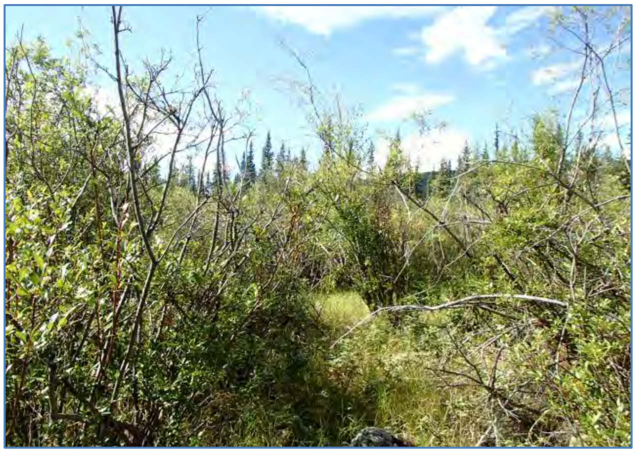
Ecosite Description

The Willow / Reedgrass ecosite is a shrub-dominated swamp ecosystem that typically occurs along the edge of marsh and fen ecosystems and along moist riverine back channels. Within the survey extent, this association was infrequently sampled. Willows characteristically dominate the shrub layer; however other shrubs including prickly rose (*Rosa acicularis*) and northern black currant (*Ribes hudsonianum*) are also common. The herb layer beneath the dense shrub layer is variable in composition, but is dominated by a moderate-to-high cover of bluejoint reedgrass (*Calamagrostis canadensis*). The moss layer can be sparse to moderate.

The soil moisture regime of the Willow – Reedgrass swamp is subhygric-to-hygric and the soil nutrient regime is commonly medium. Drainage is typically imperfect with seepage commonly occurring within 60 cm of the soil surface. The parent material is fluvial and the rooting zone soil texture is variable.

Sample Plots: 2

Full	[0]
Ground	[1]
Visual	[1]



Characteristic Vegetation

Shrub Layer:

[45] Willows (*Salix* spp.)

[10] Prickly rose (*Rosa acicularis*)

[10] Northern black current (*Ribes hudsonianum*)

Herb Layer:

[20] Bluejoint reedgrass (*Calamagrostis canadensis*)

[5] Sedges (*Carex* spp.)

[2] Common horsetail (*Equisetum arvense*)

[2] Fireweed (*Chamerion angustifolium*)

Moss/Lichen Layer:

[30] Mosses

Site Characteristics

Moisture Regime: hygric[2]

Nutrient Regime: medium[2]

Slope Gradient: level

Aspect: N/A

Slope Position: depression[2]

Soil Characteristics

Organic Thickness:

Humus Form: moder[1]

Drainage: imperfectly[1]

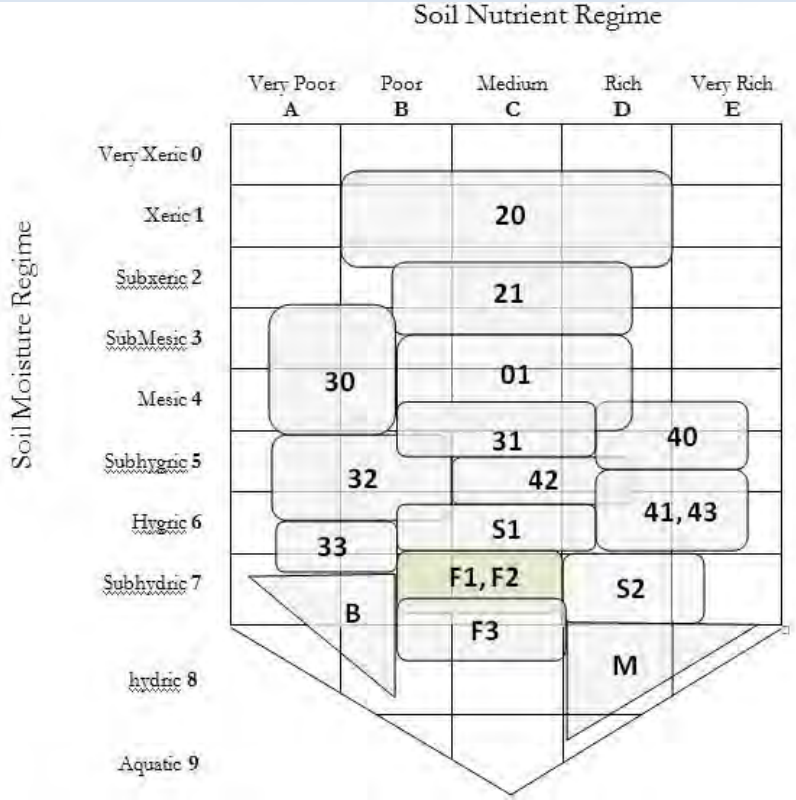
Seepage Water: typically present

Permafrost: absent

Parent Material: F

Soil Texture: SiL[1]

Spruce – Willow – Labrador tea – Sedge (Fen/F1)



Ecosite Description

The Spruce – Willow – Labrador tea – Sedge poor treed fen ecosite occurs on older, fluvial terraces below approximately 450 m elevation. White (*Picea glauca*) and/or black spruce (*Picea mariana*) comprise the open and stunted canopy (typically < 5m tall). In addition to spruce, Labrador tea (*Rhododendron groenlandicum*), willow (including *Salix glauca, S. myrtillifolia,* and *S. planifolia*) and lowbush cranberry (*Vaccinium vitis-idaea*) dominate the shrub layer, with bog blueberry (*Vaccinium uliginosum*) and shrubby cinquefoil (*Dasiphora fruticosa*) commonly present in lesser amounts. Sedge (primarily *Carex lugens*), sheathed cottongrass (*Eriophorum vaginatum*), red bearberry (*Arctous rubra*), and cloudberry (*Rubus chamaemorus*) are typically present in the herb layer. The moss and lichen layer is of moderate to high cover and is typically co-dominated by step moss (*Hylocomium splendens*), brown mosses (*Aulacoumnium* sp. and *Tomenthypnum nitens*) and peat moss (*Sphagnum* spp.).

The soil moisture regime of the ecosite ranges from hygric-to-subhydric and the nutrient regime ranges from poor-to-medium. The rooting zone soil texture is variable and parent material is typically fluvial. Permafrost is typically present within 50 cm of the soil surface and soils are poorly-to-very poorly drained.

Sample Plots: 7

Full	[1]
Ground	[6]
Visual	[0]

Characteristic Vegetation

Tree Layer:

[5] Spruce (*Picea glauca* and *P. mariana*)

Shrub Layer:

[20] Spruce (*Picea glauca* and *P. mariana*)

[12] Labrador tea (*Rhododendron groenlandicum*)

[8] Willows (*Salix* spp.)

[8] Lowbush cranberry (*Vaccinium vitis-idaea*)

[3] Bog blueberry (*Vaccinium uliginosum*)

[2] Shrubby cinquefoil (*Dasiphora fruticosa*)

Herb Layer:

[14] Sedges (*Carex* spp.)

[14] Sheathed cottongrass (*Eriophorum vaginatum*)

[5] Red bearberry (*Arctous rubra*)

[3] Cloudberry (*Rubus chamaemorus*)

[1] Sweet coltsfoot (*Petasites frigidus*)

Moss/Lichen Layer:

[20] Step moss (*Hylocomium splendens*)

[16] Brown mosses (*Aulacomnium* sp. and *Tomenthypnum nitens*)

[13] Peat mosses (*Sphagnum* spp.)

[6] Reindeer lichens (*Cladina* spp.)

Site Characteristics

Moisture Regime: subhydric[4], hygric[3]

Nutrient Regime: poor[5], medium[2]

Slope Gradient: 0-5 %

Aspect: N/A

Slope Position: toe[3], depression[3], level[1]

Soil Characteristics

Organic Thickness: 20+ cm

Humus Form: fibric[5], mesic[2]

Drainage: poorly[4], very poorly[3]

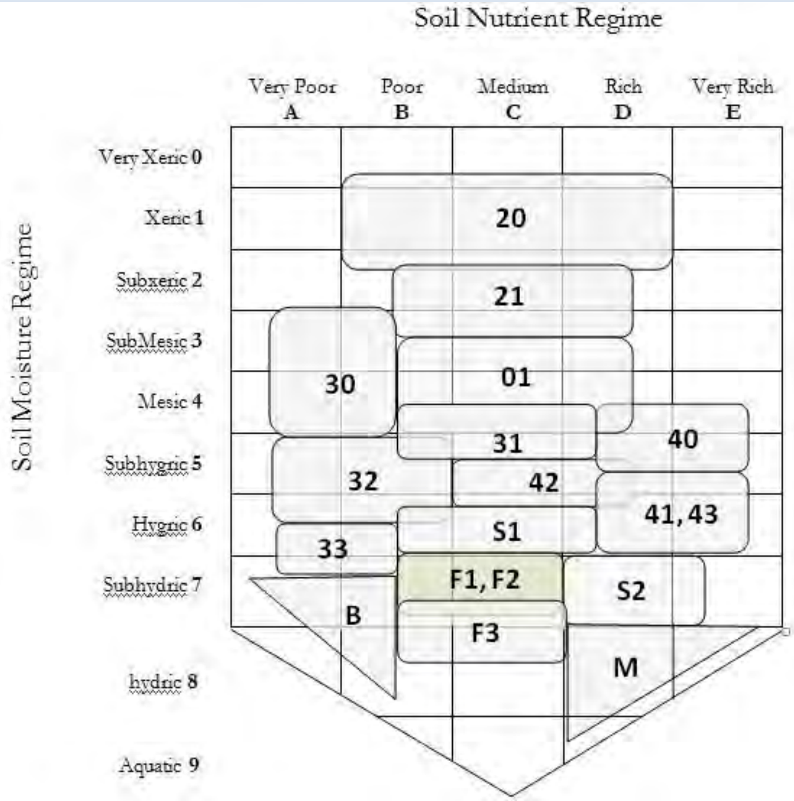
Seepage Water: present

Permafrost: present

Parent Material: F, O

Soil Texture: SiL[2], Of[2], L[1], FSL[1], Om[1]

Spruce – Red bearberry – Brown moss (Fen/F2)



Ecosite Description

The Spruce – Red bearberry – Brown moss treed fen ecosite occurs on older, level fluvial terraces below approximately 450 m elevation. White (*Picea glauca*) and/or black spruce (*Picea mariana*) comprise the open canopy, and are also a common component of the shrub layer. In addition to spruce, Labrador tea (*Rhododendron groenlandicum*) and lowbush cranberry (*Vaccinium vitis-idaea*) dominate the shrub layer, with willow (including *Salix glauca, S. myrtillifolia,* and *S. alaxensis*) commonly present in lesser amounts. Red bearberry (*Arctous rubra*), sedge (primarily *Carex lugens*), bluejoint reedgrass (*Calamagrostis canadensis*), sweet coltsfoot (*Petasites frigidus*) and dwarf-scouring rush (*Equisetum scirpoides*) are typically present in the herb layer. The moss and lichen layer is of moderate to high cover and is typically co-dominated by brown mosses (*Aulacoumnium* sp. and *Tomenthypnum nitens*) and step moss (*Hylocomium splendens*).

The soil moisture regime of the ecosite ranges from hygric-to-subhydric and the nutrient regime ranges from poor-to-medium. The rooting zone texture is primarily mesic organic, as mineral soil is often not reached before reaching the permafrost layer. Permafrost is typically present within 50 cm of the soil surface and soils are poorly drained. Parent material is typically fluvial.

Sample Plots: 3

Full	[0]
Ground	[1]
Visual	[2]

Characteristic Vegetation

Tree Layer:

[9] White spruce (*Picea glauca*)

[8] Black spruce (*Picea mariana*)

Shrub Layer:

[8] Labrador tea (*Rhododendron groenlandicum*)

[8] Lowbush cranberry (*Vaccinium vitis-idaea*)

[7] Spruce (*Picea glauca* and *P. mariana*)

[5] Willows (*Salix* spp.)

[2] Shrubby cinquefoil (*Dasiphora fruticosa*)

Herb Layer:

[6] Red bearberry (*Arctous rubra*)

[5] Sedges (*Carex* spp.)

[4] Bluejoint reedgrass (*Calamagrostis canadensis*)

[3] Sweet coltsfoot (*Petasites frigidus*)

[3] Dwarf scouring rush (*Equisetum scirpoides*)

Moss/Lichen Layer:

[33] Golden fuzzy fen moss (*Tomenthypnum nitens*)

[32] Step moss (*Hylocomium splendens*)

[10] Glow moss (*Aulacomnium* sp.)

[1] Pelt lichens (*Peltigera* spp.)

Site Characteristics

Moisture Regime: subhydric[2], hygric[1]

Nutrient Regime: medium[3]

Slope Gradient: level

Aspect: N/A

Slope Position: level[2], depression[1]

Soil Characteristics

Organic Thickness: > 45 cm

Humus Form: mesic[3]

Drainage: poorly[3]

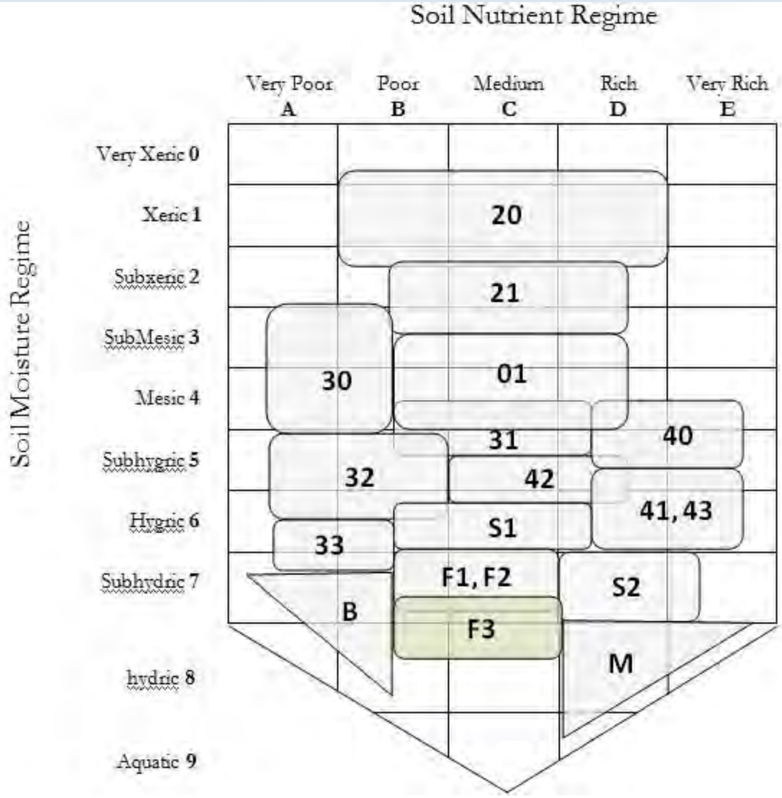
Seepage Water: present

Permafrost: present

Parent Material: F, O

Soil Texture: SiCL[1], Om[2]

Birch – Leatherleaf – Sedge (Fen/F3)



Ecosite Description

The Birch – Leatherleaf – Sedge ecosite is a shrubby poor fen ecosystem that occurs on level or gently sloping terrain with wet to saturated cryosolic soils. The ecosite occurs at relatively low elevations within the survey extent, ranging from 350-600 m. Alaska birch (*Betula neoalaskana*) is the dominant tree species; however they are restricted to the shrub layer (<5 m tall). Labrador tea (*Rhododendron groenlandicum*), leatherleaf (*Chamaedaphne calyculata*) and willows (including *Salix glauca* and *S. planifolia*) commonly dominate the shrub layer, with water birch (*Betula occidentalis*), lowbush cranberry (*Vaccinium vitis-idaea*) and bog blueberry (*Vaccinium uliginosum*) typically present in lesser amounts. The herb layer is commonly dominated by cottongrass, primarily the tussock-forming sheathed cottongrass (*Eriophorum vaginatum*), and sedges, primarily spruce muskeg sedge (*Carex lugens*). Moss cover is typically moderate and is composed of peat mosses (*Sphagnum* spp.), brown mosses (*Aulacomnium* sp. and *Tomenthypnum nitens*) and step moss (*Hylocomium splendens*).

The soil moisture regime of the Birch – Leatherleaf – Sedge ecosite is hygric-to-subhydric and the nutrient regime is poor-to-medium. Permafrost is present making cryosols the dominant soil group. Soils are poorly-to-very poorly drained.

Sample Plots: 6

Full	[1]
Ground	[4]
Visual	[1]

Characteristic Vegetation

Shrub Layer:

[14] Alaska Birch (*Betula neoalaskana*)

[10] Leatherleaf (*Chamaedaphne calyculata*)

[10] Labrador tea (*Rhododendron groenlandicum*)

[9] Lowbush cranberry (*Vaccinium vitis-idaea*)

[6] Blue-green willow (*Salix glauca*)

[6] Water birch (*Betula occidentalis*)

[4] Black Spruce (*Picea mariana*)

[4] Tea-leafed willow (*Salix planifolia*)

[3] Bog blueberry (*Vaccinium uliginosum*)

Herb Layer:

[20] Sedges (*Carex* spp.)

[19] Cottongrasses (*Eriophorum* spp.)

[3] Cloudberry (*Rubus chamaemorus*)

Moss/Lichen Layer:

[25] Peat mosses (*Sphagnum* spp.)

[22] Brown mosses (*Aulacomnium* sp. and *Tomenthypnum nitens*)

[15] Step moss (*Hylocomium splendens*)

Site Characteristics

Moisture Regime: subhydric[5], hygric[1]

Nutrient Regime: poor[5], medium[1]

Slope Gradient: 0-2 %

Aspect: N/A

Slope Position: level[3], depression[3]

Soil Characteristics

Organic Thickness: >30 cm

Humus Form: fibric[5], mesic[1]

Drainage: poorly[3], very poorly[3]

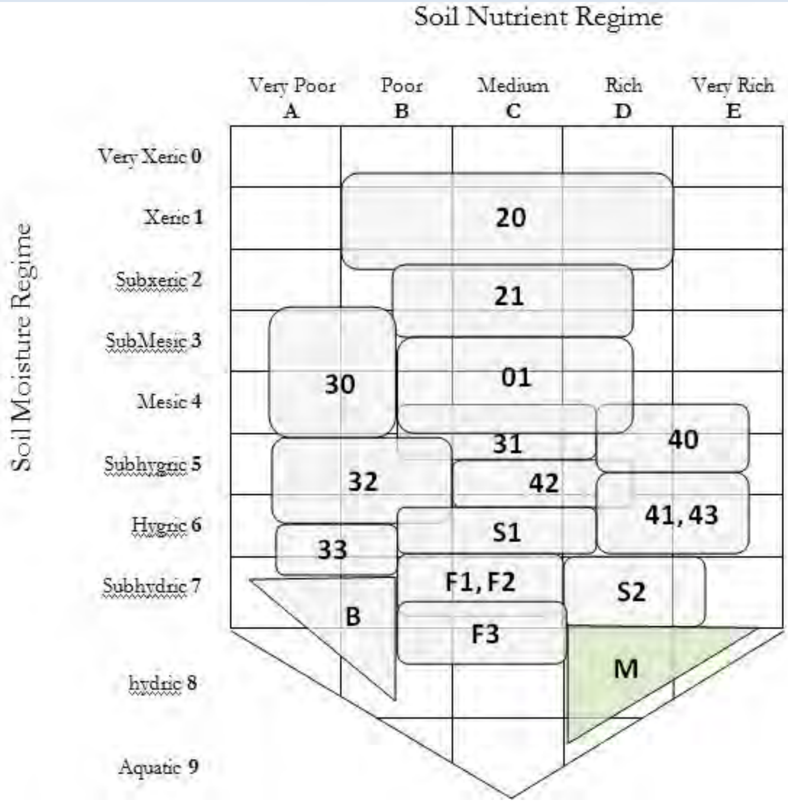
Seepage Water: present

Permafrost: present

Parent Material: C, F, O

Soil Texture: N/A

Beaked sedge (Marsh/M1)



Ecosite Description

The Beaked sedge ecosite is a graminoid-dominated riparian marsh that occurs with limited extent within the ELC survey extent. Beaked sedge marshes are only found at low elevations, primarily near the Yukon and Stewart Rivers. Species diversity is low and vegetation cover is strongly dominated by beaked sedge (*Carex utriculata*) with other forbs and aquatics scattered throughout. The water table of the ecosite fluctuates, with the early-season water tables dropping through the growing season and resulting in exposure of the substrate late in the season.

The soil moisture regime of the Beaked sedge association from subhydric-to-hydric and the nutrient regime is medium-to-rich. Nutrient availability is high due to water movement and aeration of the substrate.

Sample Plots: 6

Full	[1]
Ground	[4]
Visual	[2]

Characteristic Vegetation

Shrub Layer:

[1] Willows (*Salix* spp.)

Herb Layer:

[55] Beaked sedge (*Carex utriculata*)

[1] Marsh yellowcress (*Rorippa palustris*)

[1] Water horsetail (*Equisetum fluviatile*)*

[1] Blue-joint reedgrass (*Calamagrostis canadensis*)

Site Characteristics

Moisture Regime: subhydric[5], hydric[1]

Nutrient Regime: rich[3], medium[3]

Slope Gradient: level

Aspect: N/A

Slope Position: depression[6]

Soil Characteristics

Organic Thickness: 5 - 35 cm, typically <10 cm

Drainage: very poorly[3], poorly[2], imperfectly[1]

Seepage Water: present

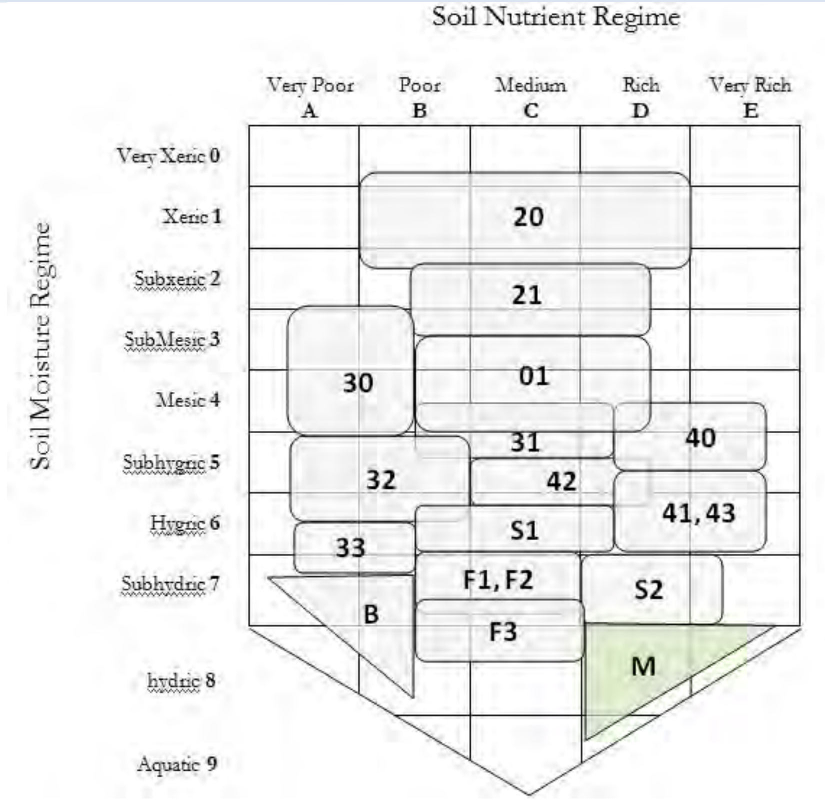
Permafrost: absent

Parent Material: F

Soil Texture: SiL[4], L[1], SiCL[1]

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Horsetail – Sedge (Marsh/M2)



Ecosite Description

The Horsetail - Sedge marsh ecosite occurs with limited extent in the survey extent and were only sampled at low elevations (below 400m), near the Stewart River. Species diversity is low and vegetation cover is dominated by water horsetail (*Equisetum fluviatile*), beaked sedge (*Carex utriculata*) and water sedge (*C. aquatilis*) with other forbs and aquatics scattered throughout. The water table of the ecosite fluctuates, with the early-season water tables dropping through the growing season and resulting in exposure of the substrate late in the season.

The soil moisture regime of the Horsetail - Sedge marsh ecosite ranges from subhydric-to-hydric and the nutrient regime is medium-to-rich. Nutrient availability is high due to water movement and aeration of the substrate.

Sample Plots: 2

Full	[0]
Ground	[2]
Visual	[0]

Characteristic Vegetation

Herb Layer:

[50] Water horsetail (*Equisetum fluviatile*)

[14] Beaked sedge (*Carex utriculata*)

[9] Water sedge (*Carex aquatilis*)

[5] Marsh cinquefoil (*Comarum palustre*)*

[1] Bluejoint reedgrass (*Calamagrostis Canadensis*)

Moss Layer:

[2] Jungermann's platydictya moss (*Platydictya jungermanniodies*)

*Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Site Characteristics

Moisture Regime: subhydric[1], hydric[1]

Nutrient Regime: rich[1], medium[1]

Slope Gradient: level

Aspect: N/A

Slope Position: depression[2]

Soil Characteristics

Organic Thickness: 2-35 cm

Humus Form: fibric[2]

Drainage: very poorly[2]

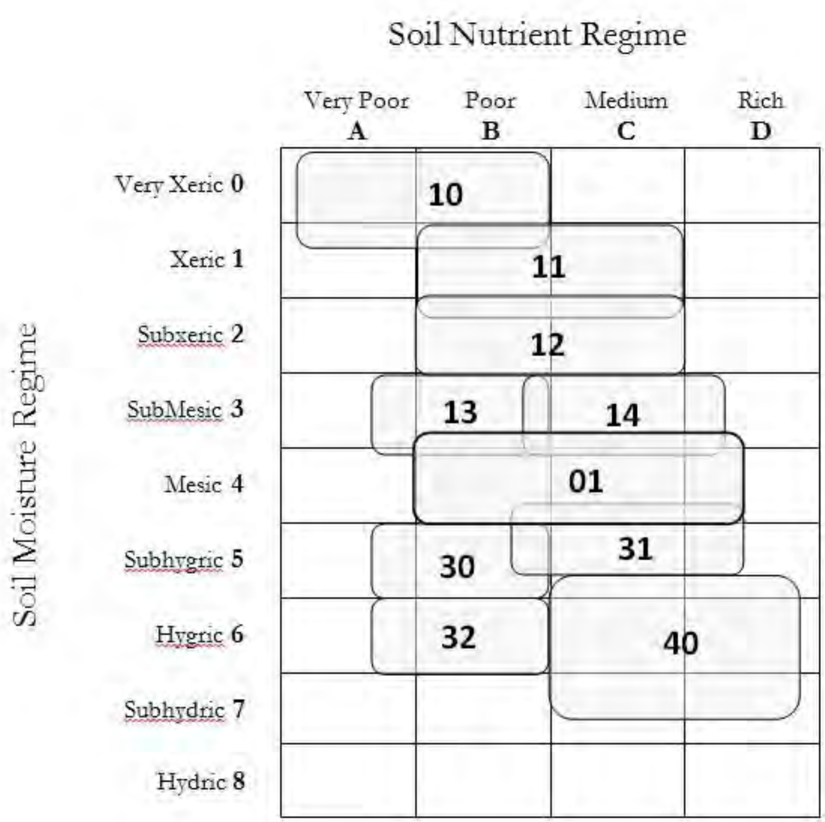
Seepage Water: present

Permafrost: absent

Parent Material: F, L

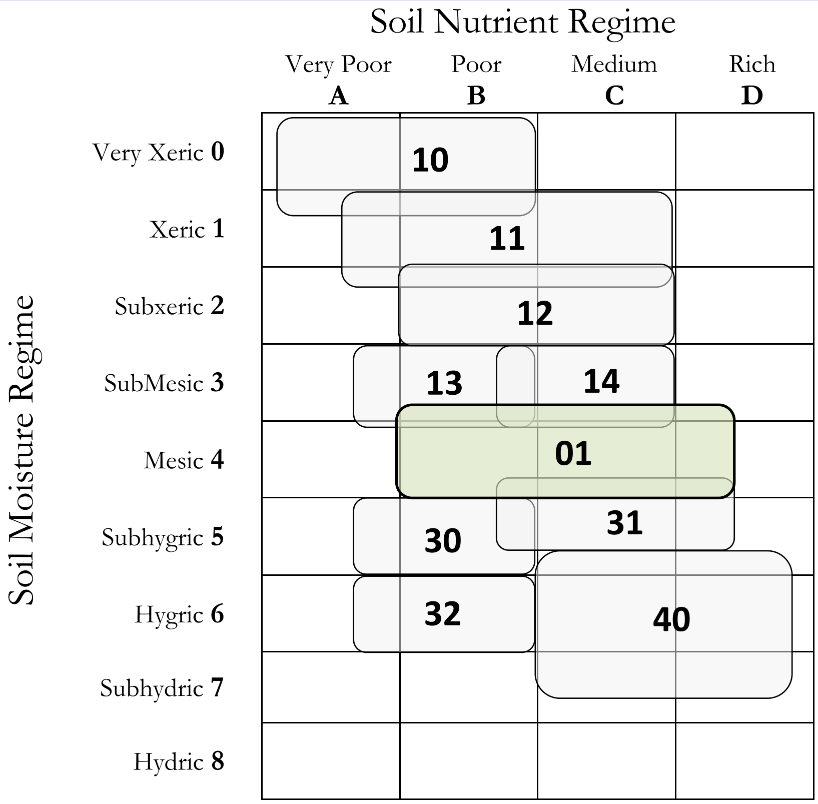
Soil Texture: SiS[1], Si[1]

Subalpine / Alpine Bioclimate Zones



10	Tors
11	Felsenmeer
12	Scrub birch – Mountain avens - Lichen
13	Scrub birch – Crowberry – Lowbush cranberry
14	Scrub birch – Willow – Mountain avens
01	Scrub birch – Lowbush cranberry – Feathermoss
31	Spruce – Scrub birch – Feathermoss
30	Scrub birch – Sedge – Feathermoss
32	Black Spruce – Labrador tea – Lowbush cranberry
40	Willow – Horsetail – Peatmoss

Scrub birch - Lowbush cranberry – Feathermoss (01)



Ecosite Description

The Scrub birch – Lowbush cranberry – Feathermoss ecosite is the zonal ecosystem of the subalpine zone and occurs on gentle-to-steep (primarily moderate), mid-to-upper slopes across a range of aspects. Within the LSA, the ecosite typically ranges from 1050-1450 m. The shrub layer is well developed and is dominated by scrub birch (*Betula glandulosa*). Also common in the shrub layer are Northern Labrador tea (*Rhododendron tomentosum*), Labrador tea (*Rhododendron groenlandicum*), lowbush cranberry (*Vaccinium vitis-idaea*) and willow species (including *Salix glauca* and *S. planifolia*). The herb layer is typically sparse with altai fescue (*Festuca altaica*) as the only characteristic species. The moss and lichen layer is well developed and contains a combination of feathermoss (*Pleurozium schreberi* and *Hylocomium splendens*) and reindeer lichen (*Cladina mitis, C. rangiferina*, and *C. stellaris*). Very low conifer tree cover (≤5%) is also common in the ecosite.

Areas disturbed by wildfire have a less diverse and abundant shrub layer, dominated by scrub birch, willow and bog blueberry (*Vaccinium uliginosum*). Altai fescue and fireweed (*Chamerion angustifolium*) dominate the more abundant herb layer, while the moss layer is dominated by fire moss (*Ceratodon purpureus*) and haircap mosses (*Polytrichum* spp.).

The soil moisture regime ranges from submesic-to-mesic and the soil nutrient regime ranges from poor-to-medium. The dominant rooting zone texture is silt loam and the drainage ranges from rapidly-to-moderately well. The parent material is weathered bedrock or colluvial.

Sample Plots: 28

Full	[1]
Ground	[8]
Visual	[19]

Characteristic Vegetation

Shrub layer:

[40] Scrub birch (*Betula glandulosa*)

[15] Labrador tea (*Rhododendron tomentosum, R. groenlandicum*)

[12] Lowbush cranberry (*Vaccinium vitis-idaea*)

[8] Willows (*Salix* spp.)

[7] Bog blueberry (*Vaccinium uliginosum*)

[7] Crowberry (*Empetrum nigrum*)

Herb layer:

[2] Altai fescue (*Festuca altaica*)

Moss/Lichen layer:

[28] Red-stemmed feathermoss (*Pleurozium schreberi*)

[23] Step moss (*Hylocomium splendens*)

[20] Reindeer lichens (*Cladina* spp.)

[7] Haircap mosses (*Polytrichum* spp.)

[3] Cetraria lichens (*Cetraria* spp.)

Site Characteristics

Moisture Regime: mesic[15], submesic[13]

Nutrient Regime: poor[17], medium[10]

Slope Gradient: 2-65 %, generally 20 %

Aspect: variable

Slope Position: upper slope[15], crest[7], midslope[5], lower slope[1]

Soil Characteristics

Organic Thickness: 2-20 cm

Humus Form: mor[16], moder[10]

Drainage: well[20], rapidly[6]

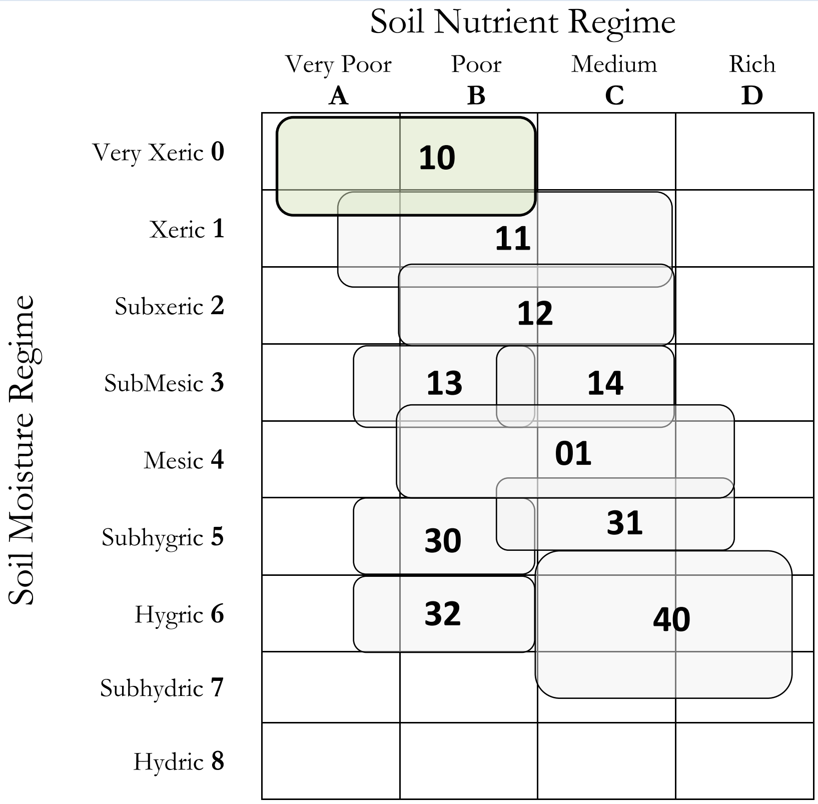
Seepage Water: absent

Permafrost: absent

Parent Material: D, C

Soil Texture: SiL[21], L[2], SL[1], FSL[1]

Tors (10)



Ecosite Description

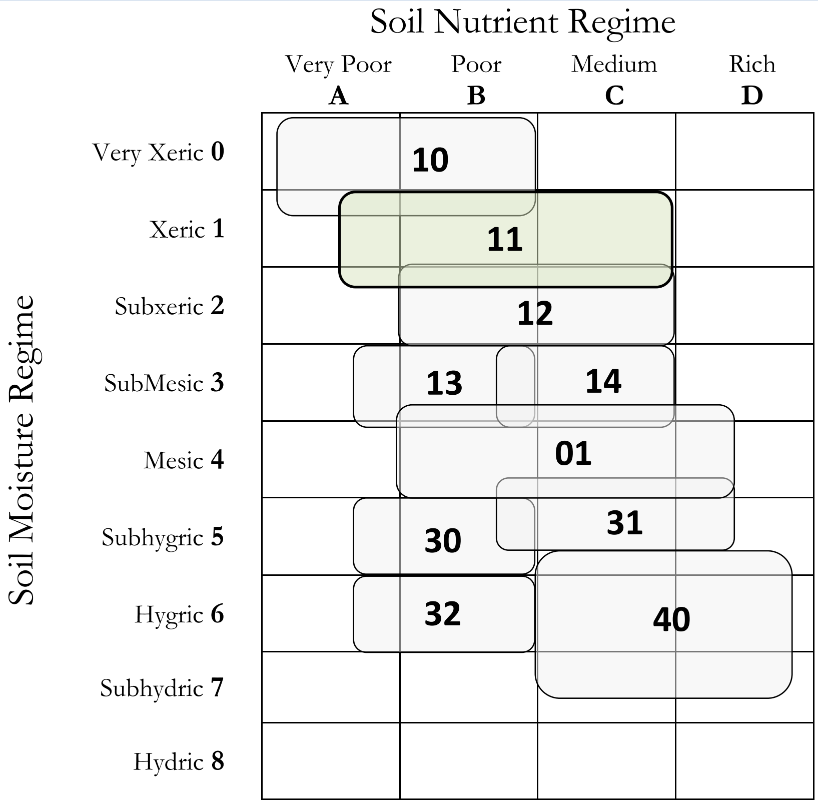
The Tors ecosite consists of protruding bedrock outcrops on summits and ridge crests. Vascular and non-vascular plants grow within the fractures and crevices of the rocks, and also form mats of vegetation perched on rock ledges. Within the ELC survey extent, the Tors ecosite has very limited extent and has not been sampled. Plant species found growing within Tors ecosystems in the adjacent Casino Project Study Area include prickly saxifrage (*Saxifraga tricuspidata*), alpine anemone (*Anemone drummondii*), arctic cinquefoil (*Potentilla nana*), sedges (*Carex* spp.), fragrant fern (*Dryopteris fragans*), step moss (*Hylocomium splendens*), rock-moss (*Racomitrium* spp.) and reindeer lichens (*Cladina* spp.; EDI 2013).

The soil moisture regime of the Tors ecosite is very xeric to xeric and the nutrient regime is very poor to poor. Soils are typically very rapidly drained, where present, and parent materials are commonly weather bedrock or blocky colluvium.

Sample Plots: 0

Full	[0]
Ground	[0]
Visual	[0]

Felsenmeer (11)



Ecosite Description

The Felsenmeer ecosite occurs on gentle-to-steep slopes across a range of aspects in crest and upper slope positions. Within the ELC survey extent, this ecosite is limited in extent and ranges between 1200-1600 m. Fifty to eighty percent of the substrate on these sites consists of boulders and cobbles, and vegetative cover is typically less than 40%. Consequently, vegetation establishment is limited to cracks, joints, and depressions between boulders where small amounts of organic matter, cobble and finer sediments have accumulated. Crustose lichens grow on rock faces, with fruiticose lichens, foliose lichens, mosses, and some rooted plants occupying pockets and depressions between boulders, or occurring as mats draped across boulders. Where soil accumulation is sufficient willow species (including *Salix arctica*, *S. glauca* and *S. pulchra*) are present. Dwarf shrubs including crowberry (*Empetrum nigrum*), lowbush cranberry (*Vaccinium vitis-idaea*) and mountain avens (*Dryas* spp.) often form mats over boulders. Herb species commonly present include alpine sweet grass (*Anthoxanthum monticola*), altai fescue (*Festuca altaica*), arctic lupine (*Lupinus arcticus*), and bistort (*Bistorta plumosa*). Rock-moss (*Racomitrium* spp.) is common.

The soil moisture regime of the Felsenmeer ecosite ranges from xeric to subxeric with a very poor to medium soil nutrient regime. Soil pockets are variable in size and extent, and the soil tends to be rapidly or very rapidly drained. Rooting zone soil texture is predominantly silt loam, overlaying weathered bedrock or colluvial parent materials that have undergone little transport from their source.

Sample Plots: 3

Full [1]
Ground [0]
Visual [2]

Characteristic Vegetation

Shrub layer:

[8] Mountain avens (*Dryas* spp.)

[6] Willow (*Salix* spp.)

[1] Lowbush cranberry (*Vaccinium vitis-idaea*)

[2] Crowberry (*Empetrum nigrum*)

Herb layer:

[4] Alpine sweet grass (*Anthoxanthum monticola*)

[2] Altai fescue (*Festuca altaica*)

[2] Mountain sagewort (*Artemisia norvegica* ssp. *saxatilis*)

[1] Arctic lupine (*Lupinus arcticus*)

[.5] Arctic bluegrass (*Poa alpina*)

[.5] Bistort (*Bistorta plumosa*)

[.5] Alpine harebell (*Campanula lasiocarpa*)

Moss/Lichen layer:

[15] Rock mosses (*Racomitrium* spp.)

[8] Wiry fern moss (*Abietinella abietina*)

[8] Reindeer lichens (*Cladina* spp.)

[3] Cetraria lichens (*Cetraria* spp.)

[1] Haircap mosses (*Polytrichum* spp.)

Site Characteristics

Moisture Regime: subxeric[6], submesic[1]

Nutrient Regime: very poor[2], poor[1]

Slope Gradient: 2-65%

Aspect: variable

Slope Position: upper slope[2], crest[1]

Soil Characteristics

Organic Thickness: 0-26 cm

Humus Form: moder[1], mor[1]

Drainage: rapidly[2], very rapidly[1]

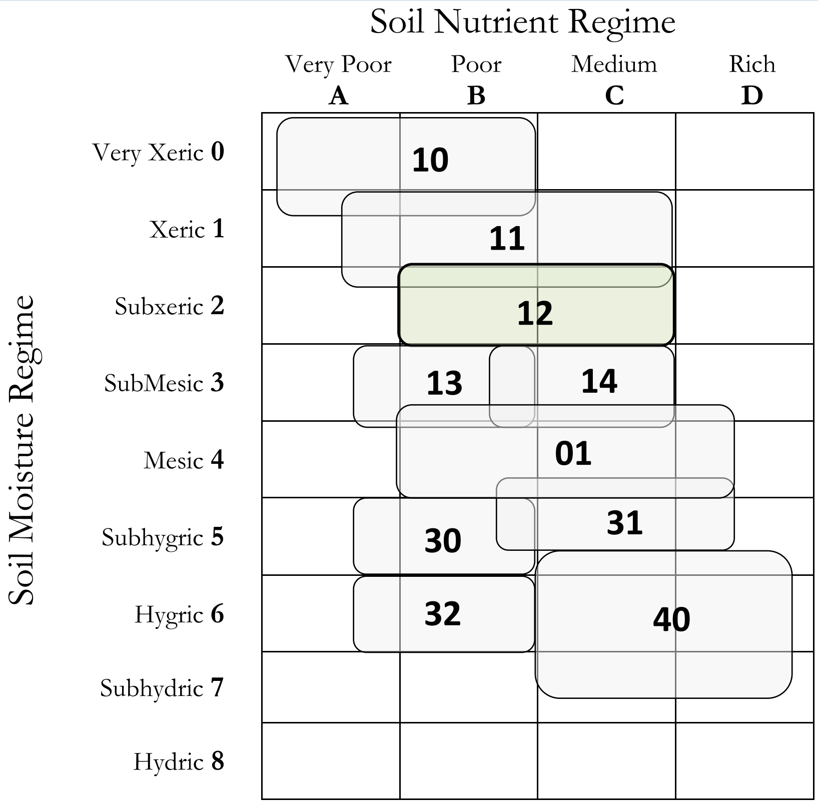
Seepage Water: absent

Permafrost: absent

Parent Material: D

Soil Texture: SiL[3]

Scrub birch – Mountain avens – Lichen (12)



Ecosite Description

The Scrub birch – Mountain avens – Lichen ecosite occurs on high elevation plateaus and gentle slopes on crest and upper slope positions, ranging from 1200-1450 m. The structural development of vegetation is limited by environmental conditions and communities are typically dominated by dwarf and low-growing shrubs and lichen. Mountain avens (*Dryas* spp.) dominate the dwarf shrub layer, with lesser components of lowbush cranberry (*Vaccinium vitis-idaea*), crowberry (*Empetrum nigrum*), and arctic willow (*Salix arctica*). Small patches of low-growing scrub birch (*Betula glandulosa*) and blue-green willow (*Salix glauca*) occur throughout the ecosite. The herb layer is very sparse and typically contains alpine sweet grass (*Anthoxanthum monticola*), sedges (*Carex* spp.) and prickly saxifrage (*Saxifraga tricuspidata*). The lichen layer is well developed and is dominated by reindeer lichens (*Cladina* spp.), Cetraria lichens (*Cetraria* spp.) and Alectoria lichens (*Alectoria* spp.).

The soil moisture regime is typically subxeric with a poor-to-medium soil nutrient regime. The dominant rooting zone soil textures are silt loam and sandy loam which are found over weathered bedrock and colluvial parent materials. The surface shape is typically convex, with rapidly- to-well drained soils.

Sample Plots: 7

Full	[1]
Ground	[3]
Visual	[3]

Characteristic Vegetation

Shrub layer:

[28] Mountain Avens (*Dryas* spp.)
[12] Scrub birch (*Betula glandulosa*)
[6] Lowbush cranberry (*Vaccinium vitis-idaea*)
[6] Artic willow (*Salix arctica*)
[5] Crowberry (*Empetrum nigrum*)
[2] Blue-green willow (*Salix glauca*)
[1] Alpine bearberry (*Arctous alpina*)*

Herb layer:

[1] Alpine sweet grass (*Anthoxanthum monticola*)
[.5] Sedges (*Carex* spp.)
[.5] Prickly saxifrage (*Saxifraga tricuspidata*) *
[.5] Alpine harebell (*Campanula lasiocarpa*)

Moss/Lichen layer:

[16] Cetraria lichens (*Cetraria* spp.)
[15] Alectoria lichens (*Alectoria* spp.)
[12] Reindeer lichens (*Cladina* spp.)

Site Characteristics

Moisture Regime: subxeric[7]

Nutrient Regime: poor[4], medium[3]

Slope Gradient: 3-15%

Aspect: variable

Slope Position: crest[5], upper slope[2]

Soil Characteristics

Organic Thickness: 3-5 cm

Humus Form: moder[4], mor[2]

Drainage: rapidly[4], well[2]

Seepage Water: absent

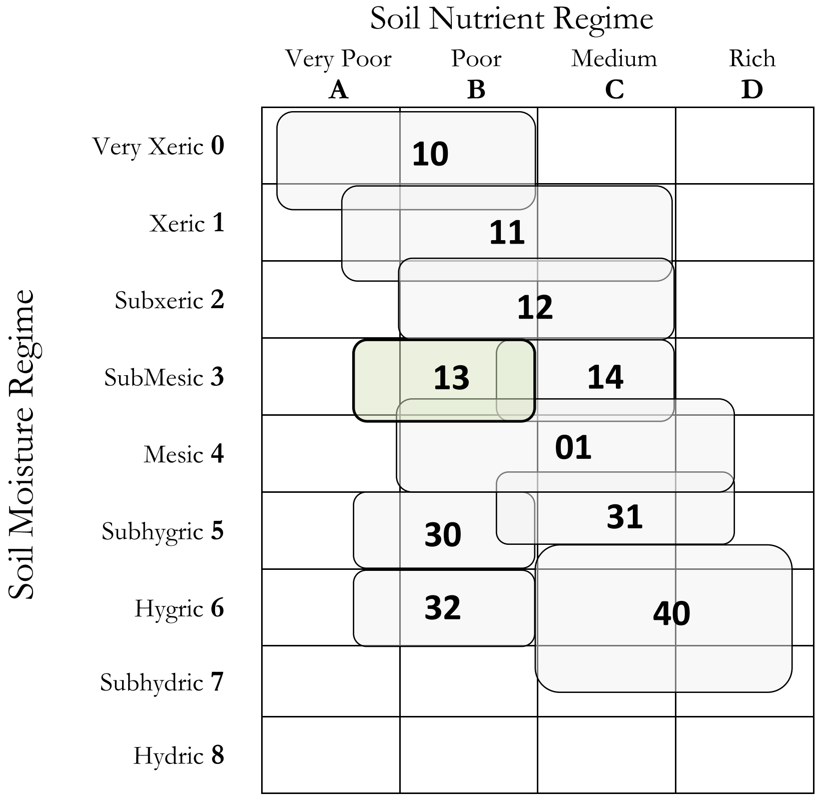
Permafrost: absent

Parent Material: D

Soil Texture: SiL[3], SL[3]

* Species characteristic of the phase but occurring in <60% of the sample plots with a prominence value <20

Scrub birch – Crowberry – Lowbush cranberry (13)



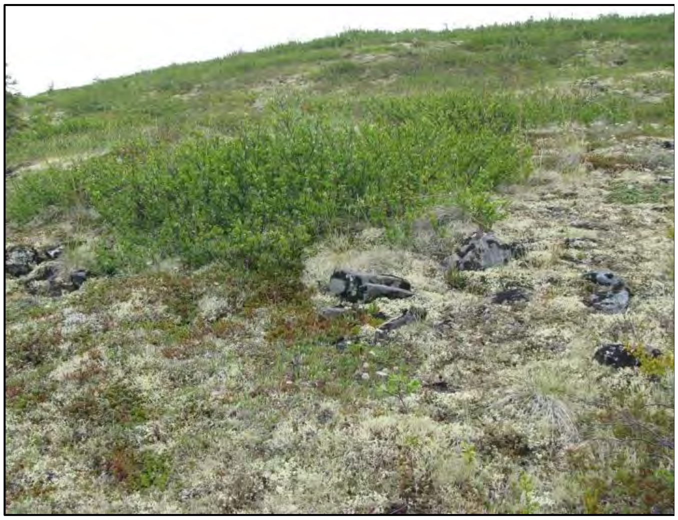
Ecosite Description

The Scrub birch – Crowberry – Lowbush Cranberry ecosite occurs primarily on cool, moderate, upper slopes, ranging from 1100-1450 m. The ecosite is shrub-dominated and characteristically contains exposed boulders and boulder channels. The shrub layer is composed of dwarf-to-medium growing shrubs and is typically dominated by scrub birch (*Betula glandulosa*) and crowberry (*Empetrum nigrum*) with lesser amounts of lowbush cranberry (*Vaccinium vitis-idaea*), Arctic white heather (*Cassiope tetragona*) and mountain avens (*Dryas* spp.). The herb layer is typically sparse and is dominated by alpine sweet grass (*Anthoxanthum monticola*) and altai fescue (*Festuca altaica*). Although low in percent cover, fragrant fern (*Dryopteris fragrans*) and prickly saxifrage (*Saxifraga tricuspidata*) are typically associated with the boulder channels within the ecosite. The moss and lichen layer is well developed and is dominated by reindeer lichens (*Cladina* spp.), Cetraria lichens (*Cetraria* spp.), red-stemmed feathermoss (*Pleurozium schreberi*) and haircap mosses (*Polytrichum* spp.).

The soil moisture regime of the Scrub birch – Crowberry – Lowbush Cranberry ecosite ranges from subxeric to mesic with a primarily poor soil nutrient regime. The dominant rooting zone soil textures are sandy loam and silt loam and the dominant parent materials are colluvial and weathered bedrock. Soils are rapidly-to-well drained.

Sample Plots: 13

Full	[1]
Ground	[7]
Visual	[5]



Characteristic Vegetation

Shrub layer:

[23] Scrub birch (*Betula glandulosa*)

[13] Crowberry (*Empetrum nigrum*)

[10] Lowbush cranberry (*Vaccinium vitis-idaea*)

[10] Arctic white heather (*Cassiope tetragona*)

[9] Blue-green willow (*Salix glauca*)

[8] Northern Labrador tea (*Rhododendron tomentosum*)

[5] Mountain Avens (*Dryas* spp.)

Herb layer:

[2] Alpine sweet grass (*Anthoxanthum monticola*)

[1] Altai fescue (*Festuca altaica*)

[.5] Fragrant fern (*Dryopteris fragrans*)

[.5] Prickly saxifrage (*Saxifraga tricuspidata*)

Moss/Lichen layer:

[22] Reindeer lichens (*Cladina* spp.)

[18] Cetraria lichens (*Cetraria* spp.)

[15] Red-stemmed feathermoss (*Pleurozium schreberi*)

[3] Haircap mosses (*Polytrichum* spp.)

Site Characteristics

Moisture Regime: submesic^{9}, subxeric^{4}, mesic^{1}

Nutrient Regime: poor^{10}, medium^{3}

Slope Gradient: 20-60 %, generally <45 %

Aspect: northerly^{10}, north-westerly^{2}, north-easterly^{1}

Slope Position: upper slope^{11}, midslope^{2}

Soil Characteristics

Organic thickness: 5-20 cm

Humus Form: mor^{8}, moder^{4}, fibric^{1}

Drainage: rapidly^{8}, well^{5}

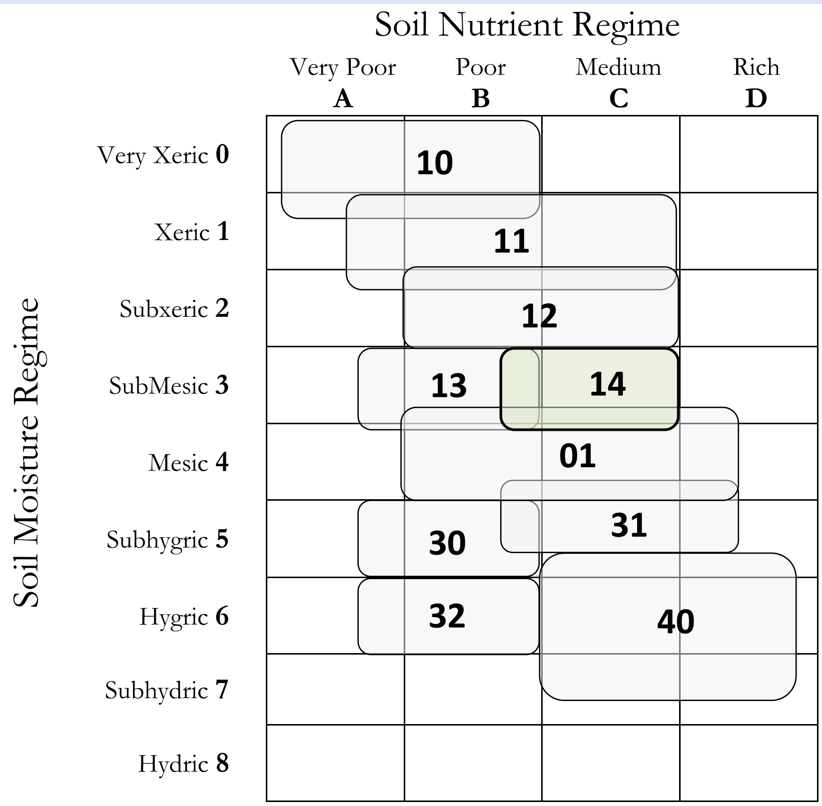
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SL^{5}, SiL^{4}, FSL^{2}, L^{1}

Scrub birch – Willow – Mountain avens (14)



Ecosite Description

The Scrub birch – Willow – Mountain avens ecosite occurs on gentle crests and upper slopes from approximately 1200 to 1500 m. The soils of this ecosite are typically shallow and exposed boulders and cobbles are common across the soil surface. The shrub layer is low in stature due to environmental limitations and is dominated by scrub birch (*Betula glandulosa*). Also common in the shrub layer are willows (including *Salix arctica* and *S. glauca*), mountain avens (*Dryas* spp.), lowbush cranberry (*Vaccinium vitis-idaea*) and crowberry (*Empetrum nigrum*). The herb layer is sparse, but commonly contains altai fescue (*Festuca altaica*) and arctic lupine (*Lupinus arcticus*). The lichen layer is well developed and contains a combination of reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*) and Cetraria lichens (*Cetraria* spp).

The soil moisture regime of the Scrub birch – Willow – Mountain avens ecosite ranges from subxeric-to-submesic and the soil nutrient regime ranges from poor-to-medium. The dominant rooting zone texture is silt loam and the drainage is typically rapid. The parent material is colluvial or weathered bedrock.

Sample Plots: 2
Full [0]
Ground [1]
Visual [1]

Characteristic Vegetation

Shrub layer:

[59] Scrub birch (*Betula glandulosa*)

[15] Willow (*Salix* spp.)

[12] Mountain avens (*Dryas* spp.)

[10] Crowberry (*Empetrum nigrum*)

[8] Lowbush cranberry (*Vaccinium vitis-idaea*)

[3] White spruce (*Picea glauca*)

Herb layer:

[2] Altai fescue (*Festuca altaica*)

[1] Arctic lupine (*Lupinus arcticus*)

Moss/Lichen layer:

[26] Reindeer lichens (*Cladina* spp.)

[15] Cetraria lichens (*Cetraria* spp.)

Site Characteristics

Moisture Regime: subxeric[2]

Nutrient Regime: poor[1], medium[1]

Slope Gradient: typically <10 %

Aspect: variable

Slope Position: crest[2]

Soil Characteristics

Organic Thickness: 6-12 cm

Humus Form: mor[1], moder[1]

Drainage: rapidly[2]

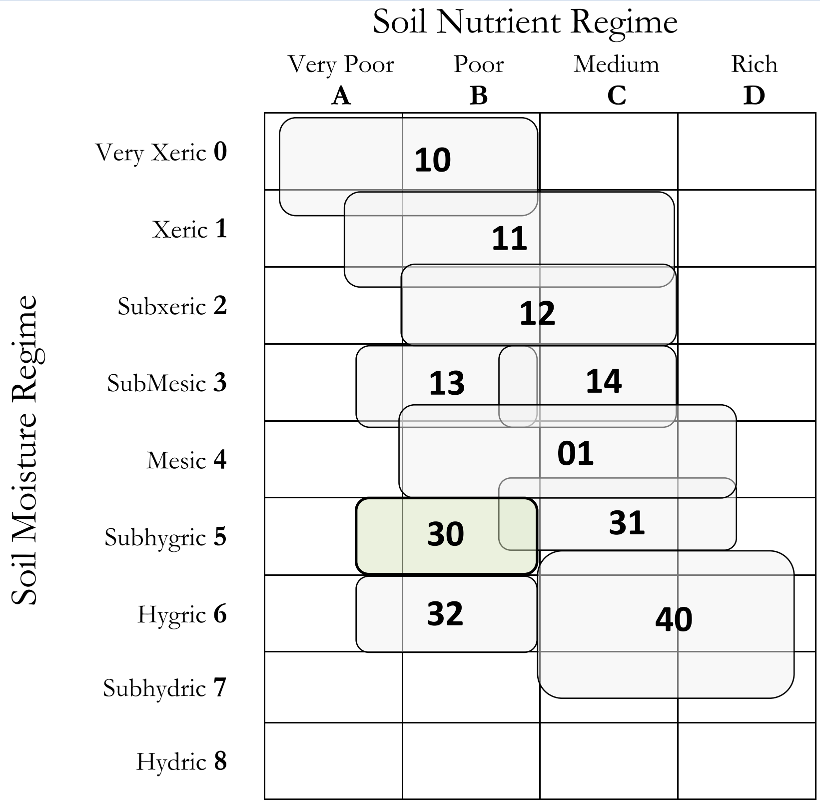
Seepage Water: absent

Permafrost: absent

Parent Material: D, C

Soil Texture: SiL[2]

Scrub birch – Sedge – Feathermoss (30)



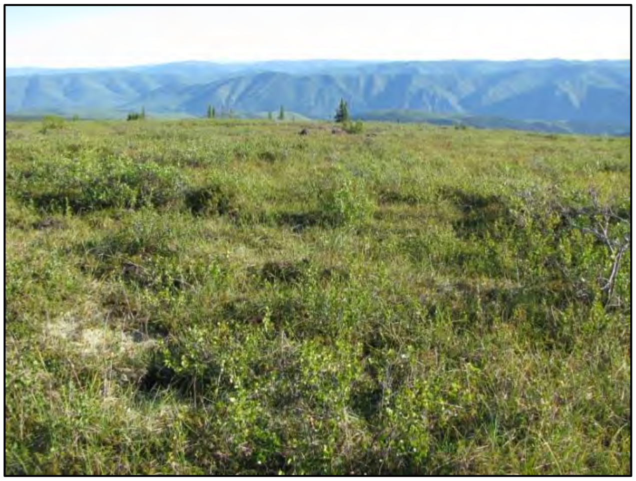
Ecosite Description

The Scrub birch – Spruce muskeg sedge – Feathermoss ecosite occurs on gentle-to-moderate, lower-to-middle slopes with a neutral or northerly aspect. Within the LSA, the ecosite typically ranges from 1050-1450 m. The shrub layer is well developed and is dominated by scrub birch (*Betula glandulosa*) and willow species (including *Salix glauca*, *S. planifolia*, and *S. pulchra*). Also common in the shrub layer are lowbush cranberry (*Vaccinium vitis-idaea*), Northern Labrador tea (*Rhododendron tomentosum*), and crowberry (*Empetrum nigrum*). Spruce muskeg sedge (*Carex lugens*) is characteristic of the herb layer, although a low cover of sweet coltsfoot (*Petasites frigidus*) is also typically present. The moss and lichen layer is an important constituent of this ecosite, often having an 80% or greater cover. A combination of mosses and lichens are typically present, including red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*), peat moss (*Sphagnum* spp.), reindeer lichen (*Cladina mitis, C. rangiferina*, and *C. stellaris*) and Cetraria lichens (*Cetraria* spp.)

The soil moisture regime of the Scrub birch / Spruce muskeg sedge / Feathermoss ecosite ranges from subhygric-to-hygric and has a poor-to-medium nutrient regime. The dominant rooting zone soil texture is silt loam overlaying colluvial or weathered bedrock parent material. Permafrost is almost always present within 50cm of the soil surface and soils are correspondingly imperfectly or poorly drained.

Sample Plots: 13

Full	[1]
Ground	[5]
Visual	[7]



Characteristic Vegetation

Shrub layer:

[25] Scrub birch (*Betula glandulosa*)

[13] Northern Labrador tea (*Rhododendron tomentosum*)

[12] Willows (*Salix* spp.)

[12] Lowbush cranberry (*Vaccinium vitis-idaea*)

[11] Labrador tea (*Rhododendron groenlandicum*)

[7] Crowberry (*Empetrum nigrum*)

[7] Bog blueberry (*Vaccinium uliginosum*)

Herb layer:

[8] Spruce muskeg sedge (*Carex lugens*)

[1] Sweet coltsfoot (*Petasites frigidus*)

Moss/Lichen layer:

[35] Step moss (*Hylocomium splendens*)

[24] Red-stemmed feathermoss (*Pleurozium schreberi*)

[14] Reindeer lichens (*Cladina* spp.)

[6] Cetraria lichens (*Cetraria* spp.)

[5] Peatmoss (*Sphagnum* spp.)

Site Characteristics

Moisture Regime: subhygric^{8}, hygric^{3}, mesic^{2}

Nutrient Regime: poor^{8}, medium^{5}

Slope Gradient: 2-25 %

Aspect: northerly^{7}, easterly^{4}, westerly^{1}

Slope Position: midslope^{8}, upper slope^{3}, lower slope^{1}, level^{1}

Soil Characteristics

Organic Thickness: 5-35 cm

Humus Form: fibric^{8}, mor^{5}

Drainage: imperfectly^{5}, poorly^{5}, moderately well^{2}

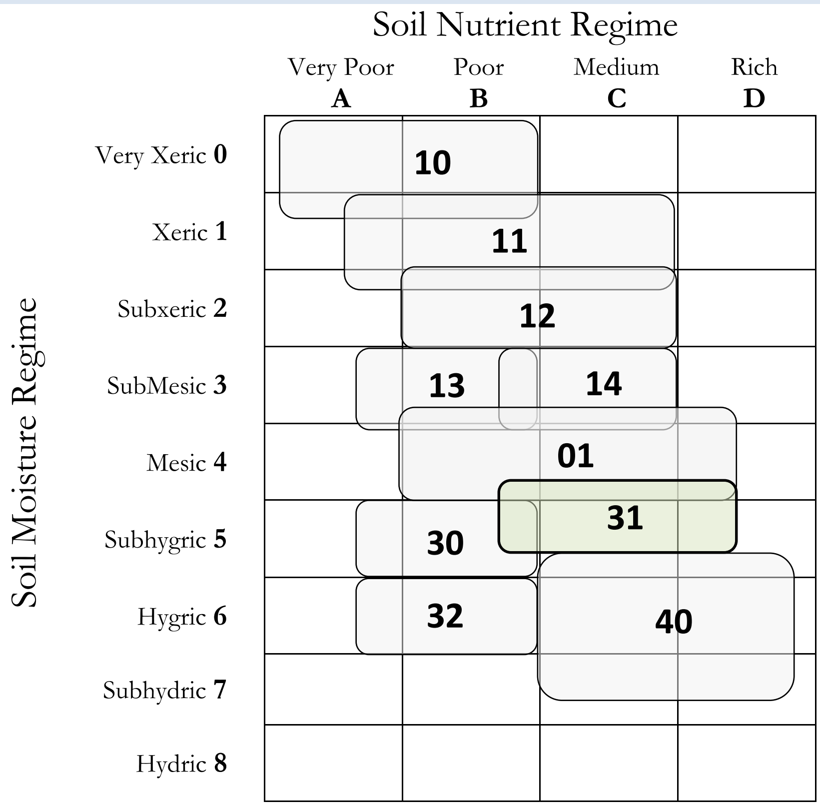
Seepage Water: present

Permafrost: present

Parent Material: D, C

Soil Texture: SiL^{8}, L^{2}, SiCL^{1}, SL^{1}

Spruce – Scrub birch – Feathermoss (31)



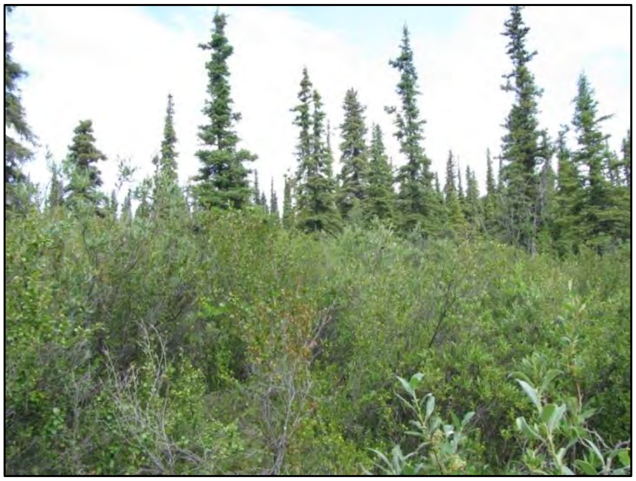
Ecosite Description

The Spruce – Scrub birch – Feathermoss ecosite occurs on gentle-to-moderate, upper slopes across a range of aspects. Within the LSA, the ecosite typically ranges from 1050-1300 m. It is commonly found adjacent to the Boreal High Bioclimate zone boundary and is transitional between forested and shrub dominated ecosystems. A sparse conifer dominated canopy (~15% cover), composed of white and black spruce (*Picea glauca* and *P. mariana*) is characteristic of this ecosite. A minor component of subalpine fir (*Abies lasiocarpa*) can also occur. The shrub layer is well developed and is dominated by scrub birch (*Betula glandulosa*) and willow species (including *Salix glauca*, *S. planifolia* and *S. scouleriana*). Also common in the shrub layer are lowbush cranberry (*Vaccinium vitis-idaea*), Labrador tea (*Rhododendron groenlandicum*), and bog blueberry (*Vaccinium uliginosum*). The herb layer is variable with limited cover, but typically altai fescue (*Festuca altaica*) and tall bluebells (*Mertensia paniculata*) are present. The well-developed moss and lichen layer is dominated by step moss (*Hylocomium splendens*), red-stemmed feathermoss (*Pleurozium schreberi*), and reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*).

The soil moisture regime of the ecosite ranges from submesic-to-mesic and the soil nutrient regime ranges from poor-to-medium. The dominant rooting zone texture is silt loam and drainage ranges from well to moderately well. The parent material is weathered bedrock or colluvial.

Sample Plots: 6

Full	[1]
Ground	[4]
Visual	[1]



Characteristic Vegetation

Tree layer:

[10] White spruce (*Picea glauca*)

[5] Black spruce (*Picea mariana*)

Shrub layer:

[20] Scrub birch (*Betula glandulosa*)

[15] Willows (*Salix* spp.)

[6] Labrador tea (*Rhododendron groenlandicum, R. tomentosum*)

[8] Lowbush cranberry (*Vaccinium vitis-idaea*)

[8] Bog blueberry (*Vaccinium uliginosum*)

[6] Crowberry (*Empetrum nigrum*)

[3] Water birch (*Betula occidentalis*)

Herb layer:

[2] Altai fescue (*Festuca altaica*)

[1] Tall bluebells (*Mertensia paniculata*)

Moss/Lichen layer:

[27] Step moss (*Hylocomium splendens*)

[22] Red-stemmed feathermoss (*Pleurozium schreberi*)

[18] Reindeer lichens (*Cladina* spp.)

[4] Haircap mosses (*Polytrichum* spp.)

Site Characteristics

Moisture Regime: mesic[3], submesic[3]

Nutrient Regime: medium[5], poor[1]

Slope Gradient: 5-35 %

Aspect: variable

Slope Position: upper slope[6]

Soil Characteristics

Organic Thickness: 3-15 cm

Humus Form: moder[3], mor[3]

Drainage: rapidly[1], well[4], moderately well[1]

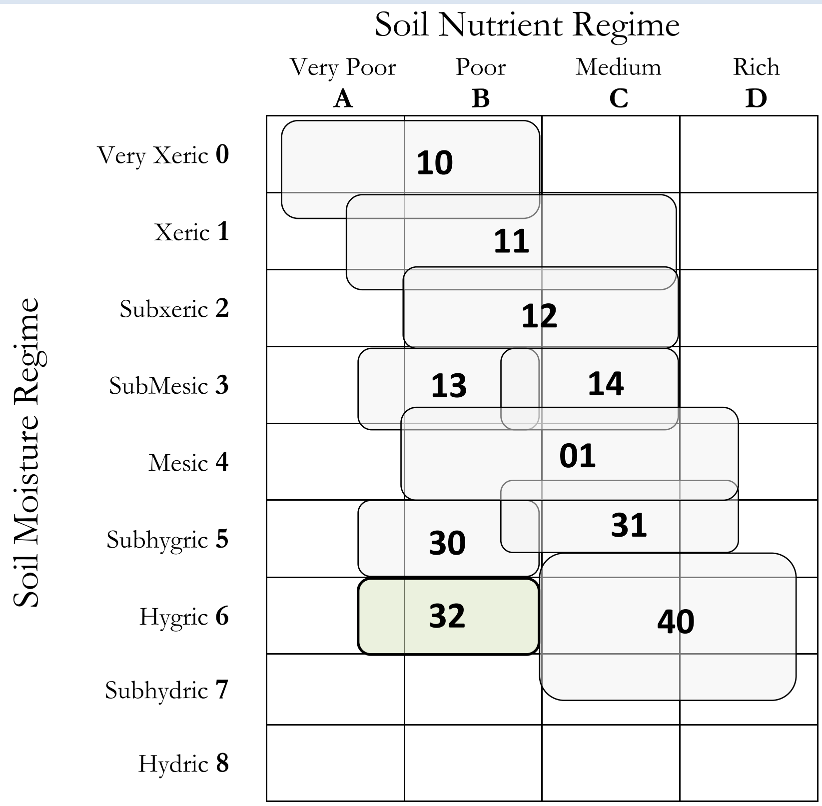
Seepage Water: absent

Permafrost: absent

Parent Material: C, D

Soil Texture: SiL[5], SL[1]

Black spruce – Labrador tea – Lowbush cranberry – Sedge (32)



Ecosite Description

The Black spruce – Labrador tea – Lowbush cranberry – Sedge ecosite occurs on gentle-to-moderate, lower-to-mid slopes, with a cool aspect. Within the LSA, the ecosite typically ranges from 1050-1250 m. Black spruce (*Picea mariana*) is the dominant tree species, but it tends to be stunted with a moderate-to-sparse canopy and is restricted to the shrub layer (i.e., <5m tall). The shrub layer is dominated by scrub birch (*Betula glandulosa*), Labrador tea (*Rhododendron groenlandicum*), lowbush cranberry (*Vaccinium vitis-idaea*) and willow species (including *Salix glauca*, *S. planifolia* and *S. lasiandra*). Spruce muskeg sedge (*Carex lugens*) dominates the herb layer; however cloudberry (*Rubus chamaemorus*) and sweet coltsfoot (*Petasites frigidus*) are also typically present. The moss and lichen layer is an important constituent of this ecosite, often with greater than 80% cover. A combination of mosses and lichens are typically present, including red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*), peat mosses (*Sphagnum* spp.), reindeer lichens (*Cladina mitis, C. rangiferina*, and *C. stellaris*) and *Cetraria* spp.

The soil moisture regime ranges from subhygric-to-hygric and the nutrient regime is typically poor. The dominant rooting zone soil texture is silt loam overlaying colluvial parent material. Permafrost is almost always present within 50 cm of the soil surface and soils are correspondingly imperfectly or poorly drained.

Sample Plots: 7

Full	[1]
Ground	[1]
Visual	[4]

Characteristic Vegetation

Shrub layer:

[29] Black spruce (*Picea mariana*)

[12] Scrub birch (*Betula glandulosa*)

[11] Lowbush cranberry (*Vaccinium vitis-idaea*)

[8] Labrador tea (*Rhododendron groenlandicum*)

[8] Willows (*Salix* spp.)

[5] Crowberry (*Empetrum nigrum*)

[4] Bog blueberry (*Vaccinium uliginosum*)

Herb layer:

[6] Spruce muskeg sedge (*Carex lugens*)

[3] Cloudberry (*Rubus chamaemorus*)

[1] Sweet coltsfoot (*Petasites frigidus*)

Moss/Lichen layer:

[25] Step moss (*Hylocomium splendens*)

[21] Red-stemmed feathermoss (*Pleurozium schreberi*)

[20] Peat mosses (*Sphagnum* spp.)

[12] Reindeer lichens (*Cladina* spp.)

[2] Cetraria lichens (*Certraria* spp.)

[0.5] Arctic kidney lichen (*Nephroma arcticum*)

Site Characteristics

Moisture Regime: subhygric[4], hygric[3]

Nutrient Regime: poor[6], medium[1]

Slope Gradient: 2-55 %, typically >15%

Aspect: northerly[5], north-easterly[1], easterly[1]

Slope Position: lower slope[3], midslope[2], upper slope[2]

Soil Characteristics

Organic Thickness: 15-35 cm

Humus Form: fibric[2], moder[2], mesic[1]

Drainage: imperfectly[3], poorly[2], moderately well[2]

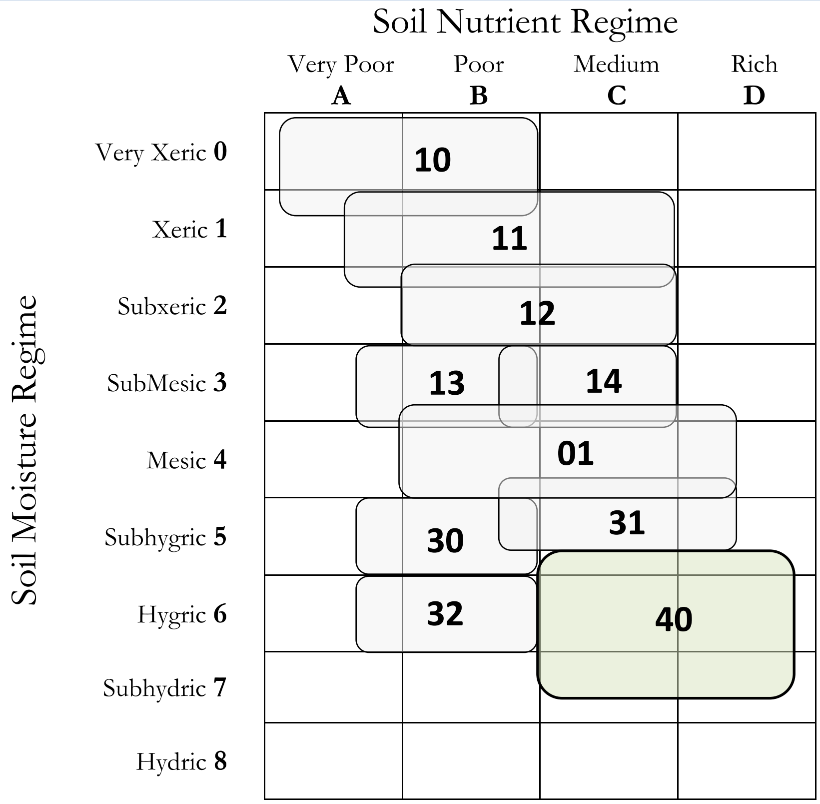
Seepage Water: present[3], absent[3]

Permafrost: present

Parent Material: C

Soil Texture: SiL[5], SL[1], L[1]

Willow – Horsetail – Peat moss (40)



Ecosite Description

The Willow – Horsetail – Peatmoss ecosite occurs along the channels of subalpine riverine habitats and side slope drainages where seasonal flooding is common (above 1150 m elevation). Willow species (including *Salix pulchra* and *S. planifolia*) are abundant and typically account for more than 60% of the shrub cover within these ecosystems. Other common shrub species include scrub birch (*Betula glandulosa*), bog blueberry (*Vaccinium uliginosum*), and Labrador tea (*Rhododendron groenlandicum*). The herb layer beneath the dense shrub layer is sparse and typically contains cloudberry (*Rubus chamaemorus*), sweet coltsfoot (*Petasites frigidus*), and horsetails (including *Equisetum pratense* and *E. sylvaticum*). The moss layer is dominated by peat moss (*Sphagnum* spp.); however Calligeron moss (*Calliergon* spp.) and leafy liverworts (*Barbilophozia* spp.) are also present.

The soil moisture regime of the Willow – Horsetail – Peatmoss ecosite is hygric and the soil nutrient regime ranges from medium-to-rich. Drainage is typically poor with seepage occurring within 30 cm of the soil surface. The parent material is typically fluvial and the rooting zone soil texture is silt loam or loam.

Sample Plots: 3

Full [1]
Ground [1]
Visual [1]

Characteristic Vegetation

Shrub layer:

[53] Willows (*Salix* spp.)

[10] Scrub birch (*Betula glandulosa*)

[10] Bog blueberry (*Vaccinium uliginosum*)

[3] Black spruce (*Picea mariana*)

[4] Labrador tea (*Rhododendron groenlandicum, R. tomentosum*)

Herb layer:

[3] Horsetails (*Equisetum* spp.)

[2] Cloudberry (*Rubus chamaemorus*)

[2] Sweet coltsfoot (*Petasites frigidus*)

Moss/Lichen layer:

[45] Peat mosses (*Sphagnum* spp.)

[10] Calliergon mosses (*Calliergon* spp.)

[3] Leafy liverworts (*Barbilophozia* spp.)

Site Characteristics

Moisture Regime: hygric[3]

Nutrient Regime: medium[3]

Slope Gradient: 10-17 %

Aspect: north-easterly[2], northerly[1]

Slope Position: gully[2], midslope[1]

Soil Characteristics

Organic Thickness: 15-25 cm

Humus Form: fibric[2], moder[1]

Drainage: poorly[3]

Seepage Water: present

Permafrost: absent

Parent Material: F

Soil Texture: SiL[2], L[1]

APPENDIX D. LIST OF POTENTIAL RARE PLANT SPECIES FOR THE COFFEE LSA

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List of rare plant species with the potential to occur in the Coffee LSA

Type	Common name[2]	Scientific name[1]	Synonym[3]	YK Rank[4]
Aquatic	floating marsh-marigold	*Caltha natans* Pall.		Watch
Aquatic	pygmy waterlily	*Nymphaea tetragona* Georgi		Track
Aquatic	closed-leaved pondweed	*Potamogeton foliosus* ssp. *foliosus* Raf.		Watch
Aquatic	Yenisei river pondweed	*Potamogeton subsibiricus* Hagstr.		Track
Aquatic	northern arrowhead	*Sagittaria cuneata* E. Sheldon		Watch
Fern	northern beech fern	*Phegopteris connectilis* (Michx.) Watt		Track
Fern	holly fern	*Polystichum lonchitis* (L.) Roth		Watch
Forb	little leaf pussytoes	*Antennaria microphylla* Rydb.		Watch
Forb	Aleutian cress	*Aphragmus eschscholtzianus* Andrz. ex DC.		Track
Forb	Yukon woodworm	*Artemisia laciniata* ssp. *laciniata* Willd.		Track
Forb	green spleenwort	*Asplenium trichomanes-ramosum* L.		Track
Forb	Alaska moonwort	*Botrychium alaskense* W.H. Wagner & J.R. Grant		Track
Forb	linear-leaf moonwort	*Botrychium lineare* W.H. Wagner		Track
Forb	leatherleaf grapefern	*Botrychium multifidum* (S.G. Gmel.) Rupr.	*Botrychium multifidum* (Gmel.) Rupr. var. *multifidum*	Track
Forb	maple-leaf goosefoot	*Chenopodium simplex* (Torr.) Raf.		Watch
Forb	elk thistle	*Cirsium foliosum* (Hook.) DC.		Track
Forb	scamman's claytonia	*Claytonia scammaniana* Hultén		Watch
Forb	Alaska bugseed	*Corispermum ochotense* var. *alaskanum* Mosyakin		Track
Forb	spotted lady's slipper	*Cypripedium guttatum* Sw.		Watch
Forb	small yellow lady's-slipper	*Cypripedium parviflorum* Salisb.		Track
Forb	arctic larkspur	*Delphinium brachycentrum* Ledeb.		Track
Forb	kathul mountain draba	*Draba murrayi* G.A. Mulligan		Track
Forb	star-flowered draba	*Draba stenopetala* Trautv.		Track
Forb	Yukon whitlowgrass	*Draba yukonensis* A.E. Porsild		Track
Forb	creeping spike-rush	*Eleocharis uniglumis* (Link) Schult.		Watch
Forb	tundra fleabane	*Erigeron hyperboreus* Greene		Watch
Forb	Philadelphia fleabane	*Erigeron philadelphicus* var. *philadelphicus* L.		Watch
Forb	porsild's arctic fleabane	*Erigeron porsildii* G.L. Nesom & D.F. Murray	*E. grandiflorus* Hook. ssp. *arcticus* A.E. Porsild	Watch
Forb	alpine golden wild buckwheat	*Eriogonum flavum* var. *aquilinum* Reveal		Track
Forb	showy alpine forget-me-not	*Eritrichium splendens* Kearney		Track
Forb	pursh's wallflower	*Erysimum capitatum* var. *purshii* (Durand) Rollins	*Erysimum angustatum* Rydb.	Track
Forb	prairie smoke	*Geum triflorum* Pursh		Watch
Forb	beach-head iris	*Iris setosa* Pall. ex Link		Track
Forb	spiny-spored quillwort	*Isoetes echinospora* Durieu		Track

Type	Common name[2]	Scientific name[1]	Synonym[3]	YK Rank[4]
Forb	maritime quillwort	*Isoetes maritima* Underw.		Track
Forb	island koenigia	*Koenigia islandica* L.		Watch
Forb	spiked saxifrage	*Micranthes spicata* (D. Don) Small		Track
Forb	Yukon goldenweed	*Nestotus macleanii* (Brandegee) R.P. Roberts, Urbatsch & Neubig		Track
Forb	Mertens' oxytrope	*Oxytropis mertensiana* Turcz.		Track
Forb	scamman's oxytrope	*Oxytropis scammaniana* Hultén		Watch
Forb	coffee creek scorpionweed	*Phacelia mollis* J.F. Macbr.		Watch
Forb	macound's woodroot	*Podistera macounii* (J.M. Coult. & Rose) Mathias & Constance		Watch
Forb	Yukon podistera	*Podistera yukonensis* Mathias & Constance		Track
Forb	arctic primrose	*Primula pumila* (Ledeb.) Pax	*Primula eximia* Greene	Watch
Forb	mount sheldon butterweed	*Senecio sheldonensis* A.E. Porsild		Track
Forb	william's catchfly	*Silene williamsii* Britton		Track
Forb	blue eyed grass	*Sisyrinchium montanum* var. *montanum* Green		Watch
Forb	water-parsnip	*Sium suave* Walter		Watch
Forb	porsild's false candytuft	*Smelowskia porsildii* (W.H. Drury & Rollins) Jurtzev	*Smelowskia calycina* var. *integrifolia* (Seem.) Rollins	Track
Forb	Alaska starwort	*Stellaria alaskana* Hultén		Track
Forb	matted starwort	*Stellaria dicranoides* (Cham. & Schltdl.) Fenzl		Track
Forb	Yukon aster	*Symphyotrichum yukonense* (Cronquist) G.L. Nesom		Track
Forb	pink dandelion	*Taraxacum carneocoloratum* A. Nelson		Track
Forb	hooker's townsendia	*Townsendia hookeri* Beaman		Watch
Forb	arctic yellow violet	*Viola biflora* var. *biflora*		Track
Graminoid	Idaho bentgrass	*Agrostis clavata* Trin.	*Agrostis filiculmis* M.E. Jones	Track
Graminoid	spike-oat	*Avenula hookeri* (Scribn.) Holub	*Helictotrichon hookeri* (Scribn.) Henrard	Watch
Graminoid	Lapland sedge	*Carex lapponica* O. Lang		Watch
Graminoid	weak sedge	*Carex laxa* Wahlenb.		Track
Graminoid	peck's sedge	*Carex peckii* Howe		Watch
Graminoid	long-styled sedge	*Carex stylosa* C.A. Mey.		Watch
Graminoid	meadow barley	*Hordeum brachyantherum* ssp. *brachyantherum* Nevski		Watch
Graminoid	oriental June grass	*Koeleria asiatica* Domin		Track
Graminoid	hairy wood rush	*Luzula rufescens* Fisch. ex E. Mey.		Watch
Graminoid	reed canarygrass	*Phalaris arundinacea* L.		Watch
Graminoid	short bluegrass	*Poa abbreviata* ssp. *abbreviata* R. Br.		Track
Graminoid	Patterson bluegrass	*Poa abbreviata* ssp. *pattersonii* (Vasey) Á. Löve, D. Löve & B.M. Kapoor	*Poa jordalii* A.E. Porsild	Track

Type	Common name[2]	Scientific name[1]	Synonym[3]	YK Rank[4]
Graminoid	viviparous alpine bluegrass	*Poa alpina ssp. vivipara* (L.) Arcang.		Watch
Graminoid	Siberian false oats	*Trisetum sibiricum* ssp. *sibiricum* Rupr.		Track
Shrub	bog birch, dwarf birch	*Betula pumila* L.	*Betula pumila* var. *glandulifera* Regel	Watch

1 Primary reference flora used was the online version of the Flora of North America (2014, 2015, 2016). Where species information was not available online, Integrated Taxonomic Information System (ITIS; 2015) was used. Reference flora for Bryophyte species was the online version of Bryophyte Flora of North America (2015). Lichen species were referenced using Lichens of North America (Brodo *et al.* 2011).

2 Common names not provided by 1) Flora of North America (2014, 2015, 2016), or 2) Flora of the Yukon Territory (Cody 2000) are from Klinkenberg (2015).

3 Synonyms are provided for the Flora of the Yukon Territory (Cody 2000).

4 Yukon conservation status rank. Track = plants that are of conservation concern in Yukon. Watch = plants for which more information is needed before a conservation status can be determined, but which may be threatened or endangered in Yukon or throughout their range (Yukon CDC 2016).

5 This species was down-listed in 2014 and is no longer considered rare following field surveys within the Project area.

APPENDIX E. DENSITY DISTRIBUTION CLASSES FOR INVASIVE PLANT SURVEYS (ADAPTED FROM LUTTMERDING *ET AL.* 1990)

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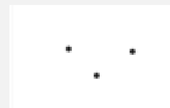
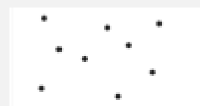
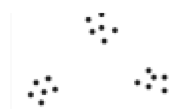
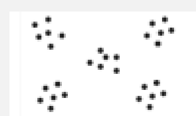
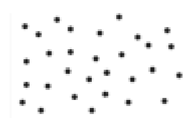
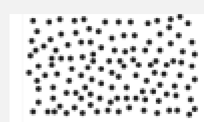
Density distribution classes for invasive plant surveys, 2015 and 2016 (Adapted from Luttmerding *et al.* 1990)

Class	Density Distribution	No. of plants in 20 m x 20 m area	No. of plants/ha 100 m x 100 m	Diagram	Approximate % Cover Range
1	rare individual, a single occurrence	1	≤5		1-5
2	a few sporadically occurring individuals	2-5	5-50		1-5
3	a single patch or clump of species	1 patch (occupying an area smaller than one quadrant of the plot)	variable (3 patches)		1-10
4	several sporadically occurring individuals	≥6	≥50		5-10
5	a few patches or clumps of species	2-5 patches (each occupying an area smaller than one quadrant of the plot)	variable (3-10 patches)		10-30
6	several well-spaced patches or clumps	≥6 patches (each occupying less than one quadrant of the plot)	variable (10-many disjunct patches)		10-30
7	continuous occurrence of a species with a few gaps in the distribution	many	many (some openings)		30-60
8	continuous dense occurrence of a species	many	many		>60

Notes: The density distribution class is determined over a sufficiently large area to account for normal variation in distribution pattern.

APPENDIX F. INVASIVE PLANT SPECIES LOCATIONS

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Invasive plant species found in the northern portion of survey extent, road survey 2015

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
1	1-2	0	7	6	6	5	2	0	0	Start at North Klondike Highway and Hunker Creek Road, driving south
2	2-4	5	6	6	4	2	2	0	0	-
3	4-6	5	5	6	5	5	5	0	0	-
4	6-8	5	2	2	0	2	2	0	0	-
5	8-10	5	2	0	0	2	2	0	0	-
6	10-12	0	7	0	0	0	0	0	0	-
7	12-14	6	5	0	0	2	2	0	0	Continue along Hunker Creek Road to Sulphur Creek Road and Eureka Ridge
8	14-16	0	2	0	0	0	3	0	0	-
9	16-18	2	2	0	0	3	5	0	0	-
10	18-20	0	0	0	0	0	2	2	0	Pullout, clearing
11	20-22	0	0	0	0	0	0	0	0	-
12	22-24	0	0	0	0	0	0	0	0	-
13	24-26	2	0	0	0	2	2	2	3	*Silene vulgaris* and *Elymus repens*; *Silene* was hand-pulled and bagged.
14	26-28	0	0	0	0	3	0	0	0	-
15	28-30	0	0	0	0	0	0	2	0	-
16	30-32	0	0	0	0	3	0	2	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
17	32-34	2	2	0	0	2	0	2	0	-
18	34-36	0	2	0	0	2	0	0	0	-
19	36-38	0	2	0	0	5	2	5	0	Pullout, clearing
20	38-40	0	7	0	0	5	0	2	0	-
21	40-42	0	7	0	0	5	3	2	0	-
22	42-44	4	5	0	0	5	0	0	0	-
23	44-46	0	7	0	0	3	2	2	0	-
24	46-48	0	0	0	0	0	0	5	0	-
25	48-50	0	0	0	0	3	0	5	0	-
26	50-52	0	2	0	0	0	0	5	0	-
27	52-54	2	0	0	0	2	0	5	0	-
28	54-56	3	2	0	0	2	0	0	0	-
29	56-58	5	5	0	0	3	5	0	0	-
30	58-60	0	2	0	0	0	3	0	0	-
31	60-62	0	2	0	0	2	0	0	0	-
32	62-64	0	2	0	0	3	3	0	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
33	64-66	0	2	0	0	0	0	0	0	-
34	66-68	0	5	0	0	0	0	0	0	-
35	68-70	0	2	0	0	2	0	0	0	-
36	70-72	0	5	0	0	5	2	0	0	-
37	72-74	0	5	0	0	5	2	0	0	-
38	74-76	0	2	0	0	2	0	0	0	-
39	76-78	0	2	0	0	0	0	3	0	-
40	78-80	0	0	0	0	0	0	5	0	-
41	80-82	0	0	0	0	0	0	3	0	-
42	82-84	0	0	0	0	0	0	0	0	-
43	84-86	0	0	0	0	0	0	0	0	-
44	86-88	0	0	0	0	0	0	0	0	-
45	88-90	0	0	0	0	0	0	2	0	-
46	90-92	0	0	0	0	0	0	0	0	-
47	92-94	0	0	0	0	0	0	0	0	-
48	94-96	0	0	0	0	0	0	0	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
49	96-98	0	2	0	0	0	2	2	0	-
50	98-100	0	2	0	0	3	3	0	0	-
51	100-102	0	2	0	0	2	0	0	0	Survey southern section of Black Hills Road, drive north and complete west and east arm of Black Hills
52	102-104	0	0	0	0	0	0	0	2	*Capsella bursa- pastoris*
53	104-106	0	0	0	0	0	0	0	0	-
54	106-108	0	2	0	0	2	0	0	0	-
55	108-110	0	0	0	0	0	0	0	0	-
56	110-112	0	0	0	0	0	0	0	0	-
57	112-114	0	0	0	0	2	0	0	0	-
58	114-116	0	0	0	0	0	0	5	0	-
59	116-118	0	0	0	0	3	0	0	0	-
60	118-120	0	0	0	0	0	0	5	0	-
61	120-122	0	0	0	0	0	0	5	0	-
62	122-124	0	0	0	0	0	0	2	0	-
63	124-126	0	0	0	0	0	0	5	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
64	126-128	0	0	0	0	0	0	0	0	-
65	128-130	0	0	0	0	3	0	5	0	-
66	130-132	0	0	0	0	0	0	5	0	-
67	132-134	0	0	0	0	0	0	5	0	-
68	134-136	0	0	0	0	5	0	6	0	-
69	136-140	0	2	0	0	0	0	5	0	-
70	140-142	0	0	0	0	0	0	2	0	-
71	142-144	0	2	3	0	2	0	0	0	-
72	144-146	0	4	5	0	5	0	0	0	-
73	146-148	0	7	0	0	5	0	0	0	-
74	148-150	0	7	0	0	5	0	0	0	-
75	150-152	0	2	0	0	0	0	0	0	-
76	152-154	0	4	0	0	0	0	0	0	-
77	154-156	0	2	0	0	0	0	0	0	-
78	156-158	0	2	0	0	0	0	0	0	-
79	158-160	0	0	0	0	0	0	0	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
80	160-162	0	0	8	0	0	0	0	0	Survey along Bonanza Creek Road & Dominion Road
81	162-164	0	2	7	0	1	0	0	0	-
82	164-166	0	0	5	0	0	0	0	0	-
83	166-168	0	2	5	0	2	3	0	3	*Trifolium pratense*
84	168-170	0	2	3	0	2	3	0	1	*Taraxaxum officinale*
85	170-172	0	2	3	0	2	2	0	1	*Caragana arborescens* at Dredge No. 4
86	172-174	0	2	5	0	2	0	0	0	-
87	174-176	3	0	0	0	2	2	3	0	-
88	176-178	0	4	5	0	2	3	2	0	-
89	178-180	0	0	0	0	0	3	6	0	-
90	180-182	0	0	0	0	0	0	5	0	-
91	182-184	0	5	0	0	2	3	5	0	-
92	184-186	0	0	0	0	0	0	5	0	-
93	186-188	0	0	0	0	3	0	5	0	-
94	188-190	0	0	0	0	3	0	5	0	-
95	190-192	0	0	0	0	0	0	5	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
96	192-194	0	0	0	0	0	0	2	0	-
97	194-196	0	2	0	0	0	0	5	0	-
98	196-198	0	0	0	0	0	0	5	0	-
99	198-200	0	0	0	0	0	0	5	0	Start of Dominion Road, drive south
100	200-202	0	2	0	0	0	0	2	0	-
101	202-204	0	4	0	0	2	0	2	0	-
102	204-206	0	5	0	0	0	0	2	0	-
103	206-208	0	5	0	0	0	0	0	0	-
104	208-210	0	2	0	0	0	0	2	0	-
105	210-212	2	2	0	0	0	0	0	0	-
106	212-214	0	2	0	0	0	0	0	0	-
107	214-216	0	0	0	0	0	0	0	0	-
108	216-218	0	6	0	0	2	0	2	0	-
109	218-220	0	7	0	0	0	0	0	0	-
110	220-222	0	7	0	0	0	0	0	0	-
111	222-224	0	7	0	0	0	0	0	0	-

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Other Spp.[2]	Notes
112	224-226	0	5	0	0	0	0	0	0	-
113	226-228	0	5	0	0	0	0	0	0	-
114	228-230	0	4	0	0	0	0	0	0	-
115	230-232	0	6	0	0	0	0	0	0	-
116	232-234	0	6	0	0	0	0	0	0	-
117	234-236	0	5	0	0	0	0	0	0	-
118	236-238	0	5	0	0	0	0	0	0	Most southern end of Dominion Road

Values represent density distribution classes (refer to Appendix E for definitions; sourced from Luttmerding *et al.* 1990).

[1] KM markers are approximate and based on 2 KM transects.

[2] Includes less common invasive plant species observed during the Northern Access Route survey.

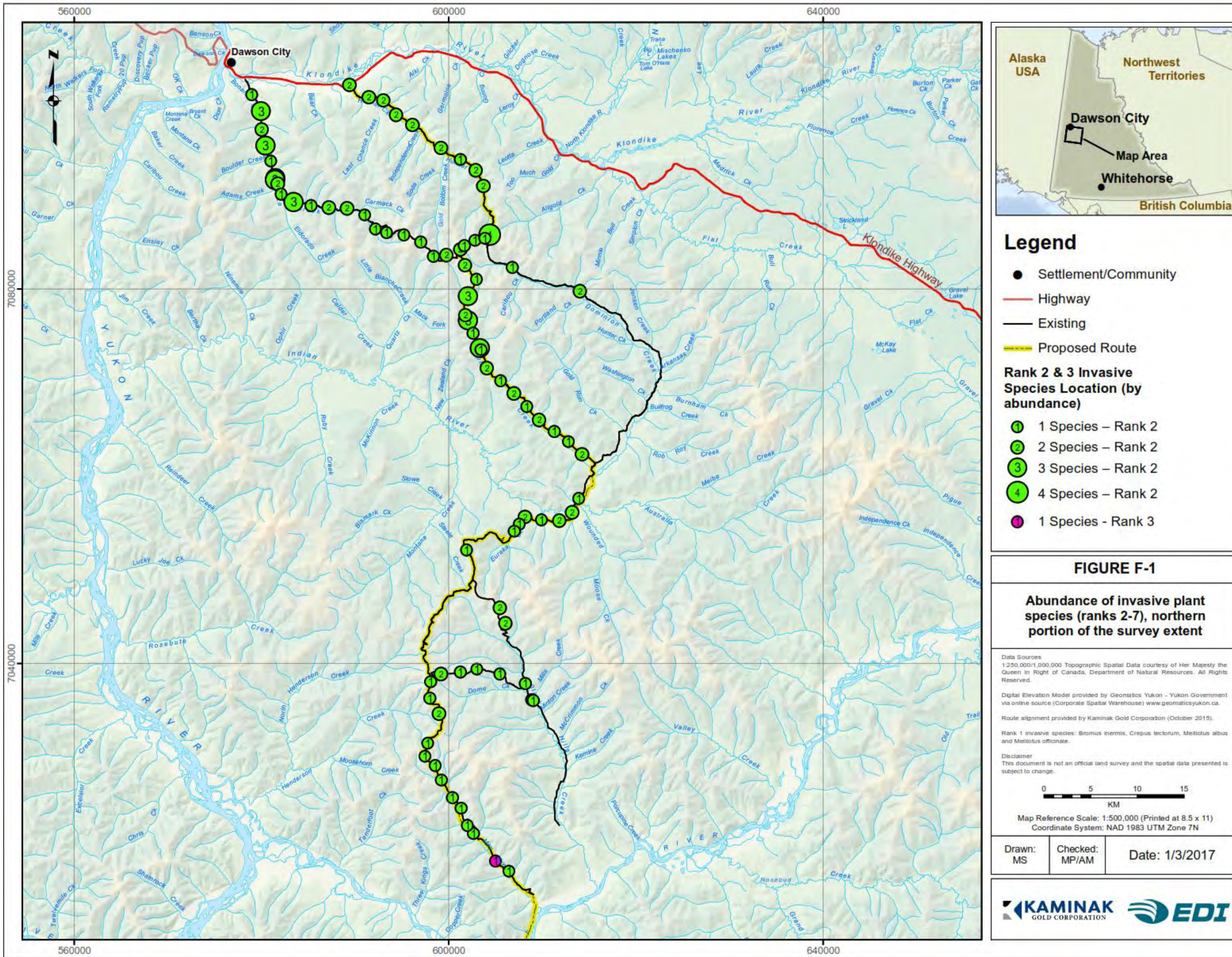

FIGURE F-1

Abundance of invasive plant species (ranks 2-7), northern portion of the survey extent

Data Sources
1:250,000/1,000,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Route alignment provided by Kaminak Gold Corporation (October 2015).

Rank 1 invasive species: Bromus inermis, Crepus tectorum, Meliotus albus and Meliotus officinale.

Disclaimer
This document is not an official land survey and the spatial data presented is subject to change.

Map Reference Scale: 1:500,000 (Printed at 8.5 x 11)
Coordinate System: NAD 1983 UTM Zone 7N

Drawn: MS | Checked: MP/AM | Date: 1/3/2017

Invasive plant species found in the southern portion of survey extent, road survey 2016

Segment	KM[1]	Smooth Brome	Narrow-leaved Hawksbeard	White Sweetclover	Yellow Sweetclover	Common Dandelion	Alsike Clover	Kentucky Bluegrass	Notes
1	1-3	0	**2**	0	0	0	0	0	-
2	3-5	0	0	0	0	0	0	0	-
3	5-7	0	0	0	0	0	0	0	-
4	7-9	0	0	0	0	0	0	0	-
5	9-11	0	0	0	0	0	0	0	-
6	11-13	0	0	0	0	0	0	0	-
7	13-15	0	0	0	0	0	0	0	-
8	15-17	0	0	0	0	0	0	0	-
9	17-19	0	0	0	0	0	0	0	-
10	19-21	0	**1**	0	0	0	0	0	One flowering individual; picked, bagged and incinerated onsite

Values represent density distribution classes (refer to Appendix E for definitions; sourced from Luttmerding *et al.* 1990).

[1] KM markers are approximate and based on 2 KM transects.

Invasive plant species found in the southern portion of survey extent, walking surveys 2015 and 2016

Species name	Common name	Latitude	Longitude	Habitat Type	Density Distribution[1]	Notes
Bromus inermis	Smooth brome	63.2432	-138.8107	Clearing; Coffee Camp	8	All around Coffee Camp
Bromus inermis	Smooth brome	62.91325	-139.0887	Clearing	7	*Old Maisey May farm, field of smooth brome and fireweed ~10,000 m²; site was accessed via helicopter
Capsella bursa-pastoris	Shepherd's purse	62.9095	-139.079679	Clearing; Coffee Camp	6	Scattered around Coffee Camp
Chenopodium album	Lamb's-quarters	62.9132	-139.0862	Clearing; Coffee Camp	4	Scattered around Coffee Camp
Crepis tectorum	Narrow-leaved hawksbeard	63.1093	-138.9549	Road	7	100 m transect
Crepis tectorum	Narrow-leaved hawksbeard	63.1093	-138.9549	Clearing	4	South of the junction for Barker route, 250 m² area, edge of burn on switchback in clearing/equipment storage
Crepis tectorum	Narrow-leaved hawksbeard	63.1093	-138.9549	Road	7	1 patch 30 m²
Crepis tectorum	Narrow-leaved hawksbeard	62.9545	-139.0223	Clearing	7	1 large patch ~5000 m², several trucks and old buildings, open area close to stream
Crepis tectorum	Narrow-leaved hawksbeard	62.9566	-139.0245	Road	5	1 patch ~30 m²
Crepis tectorum	Narrow-leaved hawksbeard	62.9081	-139.0789	Clearing; Coffee airstrip	6	Approximately 100 individuals removed
Crepis tectorum	Narrow-leaved hawksbeard	62.9076	-139.0760	Clearing; Coffee airstrip	6	Approximately 100 individuals removed
Crepis tectorum	Narrow-leaved hawksbeard	62.9082	-139.0704	Clearing; Coffee airstrip	8	Largest patch at airstrip 225 m² area, requires follow-up management
Crepis tectorum	Narrow-leaved hawksbeard	62.9075	-139.0788	Clearing; Coffee airstrip	6	Fuel tanks at Coffee airstrip; approximately 100x2 m patch
Crepis tectorum	Narrow-leaved hawksbeard	62.9076	-139.0788	Clearing; Coffee airstrip	1	Edge of fuel tanks at Coffee airstrip; one patch

Species name	Common name	Latitude	Longitude	Habitat Type	Density Distribution[1]	Notes
Crepis tectorum	Narrow-leaved hawksbeard	62.9075	-139.0846	Java Road	2	KM 1 on west side of Coffee airstrip near wind sock
Crepis tectorum	Narrow-leaved hawksbeard	62.9076	-139.0786	Java Road	2	KM 1 on north side of Coffee airstrip; approximately 300x1 m patch
Crepis tectorum	Narrow-leaved hawksbeard	62.8798	-139.3627	Java Road	1	KM 21; one flowering individual, picked, bagged and incinerated onsite
Matricaria discoidea	Pineapple weed	62.9133	-139.0854	Clearing; Camp	6	Scattered around Coffee Camp
Melilotus albus	White sweetclover	62.8928	-138.9723	Clearing	3	1 patch at Ballarat barge along north bank of Yukon River, plants were removed.
Melilotus albus	White sweetclover	63.1093	-138.9549	Clearing	3	South of the junction for Barker route, 250 m², edge of burn on switchback in clearing/ equipment storage; plants were removed.
Melilotus albus	White sweetclover	62.9520	-139.0183	Clearing	1	Few individuals, hand-pulled
Melilotus albus	White sweetclover	62.9520	-139.0183	Road	1	1 plant removed
Melilotus albus	White sweetclover	62.9165	-138.9491	Road	4	20 plants removed
Plantago major	Great plantain	62.9133	-139.0853	Clearing; Coffee Camp	6	Scattered around Coffee Camp
Sinapis alba	White mustard	62.9132	-139.0856	Other; garden box outside Camp kitchen	1	Planted in garden box
Sonchus arvensis ssp. *arvensis*	Perennial sow-thistle	62.9082	-139.0785	Clearing; Coffee airstrip near fuel drums	2	Found when waiting for plane to arrive, did not have access to GPS or camera; four individuals; flowering heads were picked, bagged and put in the incinerator; approx. location (Latitude 62.9082, Longitude -139.0785).
Taraxacum officinale	Common dandelion	62.8970	-138.9584	Clearing	2	Few scattered individuals at Ballarat barge along north bank of Yukon River, not hand-pulled
Taraxacum officinale	Common dandelion	62.8930	-138.9730	Road	1	1 plant
Taraxacum officinale	Common dandelion	62.8930	-138.9723	Clearing	7	Airstrip along Barker Creek, plants very large and healthy, other plants present were *Hordeum jubatum* and *Elymus trachycaulus*

Species name	Common name	Latitude	Longitude	Habitat Type	Density Distribution[1]	Notes
Taraxacum officinale	Common dandelion	62.8974	-138.9478	Road	2	few plants
Taraxacum officinale	Common dandelion	63.0626	-138.9796	Road	1	1 plant
Thlaspi arvense	Field pennycress	62.9130	-139.0866	Clearing; Coffee Camp	5	Scattered around Coffee Camp

[1] Values sourced from Luttmerding *et al*. 1990; refer to Appendix E for definitions.

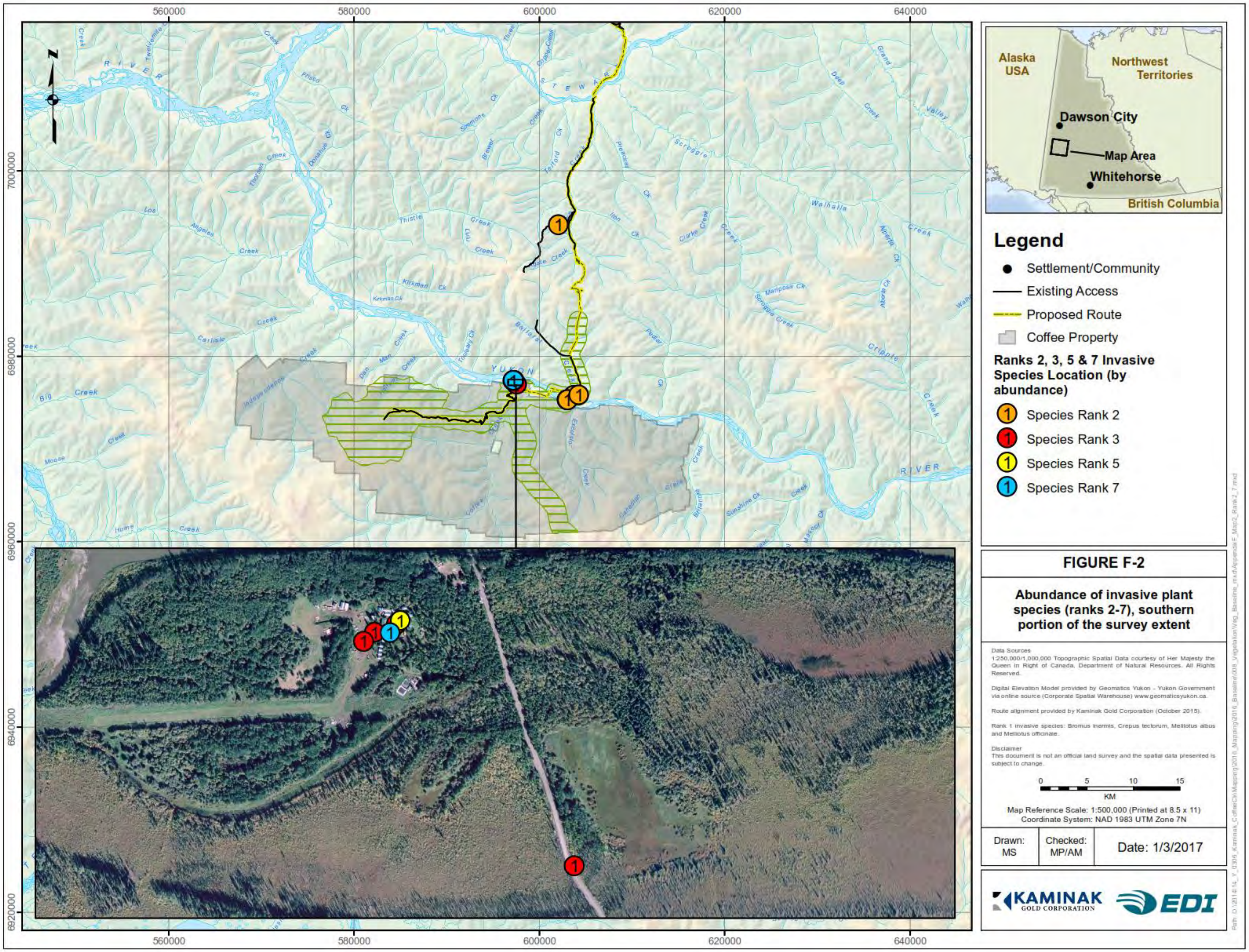

FIGURE F-2

Abundance of invasive plant species (ranks 2-7), southern portion of the survey extent

APPENDIX G. VEGETATION AND SOIL TRACE METALS SAMPLE SITE LOCATIONS

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Vegetation and soil trace metals sample sites, 2014-2016

Location	Distance Category[1]	Site	Location UTM Zone (7N) Easting	Northing	# of Samples	Species Collected[2]	Transect[3]	Year
Coffee Area	Adjacent	CCHMA-21	583487	6973572	4	S, W, L, C	-	2014
Coffee Area	Adjacent	CCHMA-39	584710	6973498	5	S, W, H, L, C	-	2014
Coffee Area	Adjacent	CCHMA-50	579744	6973002	4	S, W, L, C	-	2014
Coffee Area	Adjacent	CCTMA-628	586941	6973925	4	S, W, L, C	Transect 1	2016
Coffee Area	Adjacent	CCTMA-619	584298	6972457	5	S, W, H, L, C	Transect 11	2016
Coffee Area	Adjacent	CCTMA-622	585146	6972820	4	S, W, L, C	Transect 12	2016
Coffee Area	Adjacent	CCTMA-626	585820	6975288	4	S, W, L, C	Transect 2	2016
Coffee Area	Adjacent	CCTMA-627	584290	6975416	5	S, W, H, L, C	Transect 3	2016
Coffee Area	Adjacent	CCTMA-623	583327	6974659	4	S, W, L, C	Transect 4	2016
Coffee Area	Adjacent	CCTMA-631	582532	6974820	4	S, W, L, C	Transect 5	2016
Coffee Area	Adjacent	CCTMA-600	579395	6972911	4	S, W, L, C	Transect 7	2016
Coffee Area	Adjacent	CCTMA-601	581016	6971713	4	S, W, L, C	Transect 8	2016
Coffee Area	Adjacent	CCTMA-632	582999	6972624	4	S, W, L, C	Transect 9	2016
Coffee Area	Near	CCHMA-98	599779	6965785	4	S, W, L, C	-	2014
Coffee Area	Near	CCHMA-106	598384	6969684	4	S, W, L, C	-	2014
Coffee Area	Near	CCHMA-299	598458	6970041	2	S, H	-	2014
Coffee Area	Near	CCHMA-135	584702	6972062	3	S, H, C	-	2014
Coffee Area	Near	CCHMB-76	597532	6976362	4	S, W, L, C	-	2014
Coffee Area	Near	CCHMB-92	601841	6962653	2	S, H	-	2014
Coffee Area	Near	CCHMB-410	601935	6961852	4	S, W, L, C	-	2014
Coffee Area	Near	CCHMB-419	598578	6971398	2	S, H	-	2014
Coffee Area	Near	CCHMB-422	598825	6970580	5	S, W, H, L, C	-	2014
Coffee Area	Near	CCHMB-113	588990	6973231	2	S, W	-	2014
Coffee Area	Near	CCHMB-120	590301	6973176	3	S, W, C	-	2014
Coffee Area	Near	CCHMB-130	595839	6974105	4	S, W, H, C	-	2014
Coffee Area	Near	CCTMA-629	590024	6974220	3	S, L, C	Transect 1	2016
Coffee Area	Near	CCTMB-621	584987	6971458	3	S, L, C	Transect 11	2016
Coffee Area	Near	CCTMB-634	586152	6972368	4	S, W, L, C	Transect 12	2016
Coffee Area	Near	CCTMB-625	586521	6975931	4	S, W, L, C	Transect 2	2016
Coffee Area	Near	CCTMB-624	584741	6976510	3	S, L, C	Transect 3	2016
Coffee Area	Near	CCTMB-630	582848	6975526	4	S, W, L, C	Transect 4	2016
Coffee Area	Near	CCTMB-633	581197	6974342	4	S, W, L, C	Transect 6	2016
Coffee Area	Near	CCTMB-603	578466	6972880	4	S, W, L, C	Transect 7	2016
Coffee Area	Near	CCTMB-602	579714	6970666	4	S, W, L, C	Transect 8	2016
Coffee Area	Near	CCTMB-620	582546	6971515	4	S, W, L, C	Transect 9	2016
Coffee Area	Far	CCHMB-164	583420	6973834	4	S, W, L, C	-	2014
Coffee Area	Far	CCHMB-440	597868	6974816	4	S, W, H, C	-	2014
Coffee Area	Far	CCHMB-843	585391	6974038	4	S, W, L, C	-	2014
Coffee Area	Far	CCHMB-138	584781	6971753	5	S, W, H, L, C	-	2014

Location	Distance Category[1]	Site	Location UTM Zone (7N)		# of Samples	Species Collected[2]	Transect[3]	Year
			Easting	Northing				
Coffee Area	Far	CCHMC-55	578452	6971148	4	S, W, L, C	-	2014
Coffee Area	Far	CCHMC-59	578394	6971848	3	S, W, H	-	2014
Coffee Area	Far	CCHMC-62	584347	6970033	4	S, W, L, C	-	2014
Coffee Area	Far	CCTMC-613	584253	6966085	4	S, W, L, C	Transect 10	2016
Coffee Area	Far	CCTMC-612	589500	6965882	4	S, W, L, C	Transect 11	2016
Coffee Area	Far	CCTMC-611	596022	6968511	3	S, L, C	Transect 12	2016
Coffee Area	Far	CCTMC-606	591161	6979095	4	S, W, L, C	Transect 2	2016
Coffee Area	Far	CCTMC-607	588011	6981306	4	S, W, L, C	Transect 3	2016
Coffee Area	Far	CCTMC-608	579583	6978574	4	S, W, L, C	Transect 5	2016
Coffee Area	Far	CCTMC-609	575259	6976307	5	S, W, H, L, C	Transect 6	2016
Coffee Area	Far	CCTMC-604	571999	6973526	5	S, W, H, L, C	Transect 7	2016
Coffee Area	Far	CCTMC-605	574742	6966413	4	S, W, L, C	Transect 8	2016
Coffee Area	Far	CCTMC-610	579588	6964959	4	S, W, L, C	Transect 9	2016
Coffee Area	Control	CCTMR-614	562527	6970562	4	S, W, L, C	Moose Mt	2016
Coffee Area	Control	CCTMR-615	562244	6970134	4	S, W, L, C	Moose Mt	2016
Coffee Area	Control	CCTMR-616	562302	6969616	4	S, W, L, C	Moose Mt	2016
Coffee Area	Control	CCTMR-617	562664	6969244	4	S, W, L, C	Moose Mt	2016
Coffee Area	Control	CCTMR-618	563152	6969075	4	S, W, L, C	Moose Mt	2016
Coffee Area	Control	CCTMR-635	596932	6989830	4	S, W, L, C	Thistle Mt	2016
Coffee Area	Control	CCTMR-636	596728	6990306	4	S, W, L, C	Thistle Mt	2016
Coffee Area	Control	CCTMR-637	597050	6990697	4	S, W, L, C	Thistle Mt	2016
Coffee Area	Control	CCTMR-638	597482	6990970	4	S, W, L, C	Thistle Mt	2016
Coffee Area	Control	CCTMR-639	597498	6991481	4	S, W, L, C	Thistle Mt	2016
Coffee Area	-	CCHMC-69	582515	6970004	4	S, W, H, C	-	2014
Coffee Area	-	CCHMC-81	577747	6974381	4	S, W, L, C	-	2014
Coffee Area	-	CCHMC-400	584781	6971753	4	S, W, L, C	-	2014
Coffee Area	-	CCHMC-436	587857	6975551	4	S, W, H, C	-	2014
Coffee Area	-	CCHMA-30A	582129	6974317	3	S, W, H	-	2014
Coffee Area	-	CCHMA-851	584855	6974143	4	S, W,L, C	-	2014
Coffee Area	-	CCHMA-38	585055	6973272	4	S, W, L, C	-	2014
Coffee Area	-	CCTMA-BD5	596554	6975730	3	S, W, H	-	2014
Coffee Area	-	CCHMB-20	583162	6972867	4	S, W, L, C	-	2014
Coffee Area	-	CCHMB-28A	581838	6974643	4	S, W, L, C	-	2014
Coffee Area	-	CCHMB-49	579615	6972752	4	S, W, L, C	-	2014
Northern Access Route	-	CCTM502	598713	6988961	4	S, W, L, C	-	2015
Northern Access Route	-	CCTM507	603767	6991322	4	S, W, H, L	-	2015
Northern Access Route	-	CCTM510	604478	6984640	4	S, W, L, C	-	2015
Northern Access Route	-	CCTM500	610349	7014338	3	S, W, H	-	2015
Northern Access Route	-	CCTM501	601053	6975567	5	S, W, H, L, C	-	2015
Northern Access Route	-	CCTM503	604863	6987586	3	S, H, C	-	2015
Northern Access Route	-	CCTM504	602192	6975029	3	S, H, C	-	2015

Location	Distance Category[1]	Site	Location UTM Zone (7N) Easting	Northing	# of Samples	Species Collected[2]	Transect[3]	Year
Northern Access Route	-	CCTM505	603378	6980401	4	S, W, L, C	-	2015
Northern Access Route	-	CCTM506	599896	6984660	4	S, W, H, C	-	2015
Northern Access Route	-	CCTM508	614504	7019383	3	S, W, H	-	2015
Northern Access Route	-	CCTM509	604505	6985536	4	S, W, H, C	-	2015
Northern Access Route	-	CCTM511	608229	7009997	4	S, W, L, C	-	2015
--	**Total Sites**	**89**	--	**Total Samples**	**327**	--	--	--

[1] 2014 distance categories were preliminary (adjacent 0-25 m; near 75-250 m; far 1.5-2.5 km); In 2016, dust isopleth modelling was available and distance categories were revised to better represent site conditions (adjacent 100 m; near 1000 m; far 5.5-7.5 km; control ≥15 km)

[2] S = soil; W = willow; H = horsetail; L = lichen; C = cranberry

[3] Transects were incorporated in 2016 as part of the revised study design

APPENDIX H. VEGETATION AND SOIL TRACE METALS SAMPLING LABORATORY RESULTS

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2014 Willow trace metal analysis (n=32), sample sites CCHMWB-20 to CCHMWC-62

Parameter[1]	CCHMWB-20	CCHMWA-21	CCHMWB-28A	CCHMWA-30A	CCHMWA-38	CCHMWA-39	CCHMWB-49	CCHMWA-50	CCHMWC-55	CCHMWC-59	CCHMWC-62	RDL[2]
Aluminum	11.8	13.0	18.0	6.2	27.0	9.4	24.1	16.8	36.3	9.3	41.4	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.063	0.124	<0.050	<0.050	<0.050	0.050
Barium	15.6	23.6	13.9	8.25	35.2	25.5	22.4	11.0	28.8	14.9	52.8	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	6.9	2.2	4.7	3.5	3.3	5.5	6.2	3.8	4.3	4.6	3.8	2.0
Cadmium	0.671	0.721	0.589	0.290	0.592	0.627	1.20	0.951	0.606	0.951	1.80	0.010
Calcium	8530	7430	4680	3860	7820	5670	5810	3310	7160	5880	12300	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.257	0.443	1.91	0.575	1.51	0.244	0.282	0.186	0.686	0.283	1.01	0.020
Copper	2.72	3.39	2.29	2.76	4.49	2.42	3.31	1.99	4.26	3.39	3.84	0.050
Iron	41	42	56	44	64	38	56	44	67	58	72	10
Lead	0.023	0.014	0.021	0.013	0.042	0.027	0.039	0.022	0.034	0.022	0.032	0.010
Magnesium	1240	2080	1270	805	3080	1310	1920	1030	2950	2140	3800	10
Manganese	136	247	517	328	164	200	276	503	166	241	298	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.160	0.087	0.093	0.109	0.323	0.086	0.053	0.082	0.059	0.070	0.094	0.050
Nickel	1.49	3.83	1.02	0.635	3.66	0.276	1.45	0.888	3.21	0.915	3.10	0.050
Phosphorus	749	1020	834	960	2310	657	928	736	1040	927	1880	10
Potassium	11400	7040	5990	7600	10900	8300	7350	5000	5370	4760	9230	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	11	17	<10	<10	<10	11	<10	<10	<10	10
Strontium	18.3	21.4	22.8	29.1	44.5	18.5	29.9	19.3	38.5	29.3	81.9	0.10
Thallium	<0.0020	0.0040	<0.0020	<0.0020	<0.0020	<0.0020	0.0037	<0.0020	0.0028	<0.0020	0.0025	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	1.4	<1.0	1.6	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	94.1	49.2	92.9	39.7	43.1	65.6	146	135	35.0	107	43.9	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Willow trace metal analysis (n=32), sample sites CCHMWB-76 to CCHMWB-422

Parameter[1]	CCHMWB76	CCHMWC-81	CCHMWA-106	CCHMWB-113	CCHMWB-120	CCHMWB-130	CCHMWB-138	CCHMWB-164	CCHMWC-400	CCHMWB-410	CCHMWB-422	RDL[2]
Aluminum	26.8	33.7	27.1	19.8	94.7	52.0	11.2	36.7	32.1	28.5	28.2	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0057	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.053	<0.050	0.050
Barium	12.5	39.2	76.7	31.2	84.3	133	24.7	49.9	57.1	19.8	51.6	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	7.9	3.5	2.2	10.4	11.1	16.6	7.7	3.9	3.3	4.7	3.6	2.0
Cadmium	0.804	0.669	0.912	0.973	0.911	2.74	2.70	0.702	1.24	0.558	0.523	0.010
Calcium	13500	8640	13600	9740	12100	10300	8330	14200	7450	5340	11800	10
Chromium	0.24	<0.20	<0.20	<0.20	0.35	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.180	2.05	1.98	0.570	1.31	1.27	0.218	1.98	0.944	0.263	1.34	0.020
Copper	2.17	3.03	3.22	2.81	2.99	3.12	4.20	2.99	2.52	4.07	3.95	0.050
Iron	58	118	49	50	97	57	55	64	60	66	78	10
Lead	0.031	0.030	0.059	0.020	0.057	0.025	0.015	0.032	0.044	0.042	0.019	0.010
Magnesium	3110	2580	2400	2640	4000	1910	2250	3040	3080	1840	2430	10
Manganese	195	331	451	141	214	376	434	315	250	92.6	349	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.514	0.070	0.081	0.180	0.109	0.614	0.196	0.059	0.056	0.101	0.144	0.050
Nickel	0.997	2.81	3.84	1.54	3.15	2.60	2.36	3.32	2.71	1.91	4.12	0.050
Phosphorus	664	1170	2300	2830	2730	3620	1510	1500	1810	1030	1880	10
Potassium	5060	7110	8550	7790	9730	9550	7480	8410	7290	6340	9910	10
Selenium	<0.050	<0.050	0.119	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	12	<10	<10	<10	<10	<10	244	<10	<10	10
Strontium	37.3	54.6	66.3	31.0	86.1	64.0	45.0	67.3	54.3	23.0	34.3	0.10
Thallium	0.0023	0.0040	0.0025	0.0025	0.0036	<0.0020	<0.0020	0.0075	0.0038	<0.0020	<0.0020	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	1.8	1.2	1.2	1.1	3.3	1.4	<1.0	1.3	1.2	1.4	1.3	1.0
Uranium	<0.0020	0.0048	0.0034	<0.0020	0.0040	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	147	27.4	26.3	86.3	77.2	90.6	294	31.2	43.1	57.2	75.4	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Willow trace metal analysis (n=32), sample sites CCHMWC-436 to CCTMWA

Parameter[1]	CCHMWC-436	CCHMWC-438	CCHMWB-843	CCHMWA-851	CCHMWA-851 r	CCTMWC-BD1	CCTMWC-BD3-r[2]	CCTMWC-BD4	CCTMWA-BD5	CCTMWC-	CCTMWA-	RDL[3]
Aluminum	6.1	9.6	53.7	136	295	42.8	17.3	20.9	104	19.6	100	1.0
Antimony	<0.0050	<0.0050	0.0139	0.0446	0.0982	<0.0050	<0.0050	<0.0050	0.0096	<0.0050	0.0091	0.005
Arsenic	<0.050	<0.050	0.126	0.679	1.48	<0.050	<0.050	<0.050	0.089	<0.050	0.078	0.050
Barium	33.4	13.0	40.2	42.6	54.6	36.3	26.6	12.8	48.0	15.9	47.1	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	2.7	7.5	4.3	<2.0	3.7	4.9	6.0	7.5	5.8	5.5	9.8	2.0
Cadmium	0.780	0.526	0.626	0.522	0.484	0.805	0.289	1.30	1.45	0.561	1.67	0.010
Calcium	10600	8120	7970	5720	6920	4820	8730	6880	21100	8110	19000	10
Chromium	<0.20	<0.20	0.25	1.18	1.71	<0.20	<0.20	<0.20	0.36	<0.20	0.41	0.20
Cobalt	0.535	1.00	1.49	1.04	1.61	0.616	0.328	0.619	0.440	0.296	0.548	0.020
Copper	2.86	3.27	2.86	3.10	3.35	2.59	1.67	3.20	4.34	2.26	4.72	0.050
Iron	30	50	104	234	490	80	55	75	253	58	230	10
Lead	0.012	0.027	0.036	0.078	0.154	0.037	0.014	0.023	0.071	0.030	0.068	0.010
Magnesium	1200	2170	2780	2090	3090	1230	1710	2620	2210	1350	2210	10
Manganese	33.0	308	589	171	266	557	217	690	44.9	369	45.9	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.140	0.106	0.139	0.063	0.139	0.108	0.278	0.351	1.60	0.246	1.37	0.050
Nickel	2.61	0.702	2.48	2.84	2.95	0.514	0.840	1.37	1.38	0.460	1.76	0.050
Phosphorus	1060	1330	1370	1440	1810	638	739	1050	1270	651	1440	10
Potassium	9100	9840	8360	6550	7390	4270	8760	6090	7200	7730	9370	10
Selenium	0.061	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.051	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	23	44	<10	13	<10	10
Strontium	36.7	28.6	41.5	41.5	44.1	26.5	20.9	35.9	71.9	18.6	67.3	0.10
Thallium	<0.0020	<0.0020	0.0032	0.0042	0.0070	0.0036	<0.0020	<0.0020	0.0064	<0.0020	0.0029	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	3.3	10.0	14.4	2.6	1.3	1.4	6.2	1.3	5.2	1.0
Uranium	<0.0020	<0.0020	0.0043	0.0096	0.0201	0.0028	<0.0020	<0.0020	0.0088	<0.0020	0.0069	0.002
Vanadium	<0.20	<0.20	<0.20	0.47	0.96	<0.20	<0.20	<0.20	0.27	<0.20	0.26	0.20
Zinc	16.2	38.1	69.7	28.6	79.5	105	71.1	155	68.8	71.9	79.1	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2014 Lichen trace metal analysis (n=23), sample sites CCHMLB-20 to CCHMLB-76

Parameter[1]	CCHMLB-20	CCHMLA-21	CCHMLB-28A	CCHMLA-38	CCHMLA-39	CCHMLA-49	CCHMLB-49	CCHMLC-55	CCHMLC-62	CCHMLB-76	RDL[2]
Aluminum	95.2	136	117	140	96.1	121	136	139	140	138	1.0
Antimony	0.0184	0.0117	0.0117	0.0128	0.0123	0.0447	0.0087	0.0083	0.0094	0.0111	0.005
Arsenic	0.291	0.223	0.131	0.175	0.166	3.11	0.155	0.109	0.137	0.127	0.050
Barium	13.6	6.65	4.31	7.03	5.58	5.03	5.48	5.11	6.41	5.93	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Cadmium	0.026	0.031	0.051	0.027	0.038	0.027	0.035	0.025	0.021	0.042	0.010
Calcium	1600	822	691	548	694	798	692	727	809	962	10
Chromium	0.24	0.32	0.29	0.35	0.21	0.26	0.22	0.24	0.31	1.48	0.20
Cobalt	0.072	0.109	0.120	0.117	0.077	0.096	0.123	0.101	0.117	0.134	0.020
Copper	1.51	0.928	3.38	1.27	1.04	1.30	1.24	1.04	1.33	1.43	0.050
Iron	145	201	203	206	135	185	175	180	217	207	10
Lead	0.125	0.169	0.205	0.153	0.118	0.172	0.185	0.155	0.153	0.187	0.010
Magnesium	260	227	269	235	205	316	284	300	392	250	10
Manganese	23.4	51.1	128	63.7	82.0	151	138	121	176	26.1	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.057	<0.050	<0.050	<0.050	<0.050	0.054	<0.050	<0.050	<0.050	0.057	0.050
Nickel	0.319	0.389	0.589	0.383	0.287	0.336	0.405	0.429	0.458	1.17	0.050
Phosphorus	404	272	260	274	258	454	361	367	454	267	10
Potassium	1150	663	741	621	831	1090	916	894	1160	978	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	12	11	<10	<10	11	<10	13	15	31	30	10
Strontium	4.33	2.58	1.86	2.08	1.79	2.05	2.28	2.22	2.19	2.86	0.10
Thallium	<0.0020	<0.0020	0.0026	<0.0020	<0.0020	0.0026	<0.0020	0.0026	0.0025	0.0021	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.30	0.10
Titanium	4.7	7.2	6.4	7.8	5.1	5.1	6.6	6.5	6.7	7.4	1.0
Uranium	0.0048	0.0067	0.0191	0.0087	0.0068	0.0208	0.0117	0.0065	0.0066	0.0084	0.002
Vanadium	0.24	0.36	0.35	0.35	0.23	0.32	0.33	0.36	0.38	0.44	0.20
Zinc	10.2	11.6	8.75	9.71	8.49	14.4	9.57	9.66	8.01	12.8	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Lichen trace metal analysis (n=23), sample sites CCHMLC-81 to CCHMLA-851-r

Parameter[1]	CCHMLC-81	CCHMLA-98	CCHMLA-106	CCHMLB-164	CCHMLC-400	CCHMLB-410	CCHMLB-422	CCHMLB-843	CCHMLA-851 r[2]	RDL[3]
Aluminum	140	104	88.8	122	112	107	98.0	295	375	1.0
Antimony	0.0120	0.0095	<0.0050	0.0128	<0.0050	0.0125	0.0069	0.236	0.0991	0.005
Arsenic	0.148	0.136	0.074	0.199	<0.050	0.126	0.097	2.63	1.67	0.050
Barium	3.53	5.29	8.83	5.77	53.0	4.80	4.87	9.25	6.32	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	<2.0	<2.0	<2.0	<2.0	7.4	<2.0	<2.0	2.6	<2.0	2.0
Cadmium	0.038	0.040	0.049	0.057	0.040	0.030	0.024	0.051	0.048	0.010
Calcium	554	791	830	727	4220	653	708	1060	812	10
Chromium	0.28	0.35	<0.20	0.25	<0.20	0.24	0.24	1.43	1.07	0.20
Cobalt	0.111	0.129	0.091	0.105	0.042	0.081	0.081	0.245	0.276	0.020
Copper	1.35	1.61	1.24	1.39	2.56	1.52	0.989	2.11	2.21	0.050
Iron	198	189	111	183	57	165	156	514	525	10
Lead	0.195	0.155	0.118	0.167	0.030	0.159	0.126	0.339	0.290	0.010
Magnesium	271	235	410	313	1150	280	235	512	483	10
Manganese	72.6	113	134	95.5	1560	103	110	177	158	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	<0.050	0.072	<0.050	<0.050	0.160	<0.050	<0.050	0.208	0.062	0.050
Nickel	0.437	0.448	0.312	0.406	0.251	0.354	0.330	0.754	0.923	0.050
Phosphorus	295	323	561	418	795	361	339	532	630	10
Potassium	853	839	1360	1010	3350	951	933	1320	1390	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	14	<10	13	<10	<10	13	<10	15	23	10
Strontium	1.70	2.90	2.99	2.50	6.01	1.73	1.94	2.89	2.35	0.10
Thallium	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	0.0022	0.0023	0.0104	0.0067	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.10
Titanium	7.5	6.2	4.1	6.1	1.8	5.9	4.9	17.9	24.1	1.0
Uranium	0.0076	0.0075	0.0041	0.0062	<0.0020	0.0065	0.0047	0.0898	0.0354	0.002
Vanadium	0.39	0.32	<0.20	0.35	<0.20	0.25	0.24	0.76	1.07	0.20
Zinc	8.31	9.66	12.3	8.90	16.7	10.4	10.8	15.6	19.3	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2014 Lichen trace metal analysis (n=23), sample sites CCTMLC-BD1 to CCTMLC

Parameter[1]	CCTMLC-BD1	CCTMLC-BD2	CCTMLC-BD3-r[2]	CCTMLC-BD4	CCTML-BD7	CCTMLC	RDL[3]
Aluminum	176	113	49.7	114	116	112	1.0
Antimony	0.0166	0.0118	<0.0050	0.0079	0.0075	0.0100	0.005
Arsenic	0.170	0.126	<0.050	0.102	0.128	0.122	0.050
Barium	7.11	5.84	44.3	4.92	5.92	10.4	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	<2.0	<2.0	8.6	<2.0	<2.0	<2.0	2.0
Cadmium	0.024	0.019	0.011	0.032	0.033	0.017	0.010
Calcium	980	926	5980	676	903	955	10
Chromium	0.35	0.26	<0.20	0.25	0.27	0.27	0.20
Cobalt	0.161	0.103	0.031	0.097	0.085	0.103	0.020
Copper	3.25	1.36	2.01	1.28	0.953	1.39	0.050
Iron	299	187	55	171	174	187	10
Lead	0.280	0.140	0.039	0.168	0.142	0.114	0.010
Magnesium	375	326	819	235	282	344	10
Manganese	222	286	1140	89.5	79.6	85.7	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.078	<0.050	0.056	<0.050	<0.050	<0.050	0.050
Nickel	0.491	0.348	0.153	0.446	0.327	0.316	0.050
Phosphorus	318	233	573	276	327	294	10
Potassium	1070	803	4160	823	949	896	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	23	11	<10	13	10	16	10
Strontium	2.67	1.88	5.80	2.22	3.86	3.28	0.10
Thallium	0.0026	<0.0020	<0.0020	0.0025	<0.0020	<0.0020	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	8.6	6.8	1.7	6.8	6.4	7.3	1.0
Uranium	0.0094	0.0062	<0.0020	0.0062	0.0225	0.0182	0.002
Vanadium	0.53	0.32	<0.20	0.33	0.30	0.36	0.20
Zinc	14.4	10.9	22.1	7.82	8.43	7.92	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2014 Horsetail trace metal analysis (n=16), sample sites CCHMHA-30A to CCHMHC-436

Parameter[1]	CCHMHA-30A	CCHMHC-59	CCHMHC-69	CCHMHB-92	CCHMHB-130	CCHMHA-135	CCHMHB-138	CCHMHA-299	CCHMHB-419	CCHMHB-422	CCHMHC-436	RDL[2]
Aluminum	35.1	12.6	17.0	47.6	90.4	5.8	16.2	35.0	11.9	43.7	73.0	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	0.005
Arsenic	0.208	<0.050	<0.050	<0.050	<0.050	<0.050	0.062	<0.050	<0.050	<0.050	0.062	0.050
Barium	32.5	82.6	38.0	32.9	227	18.6	59.3	104	12.5	142	7.95	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	12.0	14.2	12.6	12.4	26.1	6.8	17.6	7.9	5.5	11.8	<2.0	2.0
Cadmium	0.045	0.083	0.133	0.131	0.077	0.081	0.079	0.024	1.98	0.097	0.045	0.010
Calcium	15500	21800	18900	17000	15900	14000	20700	14100	6720	21500	889	10
Chromium	<0.20	<0.20	<0.20	<0.20	0.46	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.160	0.552	0.419	0.098	0.605	0.067	0.052	0.084	0.204	0.326	0.077	0.020
Copper	5.51	4.30	2.84	3.59	2.85	1.94	4.00	2.04	3.04	2.98	1.20	0.050
Iron	80	140	65	30	34	19	40	22	40	28	118	10
Lead	0.064	0.029	0.020	<0.010	0.023	0.015	0.018	0.049	0.018	0.031	0.110	0.010
Magnesium	2040	3990	3120	2010	2090	1290	2960	1990	1960	3120	405	10
Manganese	96.2	247	228	45.4	47.6	32.1	50.8	84.4	632	153	129	0.10
Mercury	0.010	<0.010	<0.010	0.011	0.014	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.460	0.133	0.065	0.306	0.310	0.057	0.217	0.063	<0.050	0.186	<0.050	0.050
Nickel	0.206	0.621	0.576	0.378	2.83	0.168	0.262	0.576	0.905	1.18	0.325	0.050
Phosphorus	1100	1230	638	1370	1240	556	882	842	862	1040	544	10
Potassium	27000	29200	9500	28900	23000	13900	27300	12400	4560	15600	1310	10
Selenium	<0.050	<0.050	<0.050	<0.050	0.073	<0.050	<0.050	<0.050	<0.050	0.241	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	25	31	70	35	<10	<10	27	<10	12	<10	<10	10
Strontium	120	113	99.1	76.2	92.9	48.7	117	68.4	32.8	71.8	2.84	0.10
Thallium	0.0029	0.0048	0.0023	0.0058	0.0030	<0.0020	0.0035	<0.0020	0.0020	0.0021	0.0020	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.4	1.0
Uranium	0.0105	0.0041	0.0056	0.0028	0.0030	<0.0020	0.0135	<0.0020	<0.0020	<0.0020	0.0031	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.24	0.20
Zinc	14.3	40.1	38.3	22.9	10.7	6.04	30.8	12.7	201	23.2	11.5	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Horsetail trace metal analysis (n=16), sample sites CCHMHC-438 to CCTMHA

Parameter[1]	CCHMHC-438	CCHMHB-440	CCHMHB-455	CCTMHC-BD2	CCHMH-BD3-r[2]	CCTMHA-BD5	CCHMHC	CCTMHA	RDL[3]
Aluminum	8.4	6.7	12500	33.5	5.1	25.0	6.6	32.8	1.0
Antimony	<0.0050	0.0062	0.238	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	6.13	<0.050	<0.050	<0.050	<0.050	0.068	0.050
Barium	54.6	77.8	178	103	92.2	46.9	102	57.5	0.10
Beryllium	<0.10	<0.10	0.77	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	0.26	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	8.9	17.0	<2.0	12.5	7.9	9.9	7.6	8.0	2.0
Cadmium	0.118	0.119	0.071	0.034	0.032	0.073	0.052	0.067	0.010
Calcium	18800	18100	3920	16000	13800	16200	15900	21400	10
Chromium	<0.20	0.20	44.7	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.144	0.043	10.4	0.716	0.376	0.096	0.421	0.111	0.020
Copper	3.61	4.16	17.4	4.27	2.43	3.42	2.53	3.81	0.050
Iron	41	36	27400	59	51	73	82	92	10
Lead	0.042	0.018	11.0	0.019	0.012	0.025	0.014	0.045	0.010
Magnesium	3680	3460	4240	3270	2570	2230	3260	2240	10
Manganese	62.5	32.9	402	241	112	58.6	115	61.1	0.10
Mercury	0.010	0.014	0.032	<0.010	<0.010	0.012	<0.010	0.012	0.010
Molybdenum	0.188	0.157	0.725	0.218	0.667	1.86	0.639	2.32	0.050
Nickel	0.328	0.493	26.0	1.42	0.670	0.254	0.627	0.333	0.050
Phosphorus	837	871	713	774	583	1010	817	1040	10
Potassium	22500	21600	1540	15700	13100	21400	14300	17100	10
Selenium	<0.050	<0.050	0.332	<0.050	<0.050	0.079	<0.050	<0.050	0.050
Silver	<0.020	<0.020	0.067	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	84	<10	<10	37	<10	13	10
Strontium	88.4	73.8	27.6	45.9	43.2	51.4	56.0	67.2	0.10
Thallium	0.0070	0.0034	0.154	0.0031	0.0027	0.0032	0.0030	0.0047	0.002
Tin	<0.10	<0.10	0.44	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	349	<1.0	<1.0	1.6	<1.0	1.9	1.0
Uranium	<0.0020	<0.0020	2.17	<0.0020	<0.0020	0.0031	<0.0020	0.0081	0.002
Vanadium	<0.20	<0.20	36.5	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	9.30	12.1	52.3	59.7	28.1	14.0	26.5	13.3	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2014 Lowbush cranberry trace metal analysis (n=29), sample sites CCHMCB-20 to CCHMCB-76

Parameter[1]	CCHMCB-20	CCHMCA-21	CCHMCB-28A	CCHMCA-38	CCHMCA-39	CCHMCB-49	CCHMCA-50	CCHMCC-55	CCHMCC-62	CCHMCC-69	CCHMCB-76	RDL[2]
Aluminum	8.3	53.1	76.4	63.6	49.6	39.1	52.5	67.4	93.9	68.7	4.5	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0053	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.058	<0.050	<0.050	<0.050	<0.050	0.050
Barium	46.8	41.5	49.2	56.5	54.0	22.1	36.0	34.3	71.9	66.7	77.6	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	5.7	3.3	4.9	3.2	6.8	3.4	6.1	3.3	5.2	7.3	4.3	2.0
Cadmium	<0.010	0.027	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	0.107	0.010
Calcium	2930	3560	4010	3960	4230	2140	3640	3050	5650	5940	16600	10
Chromium	<0.20	<0.20	<0.20	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	<0.020	0.027	0.029	0.028	<0.020	<0.020	<0.020	0.025	0.027	<0.020	0.057	0.020
Copper	1.47	2.88	2.07	2.57	2.20	1.78	2.78	2.52	2.88	9.12	3.11	0.050
Iron	15	40	31	41	37	13	27	24	41	63	27	10
Lead	<0.010	0.024	0.026	0.034	0.018	<0.010	0.019	0.019	0.024	0.151	<0.010	0.010
Magnesium	589	737	862	886	864	625	808	810	1320	1100	1450	10
Manganese	225	1230	1580	1260	1120	903	1710	1170	1890	2130	39.1	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.010
Molybdenum	<0.050	0.058	<0.050	0.101	<0.050	<0.050	0.055	0.059	0.128	0.053	0.130	0.050
Nickel	0.080	0.359	0.169	0.254	0.156	0.117	0.201	0.208	0.268	0.187	0.325	0.050
Phosphorus	512	682	480	748	546	471	482	641	947	677	643	10
Potassium	2850	3090	2420	3040	2740	2120	2600	2720	3390	3130	12900	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.199	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	3.59	3.85	3.80	3.87	3.42	2.05	3.35	3.07	6.22	9.92	50.7	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0026	<0.0020	<0.0020	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	0.10
Titanium	<1.0	1.3	<1.0	1.2	1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	11.9	16.8	11.2	13.6	13.9	10.4	14.5	13.6	12.9	20.6	7.21	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Lowbush cranberry trace metal analysis (n=29), sample sites CCHMCC-81 to CCHMCB-422

Parameter[1]	CCHMCC-81	CCHMCA-98	CCHMCA-106	CCHMCB-120	CCHMCB-130	CCHMCA-135	CCHMCB-138	CCHMCB-164	CCHMCC-400	CCHMCB-410	CCHMCB-422	RDL[2]
Aluminum	96.5	58.0	59.8	37.2	177	40.6	70.5	98.9	117	78.7	73.1	1.0
Antimony	0.0055	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0131	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.051	<0.050	<0.050	<0.050	0.050
Barium	71.2	54.5	72.9	62.1	136	63.7	59.6	87.8	54.5	77.6	103	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	6.1	11.0	4.4	8.0	11.2	7.3	5.7	4.3	5.1	7.2	4.6	2.0
Cadmium	0.017	<0.010	<0.010	<0.010	0.118	<0.010	0.022	<0.010	0.011	0.010	<0.010	0.010
Calcium	5540	5120	3790	5890	6380	5030	4820	5920	4130	5520	6270	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.036	<0.020	0.038	0.022	0.103	0.044	<0.020	0.054	0.045	0.026	0.032	0.020
Copper	2.92	3.72	2.55	1.59	2.15	2.56	2.56	2.28	3.07	3.61	2.41	0.050
Iron	52	38	35	66	74	32	31	45	47	56	45	10
Lead	0.036	0.018	0.014	0.039	0.039	0.016	0.026	0.026	0.055	0.035	0.026	0.010
Magnesium	1310	1060	1070	761	1340	1100	968	1260	886	1370	1170	10
Manganese	2060	2010	986	898	2870	959	924	1800	1490	1540	1390	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.063	0.077	0.162	0.138	1.43	0.058	0.064	0.105	0.072	<0.050	0.162	0.050
Nickel	0.260	0.339	0.355	0.129	0.303	0.190	0.199	0.290	0.274	0.290	0.313	0.050
Phosphorus	822	1090	919	480	772	942	653	848	737	1170	711	10
Potassium	2950	5190	3880	2450	3770	4390	3100	3160	3130	4160	3270	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	5.30	3.54	6.84	11.7	9.66	6.61	9.87	11.1	5.90	7.05	8.91	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	0.0088	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	2.9	<1.0	<1.0	2.5	1.9	<1.0	1.0	1.3	1.2	1.2	1.6	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	0.0030	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	21.0	20.6	15.7	16.0	18.1	13.0	22.4	22.2	16.4	28.7	14.9	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2014 Lowbush cranberry trace metal analysis (n=29), sample sites CCHMCC-436 to CCTMCC

Parameter[1]	CCHMCC-436	CCHMCC-438	CCHMCB-440	CCHMCB-843	CCHMCA-851	CCHMCA-851 r[2]	CCTMCC-BD1	CCTMCC-BD2	CCTMCC-	RDL[3]
Aluminum	34.1	69.5	52.3	76.9	100	123	135	82.1	54.0	1.0
Antimony	<0.0050	<0.0050	<0.0050	0.0289	0.0217	0.0221	0.0067	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	0.205	0.320	0.396	<0.050	<0.050	<0.050	0.050
Barium	73.2	49.2	143	37.2	40.8	41.7	61.7	40.8	40.1	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	7.4	3.6	10.2	6.6	3.3	4.2	9.2	7.3	7.2	2.0
Cadmium	0.020	0.016	0.024	0.014	<0.010	<0.010	<0.010	<0.010	0.011	0.010
Calcium	3730	3230	7340	3790	3090	3020	6660	5710	5840	10
Chromium	<0.20	<0.20	<0.20	0.28	0.54	0.41	0.21	<0.20	<0.20	0.20
Cobalt	<0.020	0.068	0.036	0.040	0.054	0.055	0.034	0.023	0.034	0.020
Copper	2.16	3.49	3.39	2.55	1.96	2.41	2.84	3.37	1.73	0.050
Iron	25	32	60	98	113	111	71	44	68	10
Lead	0.027	0.018	0.038	0.047	0.048	0.049	0.050	0.032	0.045	0.010
Magnesium	939	719	1250	767	776	789	738	689	775	10
Manganese	691	1050	527	1490	1080	1090	2580	2740	946	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.109	<0.050	<0.050	0.062	<0.050	0.069	0.083	0.145	<0.050	0.050
Nickel	0.404	0.435	0.457	0.378	0.446	0.313	0.233	0.170	0.179	0.050
Phosphorus	903	746	1010	951	777	629	541	466	512	10
Potassium	4190	3210	3930	4000	3040	3110	3170	2840	3880	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	3.29	7.03	20.1	4.56	2.77	3.50	4.13	2.72	5.91	0.10
Thallium	<0.0020	<0.0020	<0.0020	0.0050	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Tin	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	1.7	3.1	5.2	4.9	2.1	1.4	2.4	1.0
Uranium	<0.0020	0.0065	0.0025	0.0079	0.0057	0.0053	0.0039	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	0.23	<0.20	<0.20	<0.20	0.20
Zinc	17.3	9.58	26.5	18.5	12.0	10.2	17.9	17.8	20.1	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2014 Soil trace metal analysis (n=37), sample sites CCHMSB-20 to CCHMSC-62

Parameter[1]	CCME Ind[2]	CCHMSB-20	CCHMSA-21	CCHMSB-28A	CCHMS-30A	CCHMSA-38	CCHMSA-39	CCHMSB-49	CCHMSA-50	CCHMSC-55	CCHMSC-59	CCHMSC-62	RDL[3]
Aluminum	NA	13200	20700	12000	11800	24600	17600	7290	8920	16900	20300	14800	100
Antimony	40	2.07	0.68	0.88	0.28	1.67	3.83	0.60	2.28	0.41	1.00	1.20	0.10
Arsenic	12	41.6	47.4	10.5	11.0	22.4	30.0	65.2	41.5	6.19	7.90	14.6	0.50
Barium	2000	388	128	114	85.2	175	223	55.9	114	100	174	103	0.10
Beryllium	8	0.47	0.63	0.44	<0.40	0.64	0.49	<0.40	<0.40	0.46	0.54	<0.40	0.40
Bismuth	NA	0.11	0.21	0.34	0.14	0.29	0.39	0.17	<0.10	0.10	0.12	0.16	0.10
Cadmium	22	0.224	0.123	0.136	0.069	0.300	0.135	0.109	0.120	0.214	0.344	0.190	0.050
Calcium	NA	24600	5590	2160	4370	3320	5380	1080	2210	3050	5030	1690	100
Chromium	87	46.0	115	34.6	49.1	45.5	55.5	14.7	12.6	24.2	27.4	22.1	1.0
Cobalt	300	9.92	19.6	8.43	6.92	12.9	15.2	3.27	2.10	7.88	6.59	5.20	0.30
Copper	91	18.3	48.5	12.0	10.7	22.1	12.4	8.85	10.8	17.2	16.1	11.5	0.50
Iron	NA	20900	28600	21800	15400	35500	25400	17000	10000	26600	19800	28700	100
Lead	600	7.39	3.39	5.25	4.44	10.8	5.54	7.09	3.52	8.52	12.2	12.4	0.10
Magnesium	NA	5650	16200	4130	6730	7830	11300	1750	1600	4670	4570	3750	100
Manganese	NA	538	491	293	222	341	520	281	185	404	212	221	0.20
Mercury	50	0.235	<0.050	<0.050	<0.050	<0.050	0.050	<0.050	0.054	0.071	0.144	<0.050	0.050
Molybdenum	40	0.53	0.39	1.00	0.30	1.06	0.74	1.35	0.51	0.78	0.71	2.19	0.10
Nickel	89	33.4	49.3	15.3	22.2	29.7	25.9	6.64	7.28	16.9	17.0	11.4	0.80
Phosphorus	NA	537	341	307	309	359	480	405	762	448	526	217	10
Potassium	NA	1050	3550	927	1510	831	3360	598	355	638	612	568	100
Selenium	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.102	0.051	0.053	<0.050	0.127	0.070	0.058	0.167	0.064	0.136	0.076	0.050
Sodium	NA	237	<100	101	326	135	148	133	223	144	188	<100	100
Strontium	NA	92.9	19.4	22.7	42.5	24.9	27.8	13.6	22.2	22.7	33.7	16.0	0.10
Thallium	1	0.419	0.310	0.106	0.117	0.154	0.227	0.116	0.113	0.121	0.173	0.139	0.050
Tin	300	0.37	0.98	0.58	0.55	0.59	0.96	0.57	0.25	0.49	0.57	0.57	0.10
Titanium	NA	588	727	721	626	1010	1070	649	188	947	761	967	1.0
Vanadium	130	38.8	64.3	42.2	28.2	68.1	46.1	54.3	17.2	60.0	45.0	82.1	2.0
Zinc	360	40.4	32.9	32.9	27.0	54.0	40.2	27.6	21.0	52.2	61.8	40.9	1.0
Zirconium	NA	2.98	3.43	1.41	0.72	8.69	1.87	0.79	<0.50	2.45	2.78	2.48	0.50
pH	6-8	6.51	6.12	5.44	6.13	6.08	5.88	4.13	5.41	5.19	5.77	4.87	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated; Lithium and uranium were missed during laboratory analysis, therefore, are not included for 2014 soil samples

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Reportable Detection Limit (RDL)

2014 Soil trace metal analysis (n=37), sample sites CCHMSC-69 to CCHMSB-138

Parameter[1]	CCME Ind[2]	CCHMSC-69	CCHMCSB-76	CCHMC-81	CCHMSB-92	CCHMSA-98	CCHMSA-106	CCHMSB-113	CCHMSB-120	CCHMSB-130	CCHMSA-135	CCHMSB-138	RDL[3]
Aluminum	NA	13100	4910	19400	17400	24700	20900	21100	11300	20400	16100	16300	100
Antimony	40	0.26	0.48	0.45	11.3	1.99	0.52	0.39	0.25	0.76	0.33	0.89	0.10
Arsenic	12	2.53	2.14	16.8	90.6	51.4	7.90	6.69	2.92	20.8	6.15	26.5	0.50
Barium	2000	112	215	121	206	260	150	190	66.7	277	164	148	0.10
Beryllium	8	<0.40	<0.40	0.42	<0.40	0.50	0.83	0.54	0.60	0.71	0.41	0.53	0.40
Bismuth	NA	<0.10	<0.10	0.15	0.21	0.14	0.25	0.13	0.14	0.43	0.18	0.17	0.10
Cadmium	22	0.164	0.314	0.242	0.343	0.343	0.241	0.121	0.121	0.409	0.277	0.285	0.050
Calcium	NA	2720	32000	2440	4360	5120	1460	5580	1270	4270	4300	4980	100
Chromium	87	17.5	10.4	26.8	22.8	59.6	30.8	56.5	11.5	50.6	18.8	33.2	1.0
Cobalt	300	5.43	2.91	7.65	12.4	14.9	8.21	14.0	4.90	13.8	8.13	10.9	0.30
Copper	91	8.33	23.9	13.1	27.1	46.8	17.6	19.3	6.13	30.6	13.0	16.1	0.50
Iron	NA	17000	7750	27900	30800	34600	33300	29800	17300	31300	21500	26400	100
Lead	600	7.94	2.02	9.22	5.58	10.3	14.2	7.11	6.66	10.4	10.8	14.5	0.10
Magnesium	NA	2730	2610	4640	6710	9030	3320	9400	3190	7390	6740	6740	100
Manganese	NA	399	225	367	733	500	248	591	316	391	707	1080	0.20
Mercury	50	0.061	0.053	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.062	0.050
Molybdenum	40	0.48	0.60	1.03	1.41	0.98	1.69	0.82	0.31	0.82	1.69	1.05	0.10
Nickel	89	9.05	13.8	14.7	17.1	42.0	16.6	32.5	7.03	28.3	11.0	17.7	0.80
Phosphorus	NA	367	907	299	705	583	468	589	249	404	450	447	10
Potassium	NA	396	192	661	944	1410	581	854	2210	1060	1900	1640	100
Selenium	2.9	<0.50	0.65	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.068	0.077	0.064	0.109	0.184	0.134	0.066	<0.050	0.094	0.374	0.086	0.050
Sodium	NA	130	129	114	315	254	<100	161	<100	179	261	237	100
Strontium	NA	18.3	124	21.8	27.0	32.0	13.5	30.3	11.1	31.2	92.3	41.2	0.10
Thallium	1	0.160	<0.050	0.189	0.227	0.162	0.123	0.155	0.341	0.207	0.251	0.243	0.050
Tin	300	0.51	0.10	0.96	0.45	0.56	0.96	0.68	0.45	0.70	0.61	0.70	0.10
Titanium	NA	618	137	1010	1290	1380	587	1010	685	1100	838	933	1.0
Vanadium	130	36.1	13.7	64.0	74.3	87.2	62.2	70.4	23.1	65.1	54.1	53.3	2.0
Zinc	360	37.3	16.2	47.6	54.5	82.0	38.9	44.1	31.9	49.7	45.7	61.9	1.0
Zirconium	NA	1.26	2.58	5.01	3.24	4.48	7.86	1.42	0.95	12.9	2.03	2.52	0.50
pH	6-8	5.72	6.32	5.69	5.86	6.20	5.54	5.95	5.15	5.78	4.48	6.21	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated; Lithium and uranium were missed during laboratory analysis, therefore, are not included for 2014 soil samples

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Reportable Detection Limit (RDL)

2014 Soil trace metal analysis (n=37), sample sites CCHMSA-164 to CCHMSB-440

Parameter[1]	CCME Ind[2]	CCHMSB-164	CCHMSA-299	CCHMSC-400	CCHMSB-410	CCHMSB-419	CCHMSB-422	CCHMBSC-436	CCHMSC-438	CCHMSB-440	RDL[3]
Aluminum	NA	15000	11000	22000	24100	16000	22800	15000	8060	15400	100
Antimony	40	0.33	0.48	1.51	49.2	0.22	0.55	1.14	0.68	0.69	0.10
Arsenic	12	4.71	4.71	7.47	50.6	2.83	7.94	8.52	7.21	13.4	0.50
Barium	2000	75.1	56.5	102	298	137	176	188	58.4	175	0.10
Beryllium	8	<0.40	<0.40	0.59	0.64	0.99	0.58	0.50	<0.40	0.47	0.40
Bismuth	NA	<0.10	0.35	0.13	0.17	0.36	0.20	0.20	0.12	0.19	0.10
Cadmium	22	0.098	0.117	0.180	0.436	0.198	0.142	0.210	0.122	0.230	0.050
Calcium	NA	1900	771	2770	7830	1910	1940	4150	2400	5040	100
Chromium	87	39.8	14.2	38.5	32.2	21.9	43.7	21.2	13.4	29.0	1.0
Cobalt	300	5.90	2.96	13.7	5.43	4.84	11.7	6.73	5.85	10.7	0.30
Copper	91	14.4	7.39	18.7	37.4	17.3	16.8	12.0	5.44	20.2	0.50
Iron	NA	19300	19200	32100	24000	17000	38900	22500	15500	26600	100
Lead	600	4.82	16.0	9.23	7.48	8.37	10.7	10.9	5.55	7.86	0.10
Magnesium	NA	4960	1710	7140	4360	3210	4820	4110	3570	6630	100
Manganese	NA	164	141	651	162	229	344	322	233	599	0.20
Mercury	50	<0.050	<0.050	0.052	0.123	0.060	<0.050	<0.050	<0.050	<0.050	0.050
Molybdenum	40	0.84	1.07	1.06	0.67	0.64	1.97	0.77	0.61	1.49	0.10
Nickel	89	18.9	6.18	18.8	15.2	12.2	27.0	12.8	8.35	19.5	0.80
Phosphorus	NA	181	189	517	907	516	249	262	273	545	10
Potassium	NA	446	389	1390	787	1060	775	799	838	1940	100
Selenium	2.9	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	<0.050	0.057	0.072	0.282	0.136	0.065	0.161	<0.050	0.083	0.050
Sodium	NA	206	<100	104	124	<100	104	124	<100	257	100
Strontium	NA	18.1	9.62	23.1	50.1	20.6	16.6	25.3	16.7	32.0	0.10
Thallium	1	0.107	0.109	0.210	0.201	0.194	0.174	0.128	0.107	0.216	0.050
Tin	300	0.38	0.73	0.60	0.50	1.23	0.87	0.59	0.38	0.57	0.10
Titanium	NA	782	660	1100	649	418	840	704	498	987	1.0
Vanadium	130	44.4	55.1	76.1	44.1	30.7	77.6	44.2	31.3	57.6	2.0
Zinc	360	24.3	24.8	51.2	37.6	36.9	42.2	39.2	25.3	61.4	1.0
Zirconium	NA	1.04	1.72	2.99	3.61	0.81	2.64	4.52	2.17	2.52	0.50
pH	6-8	5.37	4.46	5.01	6.23	4.38	4.94	5.77	5.55	5.57	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated; Lithium and uranium were missed during laboratory analysis, therefore, are not included for 2014 soil samples

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Reportable Detection Limit (RDL)

2014 Soil trace metal analysis (n=37), sample sites CCHMSB-843 to CCTMSA-BD5

Parameter[1]	CCME Ind[2]	CCHMSB-843	CCHMSA-851	CCHMSA-851-r[3]	CCTMSC-BD1	CCTMSC-BD2	CCTMSC-BD3-r[3]	CCTMSC-BD4	CCTMSA-BD5	RDL[4]
Aluminum	NA	23100	13600	15900	11700	4290	14800	18200	9620	100
Antimony	40	8.41	8.31	13.2	0.23	0.61	0.31	0.85	0.38	0.10
Arsenic	12	78.8	93.1	204	4.33	4.36	3.59	10.2	5.87	0.50
Barium	2000	162	72.3	118	176	159	373	196	149	0.10
Beryllium	8	0.65	0.73	0.90	<0.40	0.62	0.66	0.61	<0.40	0.40
Bismuth	NA	0.19	0.16	0.12	0.11	0.28	0.21	0.21	<0.10	0.10
Cadmium	22	0.158	0.149	0.156	0.116	0.230	0.586	0.296	0.152	0.050
Calcium	NA	3470	2550	3720	3430	7420	11800	4130	7270	100
Chromium	87	39.1	21.1	24.6	10.3	12.9	15.7	29.1	18.6	1.0
Cobalt	300	9.29	9.67	10.3	7.17	44.5	6.32	8.79	5.86	0.30
Copper	91	20.8	16.2	17.5	8.95	17.1	18.2	21.7	13.6	0.50
Iron	NA	27800	24600	30500	21700	44600	21000	23900	18100	100
Lead	600	9.52	9.27	9.13	3.72	7.24	12.0	13.6	4.93	0.10
Magnesium	NA	5940	6740	7670	5490	1290	3340	3910	3510	100
Manganese	NA	367	279	395	282	3420	535	418	196	0.20
Mercury	50	0.103	0.079	0.204	<0.050	0.086	0.051	0.077	<0.050	0.050
Molybdenum	40	1.26	0.73	0.59	0.77	5.55	0.73	0.66	0.53	0.10
Nickel	89	21.2	12.0	14.5	6.68	6.83	11.6	16.7	14.4	0.80
Phosphorus	NA	408	666	734	441	1370	460	307	453	10
Potassium	NA	983	2980	2190	387	229	1110	421	562	100
Selenium	2.9	<0.50	<0.50	<0.50	<0.50	0.61	0.98	<0.50	<0.50	0.50
Silver	40	0.113	0.079	0.058	<0.050	0.298	0.193	0.127	0.060	0.050
Sodium	NA	132	124	111	226	<100	<100	143	179	100
Strontium	NA	28.5	19.8	27.7	24.5	33.6	41.6	31.7	40.1	0.10
Thallium	1	0.285	0.393	0.495	0.109	0.088	0.126	0.139	0.064	0.050
Tin	300	0.72	0.74	0.67	0.38	0.19	0.74	1.09	0.27	0.10
Titanium	NA	861	921	1050	1160	107	436	751	487	1.0
Vanadium	130	67.6	59.7	74.0	60.4	36.8	36.2	52.0	34.3	2.0
Zinc	360	44.9	36.7	46.5	38.0	19.0	31.3	48.2	38.8	1.0
Zirconium	NA	1.42	1.16	2.79	0.95	0.55	4.13	5.87	2.13	0.50
pH	6-8	5.32	4.36	4.86	4.79	5.36	6.62	5.83	6.93	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated; Lithium and uranium were missed during laboratory analysis, therefore, are not included for 2014 soil samples

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Replicate samples

[4] Reportable Detection Limit (RDL)

2015 Willow trace metal analysis (n=10), sample sites CCTM500-W to CCTM511-W

Parameter[1]	CCTM 500-W	CCTM 501-W	CCTM 502-W	CCTM 505-W	CCTM 506-W	CCTM 507-W	CCTM 508-W	CCTM 509-W	CCTM 510-W	CCTM 511-W	RDL[2]
Aluminum	13.4	9.3	11.2	7.5	6.8	10.3	10.1	12.3	5.9	10.6	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	36.3	32.5	45.3	26.9	11	11.1	24.2	231	15	28.2	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	24	6.9	3.5	19.9	12.2	9.4	12.6	6.5	10.5	30.7	2.0
Cadmium	7.27	0.747	1.33	0.339	0.175	0.234	1.26	1.01	0.433	6.48	0.010
Calcium	26200	12200	11100	16100	6670	14700	16200	15800	8660	16700	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	1.85	<0.20	<0.20	<0.20	3.09	0.20
Cobalt	0.254	0.608	0.366	0.543	0.505	0.45	0.539	1.16	0.403	0.463	0.020
Copper	7.61	5.71	3.55	3.03	2.87	3.18	6.19	5.35	4.88	5.87	0.050
Iron	72	59	46	39	46	44	74	42	34	63	10
Lead	0.081	0.035	0.019	0.022	0.097	0.065	0.087	0.041	0.113	0.039	0.010
Magnesium	6410	4430	2300	5180	3360	4870	3540	2980	2890	2860	10
Manganese	57.1	440	189	294	404	149	172	64.5	213	76.7	0.10
Mercury	0.015	0.01	0.01	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	0.011	0.010
Molybdenum	0.139	0.343	0.197	0.188	0.1	0.278	0.284	<0.050	0.186	0.13	0.050
Nickel	2.56	1.22	0.775	0.505	0.214	1.64	2.71	0.981	1.79	6.16	0.050
Phosphorus	2400	1500	862	980	989	809	2200	2470	1010	1420	10
Potassium	14800	10700	11800	8500	4510	7880	14900	9510	8000	8500	10
Selenium	0.566	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.084	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	13	<10	<10	36	<10	<10	<10	<10	<10	10
Strontium	68.2	43.7	28.3	53.7	57.1	103	51.3	77.7	25.8	37.8	0.10
Thallium	0.0027	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	0.15	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	0.0055	<0.0020	<0.0020	<0.0020	0.0076	0.0218	0.0022	<0.0020	<0.0020	<0.0020	0.0020
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	209	82.4	112	84.8	78.3	120	118	58.6	53.8	267	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2015 Lichen trace metal analysis (n=5), sample sites CCTM501-L to CCTM510-L

Parameter[1]	CCTM501-L	CCTM502-L	CCTM505-L	CCTM507-L	CCTM510-L	RDL[2]
Aluminum	66.6	86.9	133	96.3	93.2	1.0
Antimony	<0.0050	0.0071	0.0112	0.012	0.0081	0.005
Arsenic	0.063	0.082	0.116	0.098	0.083	0.050
Barium	5.28	4.92	8.74	7.35	7.23	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Cadmium	0.02	0.047	0.018	0.014	0.04	0.010
Calcium	819	1020	893	1040	833	10
Chromium	<0.20	0.23	0.5	0.3	0.62	0.20
Cobalt	0.069	0.083	0.089	0.077	0.075	0.020
Copper	1.04	1.11	1.98	2.55	2.26	0.050
Iron	117	150	225	162	140	10
Lead	0.114	0.129	0.264	0.362	0.178	0.010
Magnesium	236	296	232	230	256	10
Manganese	105	94.2	41.5	31.8	61.1	0.10
Mercury	0.022	0.018	0.013	0.011	<0.010	0.010
Molybdenum	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.234	0.256	0.442	0.266	0.447	0.050
Phosphorus	332	284	288	245	278	10
Potassium	1130	877	628	795	829	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	12	<10	10
Strontium	1.97	1.83	2.86	6.63	2.07	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	3.6	5.5	7.6	5.5	5.8	1.0
Uranium	0.0038	0.0051	0.007	0.0107	0.0125	0.0020
Vanadium	<0.20	0.22	0.36	0.25	0.23	0.20
Zinc	11	11.8	10.9	12.3	9.19	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2015 Horsetail trace metal analysis (n=9), sample sites CCTM500-H to CCTM511-H

Parameter[1]	CCTM 500-H	CCTM 501-H	CCTM 503-H	CCTM 504-H	CCTM 506-H	CCTM 507-H	CCTM 508-H	CCTM 509-H	CCTM5 11-H	RDL[2]
Aluminum	4	12	90.1	6.8	63	4.2	7.1	16.1	7.2	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.066	0.050
Barium	19.4	143	230	41.1	76.8	48.1	20.2	215	48.1	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	17.4	9	12.7	12.2	14.2	22.7	17.6	9.4	20.6	2.0
Cadmium	1.12	0.139	0.067	0.087	0.038	0.025	0.237	0.106	0.611	0.010
Calcium	26100	18700	12600	15500	16000	28500	20400	19600	21800	10
Chromium	<0.20	<0.20	<0.20	0.59	2.06	0.66	0.48	1.39	0.64	0.20
Cobalt	0.044	0.562	2.03	0.042	0.12	0.342	0.362	0.678	0.262	0.020
Copper	5.96	4.69	3.83	2.88	7.53	3.9	4.82	3.62	5.3	0.050
Iron	46	44	42	35	120	38	36	33	46	10
Lead	0.025	0.013	0.021	0.05	0.233	0.042	0.069	0.087	0.04	0.010
Magnesium	9880	4340	4310	3470	6070	6110	4530	3030	5230	10
Manganese	20.4	226	320	48.6	70.4	89.8	103	46.1	40.5	0.10
Mercury	0.018	0.015	0.012	0.012	<0.010	<0.010	<0.010	0.013	0.016	0.010
Molybdenum	0.555	0.257	0.138	0.31	0.273	0.559	0.286	<0.050	0.072	0.050
Nickel	1.08	0.932	1.64	0.386	1.28	0.424	1.37	0.992	1.4	0.050
Phosphorus	1320	1900	1280	716	763	1300	643	785	1290	10
Potassium	38600	28600	15900	14800	18400	18400	18500	10000	18200	10
Selenium	1.82	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.085	0.359	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	23	<10	<10	<10	42	56	119	<10	<10	10
Strontium	71.8	81	85.6	44	196	202	67.9	92.3	58.7	0.10
Thallium	0.0048	0.0036	0.0117	<0.0020	<0.0020	<0.0020	0.0051	<0.0020	0.0025	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	2.9	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	0.0089	<0.0020	<0.0020	<0.0020	0.0433	0.0736	<0.0020	<0.0020	<0.0020	0.0020
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	30.2	23.7	35.6	13.2	17.5	23.1	25.8	7.67	31.6	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2015 Lowbush cranberry trace metal analysis (n=8), sample sites CCTM501-C to CCTM510-C

Parameter[1]	CCTM501-C	CCTM502-C	CCTM503-C	CCTM504-C	CCTM505-C	CCTM506-C	CCTM509-C	CCTM510-C	RDL[2]
Aluminum	96.5	50.9	97.4	32.5	34.5	87.3	29.8	84.7	1.0
Antimony	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	87.4	70.6	67	72.1	81.5	75.6	120	86.2	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	5.3	10.3	6.9	8.1	12.3	8.5	5.9	9.4	2.0
Cadmium	0.019	<0.010	<0.010	0.045	0.01	<0.010	0.024	<0.010	0.010
Calcium	6940	6310	5990	4920	7940	6740	4360	8020	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	1.16	0.58	<0.20	0.20
Cobalt	0.031	<0.020	0.02	<0.020	0.028	0.03	0.037	0.024	0.020
Copper	3.04	4.34	3.82	3.38	3.48	5.39	3.66	4.98	0.050
Iron	43	31	34	30	49	46	34	42	10
Lead	0.027	0.029	0.027	0.034	0.09	0.154	0.057	0.143	0.010
Magnesium	1480	846	988	1160	926	1060	1090	918	10
Manganese	1450	1950	2860	739	1070	2080	964	1380	0.10
Mercury	0.017	0.012	0.017	0.014	0.012	0.013	0.01	0.012	0.010
Molybdenum	0.102	0.059	0.068	0.123	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.228	0.119	0.188	0.186	0.167	0.525	0.721	0.177	0.050
Phosphorus	910	695	575	848	585	651	796	627	10
Potassium	3620	4000	3030	4060	2820	3030	2710	3060	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	11	<10	<10	10
Strontium	10.3	4.81	4.07	6.55	17.9	10.6	6.15	7.2	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	1.1	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	19.6	22	19.7	25.3	33.7	20.1	14	24.3	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2015 Soil trace metal analysis (n=12), sample sites CCTM500-S to CCTM511-S

Parameter[1]	CCME Ind[2]	CCTM 500-S	CCTM 501-S	CCTM 502-S	CCTM 503-S	CCTM 504-S	CCTM 505-S	CCTM 506-S	CCTM 507-S	CCTM 508-S	CCTM 509-S	CCTM 510-S	CCTM 511-S	RDL[3]
Aluminum	NA	10400	16800	12300	15800	12500	14000	17400	15500	7720	17200	9120	11900	100
Antimony	40	1.73	0.51	0.25	0.2	0.87	0.27	0.18	0.42	0.3	0.16	0.52	1.61	0.10
Arsenic	12	17.7	8.33	4.77	4.74	11.8	3.59	4.75	6.21	5.11	3.42	2.77	14.3	0.50
Barium	2000	585	181	336	182	514	281	187	175	148	262	467	545	0.10
Beryllium	8	0.55	0.4	<0.40	<0.40	0.83	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.66	0.40
Bismuth	NA	0.25	0.14	<0.10	<0.10	0.21	0.1	<0.10	0.11	<0.10	<0.10	<0.10	0.27	0.10
Cadmium	22	1.43	0.197	0.185	0.149	0.762	0.138	0.105	0.325	0.154	0.105	0.181	0.749	0.050
Calcium	NA	16700	5670	7740	2460	6940	8240	4830	14600	3410	3580	13000	5390	100
Chromium	87	21.1	34.7	18.4	22.2	30.7	27.8	26.6	22.9	18.1	17.7	16.5	22	1.0
Cobalt	300	13	9.69	13.3	6.67	12.8	10.2	10.9	10.6	5.93	10.6	13.6	13	0.30
Copper	91	37.5	18.5	22.3	15.8	56.6	37.1	20.4	25.5	9.98	23.3	33.1	41.4	0.50
Iron	NA	29100	25100	22800	25700	29900	27200	26900	22700	15200	27400	20400	27400	100
Lead	600	15.9	7.79	5.07	8.18	10.8	4.4	4.73	6.79	4.51	3.36	3.34	17.8	0.10
Lithium	NA	19.8	12.5	8.2	8	12.5	7.2	11.5	11.8	8.2	9.4	<5.0	22.3	5.0
Magnesium	NA	6470	6510	6640	4780	5800	6810	10000	5840	3960	12200	4630	5390	100
Manganese	NA	953	254	796	183	1130	361	334	478	209	296	573	453	0.20
Mercury	50	0.095	<0.050	<0.050	0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.073	0.193	0.050
Molybdenum	40	3.34	0.67	0.84	0.56	3.31	1.03	0.72	0.38	0.45	0.37	0.56	2.08	0.10
Nickel	89	40.5	20.4	10.4	11.2	39.2	14.8	14.6	16.2	13.1	10.1	15.9	39.1	0.80
Phosphorus	NA	889	613	695	477	850	422	466	497	702	569	644	849	10
Potassium	NA	939	619	1400	1030	1960	1230	1130	694	1370	4630	677	927	100
Selenium	2.9	1.28	<0.50	<0.50	<0.50	1.52	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	1.38	0.50
Silver	40	0.282	0.066	0.127	0.149	0.499	0.075	0.066	0.118	<0.050	0.063	0.104	0.3	0.050
Sodium	NA	101	240	162	138	125	235	219	312	152	191	137	<100	100
Strontium	NA	66	36.8	34.3	18.6	40.7	43.8	21.2	114	17.7	15.2	65.4	34.9	0.10
Thallium	1	0.117	0.123	0.12	0.102	0.159	0.072	0.071	<0.050	0.1	0.106	<0.050	0.126	0.050
Tin	300	0.31	0.52	0.27	0.42	0.43	0.35	0.33	0.31	0.23	0.29	0.18	0.26	0.10
Titanium	NA	120	1000	859	840	602	573	1090	709	529	1510	375	92.7	1.0
Uranium	300	1.18	1.36	0.774	0.614	1.51	1.04	0.511	10.9	0.803	0.305	0.518	1.31	0.050
Vanadium	130	40.1	62.7	58.7	50.6	56.8	58.7	72.3	50.9	28	74.3	31.2	39.1	2.0
Zinc	360	167	51.6	54	61.8	115	61.7	54.1	47.5	38.9	57.9	30.2	133	1.0
Zirconium	NA	2.6	4.28	1.21	1.14	0.66	2.89	1.04	7.79	1.83	0.91	3.13	2.12	0.50
pH	6-8	8.29	5.92	5.85	4.79	6.39	5.85	5.44	7.19	5.76	4.83	5.90	5.82	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Reportable Detection Limit (RDL)

2016 Willow trace metal analysis (n=36), sample sites CCTMAW-600 to CCTMCW-610

Parameter[1]	CCTMAW-600	CCTMAW-601	CCTMBW-602	CCTMBW-603	CCTMCW-604	CCTMCW-605	CCTMCW-606	CCTMCW-607	CCTMCW-608	CCTMCW-609	CCTMCW-610	RDL[2]
Aluminum	28.6	19.5	20.3	25.6	16.6	22.7	16.1	9.9	13.5	13.5	32.7	1.0
Antimony	0.0193	0.0137	0.0102	0.0168	0.0086	0.0142	<0.0050	<0.0050	0.0055	<0.0050	0.0099	0.005
Arsenic	<0.050	<0.050	<0.050	0.126	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	37.9	22.8	12.8	15.2	11.1	22.5	53.6	23.2	8.38	26.3	82.5	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	4.3	7	3.4	4.2	5.6	5.9	14.7	9.9	2.2	7.6	3.7	2.0
Cadmium	1.03	0.305	0.363	0.224	1.65	2.93	1.08	1.16	0.573	1.35	14.1	0.010
Calcium	7890	6450	4480	5540	2720	7540	12600	12400	4530	5830	10100	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.895	0.275	0.919	0.427	0.851	0.333	0.245	0.557	0.656	0.143	1.18	0.020
Copper	3.63	3.8	3.43	3.75	4.04	5.48	4.38	4.37	3.08	3.18	3.26	0.050
Iron	68	72	79	68	84	58	66	82	59	44	59	10
Lead	0.031	0.014	0.012	0.025	0.024	0.025	0.021	<0.010	0.015	0.022	0.025	0.010
Magnesium	2840	2720	1550	2820	1430	2540	3040	3510	1810	2250	3690	10
Manganese	586	317	1050	224	464	212	50.1	245	434	761	108	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.121	0.086	0.086	0.084	0.506	0.058	0.712	3.03	0.097	0.075	0.118	0.050
Nickel	3.58	3.73	1.35	2.17	2.05	2.75	1.26	1.17	0.519	1.3	4.99	0.050
Phosphorus	2380	2260	1830	1740	1710	1340	1980	2470	1240	1270	2400	10
Potassium	9880	9900	8360	10900	13000	10800	12800	9320	6850	9790	10700	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.342	<0.050	<0.050	<0.050	0.094	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	15	<10	10
Strontium	46.4	38.6	30.8	30.2	15.9	19.8	46.5	39	19.5	37.1	50	0.10
Thallium	0.0023	<0.0020	<0.0020	0.0038	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0033	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	1.1	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	1.2	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	123	85.9	83.2	61.3	121	154	93	112	71.3	157	99.4	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2016 Willow trace metal analysis (n=36), sample sites CCTMCW-612 to CCTMAW-622

Parameter[1]	CCTMCW-612	CCTMCW-613	CCTMCW-613-R[2]	CCTMRW-614	CCTMRW-615	CCTMRW-616	CCTMRW-617	CCTMRW-618	CCTMAW-619	CCTMBW-620	CCTMAW-622	RDL[3]
Aluminum	71.7	232	118	25	19.7	55.1	47.6	38.6	12.8	68.2	22	1.0
Antimony	0.0223	0.026	0.0085	0.0053	0.011	0.0113	0.0275	0.0148	0.0308	0.015	0.0147	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	43.4	65.6	59.2	19.2	43.9	99.2	102	62.5	22.3	11	136	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	5.8	3.4	3.3	6.7	5.4	4.9	2.5	2.9	6.9	8.8	3.6	2.0
Cadmium	0.91	0.894	0.783	10.3	2.78	0.669	0.793	2.78	0.323	0.47	0.799	0.010
Calcium	11100	12400	10100	4830	8290	12500	11400	10100	22000	4230	26700	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	1.21	3.28	1.49	1.69	0.329	1.25	3.07	3.03	0.351	2.54	0.862	0.020
Copper	4.52	3.69	3.81	3.63	4.1	3.12	3.44	3.4	4	3.47	4.7	0.050
Iron	53	74	180	45	52	113	66	74	69	97	64	10
Lead	0.03	0.046	0.027	0.018	0.029	0.022	0.02	0.037	0.03	0.022	0.019	0.010
Magnesium	4460	4880	5120	1280	2090	4450	4630	3390	2280	1790	2880	10
Manganese	281	242	277	1150	400	310	240	184	77.1	1040	198	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	0.011	0.010
Molybdenum	0.082	0.107	0.168	0.089	0.127	0.355	0.242	0.265	0.303	0.094	0.096	0.050
Nickel	4.01	7.89	6.55	4.23	3.33	3.31	16.5	9.41	0.478	2.74	1.56	0.050
Phosphorus	2600	2110	2200	980	1190	1750	2020	1510	1090	1060	1850	10
Potassium	10900	9430	9340	7000	11500	9400	11200	10500	9180	7020	11200	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.123	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	30	<10	10
Strontium	56.5	91.2	72.1	24.6	35.5	73.1	75.6	45.7	73	22.7	92.6	0.10
Thallium	0.0032	<0.0020	0.0036	<0.0020	0.0027	<0.0020	0.0066	0.0058	<0.0020	0.0024	0.0033	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	81.3	30.7	39.8	293	201	116	74.7	103	118	118	83.3	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Willow trace metal analysis (n=36), sample sites CCTMAW-622-R to CCTMBW-633

Parameter[1]	CCTMAW-622-R[2]	CCTMAW-623	CCTMBW-625	CCTMBW-625-R[2]	CCTMAW-626	CCTMAW-627	CCTMAW-628	CCTMBW-629	CCTMAW-631	CCTMAW-632	CCTMBW-633	RDL[3]
Aluminum	20.9	35.5	44.1	45.2	46	38.9	73.7	26	26.3	20.4	15.3	1.0
Antimony	0.0639	0.0303	0.026	0.0263	0.0131	0.0523	0.0192	0.022	0.024	0.0194	0.0145	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	0.084	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	104	45.8	103	106	16.4	67.1	79.8	64.5	209	47.9	30.1	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	3.3	3	21	17.4	6.6	7.3	2.8	20.2	5.3	3.4	9.1	2.0
Cadmium	0.644	1.03	1.48	1.48	0.654	0.973	0.914	2.26	1.31	2.4	0.962	0.010
Calcium	19500	11600	13000	11300	6070	12600	12800	14300	14200	13800	11500	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.3	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	1.55	1.31	2.03	2.25	4.09	0.698	1.32	1.08	0.68	0.987	0.156	0.020
Copper	4.55	3.18	4.8	5	2.61	2.71	3.95	4.41	3.49	3.4	3.07	0.050
Iron	56	71	44	43	96	90	112	43	43	44	53	10
Lead	0.027	0.025	0.031	0.038	0.017	0.039	0.052	0.033	0.056	0.031	0.025	0.010
Magnesium	3290	3750	2650	2390	2240	3620	5150	1760	2020	3470	2030	10
Manganese	242	260	851	817	1220	357	250	272	107	179	136	0.10
Mercury	<0.010	<0.010	0.011	0.011	<0.010	0.011	<0.010	0.012	0.012	<0.010	<0.010	0.010
Molybdenum	0.12	0.174	0.314	0.252	0.241	0.158	0.111	0.269	<0.050	0.086	0.53	0.050
Nickel	5.04	2.77	6.9	7.81	1.9	1.99	7.97	1.82	2.07	2.13	0.402	0.050
Phosphorus	2160	1510	3170	3180	902	1020	3170	2730	2110	2780	869	10
Potassium	16600	11100	15800	16700	6790	12300	11100	10500	14600	11700	10500	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	30	<10	<10	<10	<10	<10	<10	10
Strontium	76.7	59.5	94.4	93.5	22.6	46.3	73.4	72	87.1	71.3	63.4	0.10
Thallium	0.012	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.004	<0.0020	<0.0020	0.0042	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	3.3	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0036	<0.0020	0.0111	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	54.2	78.7	93.5	90.2	108	72.5	80.8	68.7	72.8	118	240	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Willow trace metal analysis (n=36), sample sites CCTMBW-634 to CCTMRW-639-R

Parameter[1]	CCTMBW-634	CCTMRW-635	CCTMRW-636	CCTMRW-637	CCTMRW-638	CCTMRW-639	CCTMRW-639-R[2]	RDL[3]
Aluminum	11	10.2	9.1	17.4	52.5	57.4	70.4	1.0
Antimony	0.0267	0.0171	0.0395	0.0164	0.0519	0.0397	0.0469	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	37.6	12.9	43.5	51.1	60.9	80.3	55	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	6.9	3.5	8.5	6.5	4.2	4.2	4.4	2.0
Cadmium	0.648	0.959	3.2	0.974	0.562	1.37	1.07	0.010
Calcium	17700	2680	9930	10900	8940	11600	8050	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.335	1.52	0.396	0.637	1.99	3.17	3.15	0.020
Copper	6.87	3.64	3.89	2.66	3.51	3.38	3.08	0.050
Iron	49	40	37	46	103	125	127	10
Lead	0.034	0.017	0.043	0.017	0.026	0.224	0.099	0.010
Magnesium	1310	2090	2230	2760	3010	3710	3930	10
Manganese	52.1	385	483	261	274	308	660	0.10
Mercury	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.277	0.093	0.055	0.158	0.207	0.061	0.058	0.050
Nickel	2.22	9.38	3.51	0.7	2.66	3.34	2.93	0.050
Phosphorus	935	1350	950	1120	1380	1510	1990	10
Potassium	8600	8410	7810	9330	11100	10900	10900	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	10
Strontium	91.3	6.91	39.2	40.4	39.1	49.6	34	0.10
Thallium	<0.0020	<0.0020	0.0042	<0.0020	<0.0020	<0.0020	0.0025	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	21.7	61.6	298	137	48.1	81.9	68.7	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lichen trace metal analysis (n=38), sample sites CCTMAL-600 to CCTMCL-610

Parameter[1]	CCTMAL-600	CCTMAL-601	CCTMBL-602	CCTMBL-603	CCTMCL-604	CCTMCL-605	CCTMCL-606	CCTMCL-607	CCTMCL-608	CCTMCL-609	CCTMCL-610	RDL[2]
Aluminum	159	168	159	140	174	220	130	92.6	162	108	159	1.0
Antimony	0.0686	0.0461	0.0858	0.0357	0.0201	0.021	0.0149	0.0146	0.02	0.0163	0.0855	0.005
Arsenic	0.192	0.151	0.167	0.162	0.18	0.249	0.104	0.077	0.148	0.099	0.148	0.050
Barium	3.88	8.3	8.44	7.45	8.19	12.3	16.8	15	6.65	7.36	12.4	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	4.6	4	3.6	2.5	<2.0	2.2	2.1	2.5	2.6	<2.0	2.5	2.0
Cadmium	0.039	0.054	0.033	0.024	0.067	0.072	0.032	0.011	0.028	0.035	0.062	0.010
Calcium	715	1080	911	935	785	1370	2080	1940	888	956	1270	10
Chromium	0.35	0.32	0.37	0.39	0.35	0.5	0.32	0.25	0.43	0.25	0.38	0.20
Cobalt	0.098	0.105	0.12	0.106	0.147	0.172	0.114	0.078	0.142	0.09	0.156	0.020
Copper	1.52	1.52	3.06	1.5	1.25	1.56	1.16	0.839	1.36	1.07	1.61	0.050
Iron	215	231	246	228	290	360	232	155	265	172	246	10
Lead	0.193	0.196	0.45	0.148	0.223	0.242	0.163	0.108	0.182	0.13	0.202	0.010
Magnesium	293	356	331	326	298	435	291	202	272	286	505	10
Manganese	180	196	167	213	120	286	145	24.4	203	197	138	0.10
Mercury	0.017	0.021	0.026	0.02	0.013	0.028	0.026	0.016	0.018	0.017	0.035	0.010
Molybdenum	<0.050	<0.050	<0.050	<0.050	0.072	0.055	<0.050	0.199	<0.050	<0.050	<0.050	0.050
Nickel	0.607	0.862	0.546	0.479	0.545	0.586	0.416	0.278	0.475	0.332	0.695	0.050
Phosphorus	428	473	566	452	292	444	447	298	310	348	526	10
Potassium	954	1010	1120	920	694	920	1020	763	849	924	1060	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	18	15	13	17	<10	11	<10	<10	10	13	16	10
Strontium	1.69	3.58	1.93	1.67	2.24	2.19	4.92	5.49	2.22	2.5	4.5	0.10
Thallium	<0.0020	<0.0020	0.0032	0.0032	0.0026	0.0032	0.0041	<0.0020	0.0022	<0.0020	0.0034	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	7.1	7.4	8.7	7.2	8.8	11.4	6.9	4.8	9.3	6	8.2	1.0
Uranium	0.0087	0.0459	0.0103	0.0098	0.0103	0.0148	0.0074	0.0057	0.0091	0.0127	0.0095	0.002
Vanadium	0.32	0.39	0.43	0.36	0.44	0.66	0.33	<0.20	0.4	0.27	0.46	0.20
Zinc	12.7	14.2	17	15.9	9.57	15.6	20.2	11.2	10.1	12.6	18.6	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2016 Lichen trace metal analysis (n=38), sample sites CCTMCL-611 to CCTMBL-620

Parameter[1]	CCTMCL-611	CCTMCL-612	CCTMCL-613	CCTMCL-613R[2]	CCTMRL-614	CCTMRL-615	CCTMRL-616	CCTMRL-617	CCTMRL-618	CCTMBL-619	CCTMBL-620	RDL[3]
Aluminum	120	249	189	226	182	160	190	231	197	141	178	1.0
Antimony	0.0311	0.0207	0.0358	0.0263	0.0509	0.0299	0.0257	0.0301	0.0309	0.315	0.033	0.005
Arsenic	0.112	0.179	0.167	0.188	0.165	0.135	0.16	0.191	0.167	0.181	0.184	0.050
Barium	7.38	5.98	5.95	6.27	7.81	10.5	11.6	6.66	6.84	5	3.73	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.1	2.0
Cadmium	0.029	0.031	0.023	0.027	0.05	0.064	0.043	0.041	0.045	0.023	0.018	0.010
Calcium	791	857	665	737	973	1130	1120	752	829	1220	600	10
Chromium	0.31	0.5	0.48	0.64	0.46	0.48	0.44	0.6	0.51	0.37	0.45	0.20
Cobalt	0.087	0.165	0.148	0.186	0.146	0.124	0.15	0.181	0.16	0.099	0.151	0.020
Copper	1.01	1.16	1.29	1.2	1.21	1.19	1.31	1.26	1.34	1.56	1.16	0.050
Iron	199	275	298	348	287	248	294	361	301	227	279	10
Lead	0.122	0.181	0.207	0.199	0.177	0.131	0.178	0.239	0.219	0.244	0.166	0.010
Magnesium	258	352	326	357	339	365	361	294	282	233	273	10
Manganese	163	106	72.4	83.6	296	148	142	87.5	101	20.2	158	0.10
Mercury	0.018	0.029	0.026	0.021	0.023	0.023	0.021	0.02	0.021	0.021	0.017	0.010
Molybdenum	0.075	<0.050	<0.050	<0.050	<0.050	0.066	0.057	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.37	0.547	0.591	0.67	0.575	0.553	0.579	0.634	0.625	0.389	0.491	0.050
Phosphorus	310	416	400	430	294	391	445	309	348	283	250	10
Potassium	870	1050	899	887	839	1010	879	828	884	865	880	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	13	11	12	15	11	14	10	13	14	10	12	10
Strontium	1.5	2.2	2.42	2.71	2.05	3.77	4.48	2.07	1.91	3.56	1.24	0.10
Thallium	0.002	0.0028	0.0025	0.003	0.0028	0.0023	<0.0020	0.0043	0.0037	0.0022	0.0026	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	6.9	8.9	10.7	12.6	11.4	8.7	9.5	13.4	12.3	8.7	11.5	1.0
Uranium	0.0089	0.0118	0.0109	0.0113	0.0091	0.0067	0.0103	0.0128	0.0107	0.009	0.0095	0.002
Vanadium	0.29	0.49	0.51	0.6	0.51	0.49	0.49	0.59	0.49	0.35	0.49	0.20
Zinc	10.3	12.9	12.4	13.1	12.2	13.8	15.1	9.83	10	12.2	9.52	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lichen trace metal analysis (n=38), sample sites CCTMBL-621 to CCTMAL-632

Parameter[1]	CCTMBL-621	CCTMAL-622	CCTMAL-622-R[2]	CCTMAL-623	CCTMBL-624	CCTMAL-626	CCTMAL-627	CCTMAL-628	CCTMBL-630	CCTMAL-631	CCTMAL-632	RDL[3]
Aluminum	127	107	93.7	125	116	151	137	166	53.9	88.6	85.5	1.0
Antimony	0.0266	0.0311	0.0438	0.0794	0.117	0.0728	0.0434	0.025	0.0958	0.0638	0.0922	0.005
Arsenic	0.138	0.122	0.092	0.218	0.127	0.175	0.265	0.237	0.066	0.124	0.09	0.050
Barium	4.34	7.43	7.72	8.79	3.9	5.36	4.77	4.51	5.14	6.52	5.36	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	2.0
Cadmium	0.02	0.03	0.027	0.022	0.027	0.021	0.017	0.018	0.031	0.031	0.066	0.010
Calcium	646	972	921	702	587	672	546	639	554	745	739	10
Chromium	0.29	0.23	0.21	0.36	0.31	0.43	0.36	0.45	<0.20	0.21	0.22	0.20
Cobalt	0.101	0.092	0.075	0.102	0.092	0.13	0.108	0.112	0.049	0.083	0.081	0.020
Copper	0.908	0.898	0.806	0.955	0.837	1.05	0.862	1.08	0.81	0.905	0.807	0.050
Iron	204	162	126	199	173	244	216	231	86	143	121	10
Lead	0.126	0.09	0.071	0.117	0.108	0.129	0.104	0.139	0.066	0.089	0.087	0.010
Magnesium	255	432	386	292	234	256	246	388	204	358	406	10
Manganese	186	171	164	136	203	120	113	91.8	86.7	229	132	0.10
Mercury	0.021	0.014	0.015	0.023	0.015	0.012	0.015	0.021	0.021	0.028	0.014	0.010
Molybdenum	<0.050	<0.050	<0.050	0.05	<0.050	0.06	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.345	0.306	0.259	0.366	0.337	0.372	0.378	0.408	0.213	0.334	0.301	0.050
Phosphorus	268	511	497	392	257	267	362	538	401	404	499	10
Potassium	954	1170	1190	956	986	892	896	1490	1130	1110	1100	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	11	11	12	12	<10	<10	<10	<10	10
Strontium	1.1	2.52	2.34	1.68	1.18	1.72	1.2	1.75	1.32	1.94	2.2	0.10
Thallium	0.0027	0.0021	0.0027	0.0049	0.002	0.0025	0.004	0.0023	0.0032	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	7.4	5.9	4.4	7.3	6.6	10.5	7.6	9.9	2.3	4.7	4	1.0
Uranium	0.0068	0.0085	0.0048	0.0101	0.0057	0.0092	0.01	0.0096	0.0078	0.0085	0.0037	0.002
Vanadium	0.34	0.23	<0.20	0.3	0.28	0.39	0.38	0.43	<0.20	0.22	<0.20	0.20
Zinc	7.88	12.6	11.6	9.35	8.84	8.67	11.2	12.2	8.14	18.6	13.6	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lichen trace metal analysis (n=38), sample sites CCTMBL-633 to CCTMRL-639-R

Parameter[1]	CCTMBL-633	CCTMBL-634	CCTMRL-635	CCTMRL-636	CCTMRL-637	CCTMRL-638	CCTMRL-639	CCTMRL-639-R[2]	RDL[3]
Aluminum	119	65	102	90.4	127	90.5	84.8	87.9	1.0
Antimony	0.0218	0.0281	0.0139	0.018	0.0146	0.0634	0.0218	0.0252	0.005
Arsenic	0.143	0.085	0.108	0.086	0.068	0.085	0.084	0.085	0.050
Barium	5.05	8.51	4.08	6.59	4.53	5.19	6.11	5.93	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	2.1	3.2	<2.0	<2.0	<2.0	2.1	<2.0	<2.0	2.0
Cadmium	0.025	0.027	0.024	0.039	0.027	0.039	0.036	0.032	0.010
Calcium	811	1290	665	979	693	764	909	814	10
Chromium	0.27	<0.20	0.32	0.32	0.23	0.29	0.3	0.3	0.20
Cobalt	0.096	0.072	0.091	0.078	0.082	0.112	0.092	0.1	0.020
Copper	0.885	0.926	0.897	0.852	0.877	0.898	0.874	0.895	0.050
Iron	186	121	156	141	110	150	136	134	10
Lead	0.138	0.08	0.121	0.103	0.075	0.107	0.085	0.093	0.010
Magnesium	219	424	486	305	427	305	368	351	10
Manganese	51.2	20.5	34.7	138	121	154	193	178	0.10
Mercury	0.016	0.019	0.02	0.019	0.017	0.016	0.02	0.019	0.010
Molybdenum	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.309	0.231	0.445	0.346	0.297	0.294	0.271	0.313	0.050
Phosphorus	237	429	336	391	571	399	482	490	10
Potassium	865	1610	1090	1160	1330	1120	1180	1180	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	2.76	5.39	1.47	2.4	1.81	1.58	1.69	1.61	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	7.2	3.3	5.4	5	4.1	4.5	4.4	4.4	1.0
Uranium	0.0065	0.0035	0.005	0.0045	0.0044	0.0047	0.0047	0.0047	0.002
Vanadium	0.26	<0.20	0.27	0.25	<0.20	0.24	0.22	0.24	0.20
Zinc	10.5	10.9	10.1	12.3	14.6	10.9	13.1	12.9	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Horsetail trace metal analysis (n=6), sample sites CCTMCH-604 to CCTMBH-630

Parameter[1]	CCTMCH-604	CCTMCH-609	CCTMAH-619	CCTMBH-625	CCTMBH-625-R[2]	CCTMAH-627	CCTMBH-630	RDL[3]
Aluminum	99.7	24.1	4.8	71.7	50.0	74.3	60.1	1.0
Antimony	0.0087	0.0179	0.0406	0.0155	0.0182	0.0166	0.124	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	0.063	0.108	<0.050	0.050
Barium	104	123	30.9	346	310	295	203	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	13.0	8.8	22.9	28.7	25.8	14.7	11.5	2.0
Cadmium	0.432	0.141	0.051	0.085	0.107	0.061	0.070	0.010
Calcium	7020	9700	35300	28400	27300	28000	16600	10
Chromium	<0.20	<0.20	<0.20	<0.20	0.28	<0.20	0.21	0.20
Cobalt	2.07	0.413	0.544	0.608	0.441	0.625	0.834	0.020
Copper	3.84	4.45	2.17	2.23	2.24	2.52	4.04	0.050
Iron	170	45	40	24	23	105	85	10
Lead	0.036	0.027	0.014	0.052	0.053	0.037	0.056	0.010
Magnesium	3050	3590	2280	1760	2040	1350	3840	10
Manganese	234	285	82.5	136	122	202	181	0.10
Mercury	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Molybdenum	0.705	0.182	0.127	0.117	0.198	0.304	0.383	0.050
Nickel	3.69	0.813	0.198	3.09	2.76	1.27	1.73	0.050
Phosphorus	1570	2210	945	899	959	748	1070	10
Potassium	26100	26800	28400	9150	10600	14000	26900	10
Selenium	<0.050	<0.050	<0.050	0.307	0.511	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	48	<10	<10	<10	<10	10
Strontium	48.8	72.3	99.4	163	153	113	106	0.10
Thallium	0.0258	<0.0020	<0.0020	0.0025	0.0021	0.0031	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	0.64	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	<0.0020	0.0034	<0.0020	0.0061	0.0046	0.0023	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	70.7	39.8	27.9	34.0	41.8	22.1	46.9	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lowbush cranberry trace metal analysis (n=40), sample sites CCTMAC-600 to CCTMCC-610

Parameter[1]	CCTMAC-600	CCTMAC-601	CCTMBC-602	CCTMBC-603	CCTMCC-604	CCTMCC-605	CCTMCC-606	CCTMCC-607	CCTMCC-608	CCTMCC-609	CCTMCC-610	RDL[2]
Aluminum	161	119	162	146	144	157	34.1	40.5	95.2	101	93.3	1.0
Antimony	<0.0050	0.0069	0.0051	0.0069	0.0058	0.0055	0.0091	0.0066	0.0069	<0.0050	0.0079	0.005
Arsenic	<0.050	<0.050	<0.050	0.09	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	76.4	96.3	62.5	71.3	54	71.1	121	116	73.5	75.2	86.9	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	7.5	8.1	4.2	6.9	7.2	8.8	10.1	8.8	4.4	6.9	7.3	2.0
Cadmium	<0.010	0.019	<0.010	<0.010	0.011	0.015	<0.010	0.014	<0.010	0.013	0.04	0.010
Calcium	6180	6450	5430	5750	8040	5530	6260	8030	5240	5390	5910	10
Chromium	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.035	0.039	0.037	0.029	0.044	0.021	0.024	0.024	0.03	0.029	0.031	0.020
Copper	6.81 (1)	4.49	3.9	3.95	3.3	4.53	2.15	1.74	3.2	2.96	3.23	0.050
Iron	60	59	82	58	61	42	41	35	36	46	48	10
Lead	0.034	0.05	0.055	0.044	0.034	0.023	0.019	0.021	0.028	0.029	0.025	0.010
Magnesium	1230	1100	1290	1300	1170	864	1010	911	1230	712	869	10
Manganese	3040	2620	1820	2650	2900	2500	1070	828	1920	2560	1970	0.10
Mercury	0.018	0.025	0.013	0.017	0.017	<0.010	0.014	0.012	<0.010	0.012	<0.010	0.010
Molybdenum	0.057	<0.050	0.088	<0.050	0.243	<0.050	0.12	1.89	0.096	0.4	<0.050	0.050
Nickel	0.303	0.349	0.436	0.254	0.321	0.404	0.134	0.137	0.317	0.184	0.187	0.050
Phosphorus	1040	1160	1110	997	635	811	930	728	649	611	1130	10
Potassium	3540	4200	3590	3580	2790	3840	4380	2730	2210	3400	4170	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	6.82	10.7	5.91	6.98	6.07	4.36	10.8	12.7	5.52	9.08	5.02	0.10
Thallium	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	1.4	1.4	1.8	1.5	1.7	<1.0	1	<1.0	<1.0	1.1	1.4	1.0
Uranium	<0.0020	0.0027	<0.0020	<0.0020	<0.0020	0.0076	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	24.2	25.5	24	24.1	22.1	22.9	27.7	15.5	20.6	17.9	24.1	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Reportable Detection Limit (RDL)

2016 Lowbush cranberry trace metal analysis (n=40), sample sites CCTMCC-611 to CCTMBC-620

Parameter[1]	CCTMCC-611	CCTMCC-612	CCTMCC-613	CCTMCC-613-R[2]	CCTMRC-614	CCTMRC-615	CCTMRC-616	CCTMRC-617	CCTMRC-618	CCTMAC-619	CCTMBC-620	RDL[3]
Aluminum	94.2	107	111	64.7	111	111	127	159	137	44.3	95.1	1.0
Antimony	0.0116	<0.0050	0.0081	0.0097	<0.0050	0.0198	0.0134	0.0178	0.0062	0.0249	0.0201	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	61.1	93.7	76.1	95.1	77.4	91.5	116	117	74.8	89.4	50.1	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	8.1	5.1	5.8	5.1	8.9	8	8.2	6.1	8.4	9.5	8.9	2.0
Cadmium	<0.010	<0.010	<0.010	<0.010	0.025	0.013	0.017	0.011	0.033	<0.010	<0.010	0.010
Calcium	5970	6020	5870	5620	7440	7400	6710	6180	6650	9620	5100	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.028	0.039	0.037	0.052	0.02	0.025	0.035	0.05	0.043	0.026	0.029	0.020
Copper	4.7	4.95	3.43	3.77	4.57	3.3	4.18	3.19	4.07	3.81	3.33	0.050
Iron	43	46	44	41	44	46	60	68	54	44	26	10
Lead	0.03	0.037	0.02	0.029	0.021	0.027	0.029	0.035	0.032	0.029	0.021	0.010
Magnesium	993	1580	1480	1650	785	947	1130	1670	1220	909	875	10
Manganese	2530	1700	1720	1520	3260	3050	2910	2460	2690	864	2520	0.10
Mercury	0.015	0.012	0.013	<0.010	0.014	0.012	0.015	0.021	0.014	0.018	0.013	0.010
Molybdenum	0.124	0.059	0.051	<0.050	0.087	0.093	0.077	0.054	<0.050	<0.050	0.051	0.050
Nickel	0.253	0.387	0.352	0.39	0.266	0.421	0.331	0.432	0.358	0.574	0.173	0.050
Phosphorus	652	1230	1260	1170	729	947	1070	1090	1090	690	645	10
Potassium	2790	4620	3900	3920	4010	3840	3990	3900	4020	3960	2860	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	5.14	5.87	7.4	10.5	5.97	6.03	8.08	10	4.32	16.1	3.43	0.10
Thallium	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.43	<0.10	<0.10	0.10
Titanium	1	<1.0	1.1	<1.0	1.1	1.1	1.8	2	1.4	1.1	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	20.3	30.9	27.3	24.7	27.2	28.1	23.1	25.9	36.5	46.8	17.7	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lowbush cranberry trace metal analysis (n=40), sample sites CCTMBC-621 to CCTMBC-629

Parameter[1]	CCTMBC-621	CCTMAC-622	CCTMAC-622-R[2]	CCTMAC-623	CCTMBC-624	CCTMBC-625	CCTMBC-625-R	CCTMAC-626	CCTMAC-627	CCTMAC-628	CCTMBC-629	RDL[3]
Aluminum	105	49.4	47.6	144	105	155	139	136	135	111	84.9	1.0
Antimony	0.0479	0.0206	0.0416	0.0167	0.0209	0.0145	0.0119	0.0202	0.0121	0.0096	0.0079	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	74.8	68.6	72.8	79.7	81.2	103	116	87.5	96.8	94.8	86.9	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	8.9	5.3	5.6	7.6	6.3	13.7	12.8	7	9.4	3.5	10.1	2.0
Cadmium	<0.010	<0.010	<0.010	0.016	<0.010	0.133	0.174	<0.010	0.01	<0.010	0.055	0.010
Calcium	7790	5250	4860	7580	5900	7370	6760	7930	6380	4990	6380	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.024	0.029	0.027	0.036	<0.020	0.062	0.056	0.028	0.024	0.038	<0.020	0.020
Copper	3.99	3.4	3.68	4.67	2.75	4.13	4.65	2.81	3.95	3.28	2.43	0.050
Iron	38	30	30	46	36	39	52	41	41	44	39	10
Lead	0.024	0.021	0.028	0.038	0.02	0.015	0.068	0.039	0.02	0.022	0.017	0.010
Magnesium	918	936	851	1220	1310	896	958	1310	1120	1250	866	10
Manganese	3210	1830	1840	2680	2680	2690	2500	2830	2140	1540	1140	0.10
Mercury	0.016	<0.010	0.011	0.018	0.013	0.013	0.011	0.017	0.016	0.012	0.012	0.010
Molybdenum	<0.050	0.181	0.158	0.107	0.088	0.457	0.317	0.072	<0.050	0.109	0.238	0.050
Nickel	0.195	0.238	0.299	0.247	0.192	0.184	0.162	0.173	0.248	0.275	0.152	0.050
Phosphorus	640	1150	1150	993	689	1120	1010	649	768	1150	890	10
Potassium	2940	4150	4480	3660	2940	4790	3570	2780	3350	4750	3440	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	4.07	5.1	5.94	6.05	4.46	13.9	12.4	6.63	6.15	5.76	9.71	0.10
Thallium	0.0029	<0.0020	<0.0020	0.003	<0.0020	0.0078	0.0124	<0.0020	0.0021	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	1.1	1	1.2	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	19.1	18.6	17.5	30.9	13.4	24.3	24.4	20.7	25.1	20.1	20.2	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Lowbush cranberry trace metal analysis (n=40), sample sites CCTMBC-630 to CCTMRC-639-R

Parameter[1]	CCTMBC-630	CCTMBC-630	CCTMAC-632	CCTMBC-633	CCTMBC-634	CCTMRC-635	CCTMRC-636	CCTMRC-637	CCTMRC-638	CCTMRC-639	CCTMRC-639-R[2]	RDL[3]
Aluminum	107	85.4	119	48.6	33.4	45.5	83.8	84.8	81.2	106	89.6	1.0
Antimony	0.125	0.0182	0.0111	0.0138	0.0115	0.0068	0.0239	0.0143	0.0223	0.0067	0.0075	0.005
Arsenic	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Barium	95.2	90	111	61.7	96.9	75	65.3	84.8	77.5	97.6	106	0.10
Beryllium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Boron	5.5	4.4	6.5	8.8	14.1	7.2	13.4	10	6.8	8.5	7	2.0
Cadmium	<0.010	0.012	0.022	0.021	0.027	<0.010	0.027	0.016	<0.010	0.015	<0.010	0.010
Calcium	6430	5380	6760	6990	8950	5350	6690	7000	6280	5810	6950	10
Chromium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Cobalt	0.06	0.029	0.021	<0.020	0.049	0.032	<0.020	<0.020	0.021	0.058	0.033	0.020
Copper	3.13	4.13	3.4	4.42	4.72	4.47	3.35	3.59	4.21	4.83	4.7	0.050
Iron	40	33	35	36	63	26	33	37	31	36	33	10
Lead	0.028	0.034	0.014	0.014	0.033	0.012	0.02	0.018	0.013	0.019	0.014	0.010
Magnesium	1260	1380	1150	895	979	916	861	971	921	910	939	10
Manganese	1600	1540	2310	2190	555	1630	2640	2190	2500	2140	2430	0.10
Mercury	0.013	0.011	0.013	0.014	0.032	0.01	0.012	0.015	0.01	0.011	0.014	0.010
Molybdenum	0.116	0.063	0.093	0.156	0.358	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Nickel	0.269	0.432	0.205	0.127	0.195	0.902	0.194	0.157	0.248	0.267	0.264	0.050
Phosphorus	869	884	1280	920	749	1180	904	1180	1110	1140	1200	10
Potassium	3530	3210	4950	4300	4110	5090	4190	4060	4140	4200	4430	10
Selenium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Silver	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Sodium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Strontium	11.6	8.88	7.49	8.45	21.7	3.98	6.08	5.38	4.13	5.78	5.6	0.10
Thallium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Uranium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002
Vanadium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Zinc	14.6	20.4	31	32.8	15.8	24.3	26.6	29.1	26.6	31.6	30.8	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] Reportable Detection Limit (RDL)

2016 Soil trace metal analysis (n=40), sample sites CCTMAS-600 to CCTMCS-610

Parameter[1]	CCME Ind[2]	CCTMAS-600	CCTMAS-601	CCTMBS-602	CCTMBS-603	CCTMCS-604	CCTMCS-605	CCTMCS-606	CCTMCS-607	CCTMCS-608	CCTMCS-609	CCTMCS-610	RDL[3]
Aluminum	NA	17500	18000	3180	41000	12200	24000	14800	11300	14900	10400	10900	100
Antimony	40	0.62	0.37	<0.10	1.73	1.87	0.44	0.45	0.3	0.4	0.57	0.58	0.10
Arsenic	12	53.1	8.18	0.9	520	16.1	7.65	8.22	4.91	4.51	9.9	6.35	0.50
Barium	2000	122	99.8	18.4	300	158	138	278	131	138	312	91.8	0.10
Beryllium	8	<0.40	<0.40	<0.40	1.08	<0.40	<0.40	<0.40	<0.40	<0.40	0.43	<0.40	0.40
Bismuth	NA	<0.10	0.31	<0.10	0.23	0.25	<0.10	0.12	<0.10	0.17	<0.10	0.21	0.10
Cadmium	22	0.227	0.253	<0.050	0.75	0.796	0.378	0.69	0.218	0.196	0.772	0.317	0.050
Calcium	NA	3000	2780	578	6240	2820	5120	4340	10400	3480	7620	1160	100
Chromium	87	27.7	26.7	6.2	49.7	26.1	44.7	28	21.1	28	12.4	20	1.0
Cobalt	300	6.98	6.52	0.7	9.18	5.59	16.7	9.16	6.39	8.1	21.5	4.3	0.30
Copper	91	17.8	12	3.23	31.6	18.2	28.9	15.5	12.2	11.5	15.8	15.3	0.50
Iron	NA	23400	24900	4890	38300	18000	36600	22300	18300	18400	11200	23500	100
Lead	600	8.54	12	2.1	14.2	42.2	6.95	6.72	4.88	11.8	4.91	9.32	0.10
Lithium	NA	10.9	14.6	<5.0	14.6	6.2	10.2	9.2	8.4	8.6	<5.0	5.9	5.0
Magnesium	NA	4300	3830	298	3850	3060	15400	4070	3410	4120	1670	2100	100
Manganese	NA	294	520	17.6	670	177	574	420	224	265	3150	153	0.20
Mercury	50	<0.050	<0.050	<0.050	0.261	0.071	<0.050	<0.050	<0.050	<0.050	0.157	<0.050	0.050
Molybdenum	40	0.47	0.73	0.31	2.17	1.86	0.68	1.45	0.37	0.84	0.93	1.56	0.10
Nickel	89	16.2	13.1	1.61	27.6	13.8	29.2	19	13.7	16.4	11.7	10.7	0.80
Phosphorus	NA	489	351	259	1240	642	644	375	584	530	1040	267	10
Potassium	NA	643	1020	222	1350	671	1430	358	733	663	517	354	100
Selenium	2.9	<0.50	<0.50	<0.50	0.55	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.066	0.089	<0.050	0.491	0.681	0.103	0.076	0.057	0.108	0.269	0.227	0.050
Sodium	NA	<100	108	194	107	168	127	192	196	209	<100	142	100
Strontium	NA	21.3	21.4	7.58	49.5	24.9	34.9	29.4	38.8	27	71	13.3	0.10
Thallium	1	0.167	0.262	<0.050	0.316	0.325	0.125	0.109	0.069	0.139	0.134	0.117	0.050
Tin	300	0.56	1.16	0.15	0.72	0.44	0.26	0.42	0.31	0.67	0.2	0.53	0.10
Titanium	NA	881	1030	84.2	451	657	1140	631	686	796	198	657	1.0
Uranium	300	1.76	3.66	0.234	26.8	5.21	0.419	0.569	0.867	1.17	11.1	0.397	0.050
Vanadium	130	53.7	53.2	11.1	60.3	40.2	80.8	61.2	42.1	53.5	19.1	68.3	2.0
Zinc	360	47	57.6	6.6	76.2	67.9	75.6	51.1	40.4	53.6	29.5	37.6	1.0
Zirconium	NA	4	2.83	<0.50	4.65	6	2.29	2.46	1.88	1.88	2.06	1.44	0.50
pH	6-8	5.8	4.98	4.19	7.10	4.69	6.12	4.98	5.04	4.77	5.30	4.82	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] Reportable Detection Limit (RDL)

2016 Soil trace metal analysis (n=40), sample sites CCTMCS-611 to CCTMBS-620

Parameter[1]	CCME Ind[2]	CCTMCS-611	CCTMCS-612	CCTMCS-613	CCTMCS-613-R[3]	CCTMRS-614	CCTMRS-615	CCTMRS-616	CCTMRS-617	CCTMRS-618	CCTMAS-619	CCTMBS-620	RDL[4]
Aluminum	NA	13000	12100	13500	14900	9790	25500	27700	10300	28600	12800	13100	100
Antimony	40	0.5	0.64	0.52	0.55	0.28	0.24	0.31	0.29	0.24	0.42	0.32	0.10
Arsenic	12	11.7	4.9	7.97	8.38	2.79	3.61	9.29	6.73	6.96	7.47	6.42	0.50
Barium	2000	80.6	54.1	74.4	56.9	193	401	260	65.7	341	165	96.3	0.10
Beryllium	8	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40
Bismuth	NA	0.25	0.46	0.18	0.16	0.1	<0.10	0.15	0.12	0.13	0.12	0.14	0.10
Cadmium	22	0.181	0.136	0.148	0.15	0.897	0.277	0.251	0.114	0.328	0.313	0.168	0.050
Calcium	NA	2300	732	1210	1400	4300	5220	3880	1130	4420	27000	2780	100
Chromium	87	24.4	19.2	27	24.9	19.3	109	64.5	70.4	87	34.7	23.4	1.0
Cobalt	300	3.59	3.63	4.9	5.3	17.6	14.4	16.2	5.55	23.3	9.05	4.67	0.30
Copper	91	9.29	11.1	16.7	12.8	40.6	27.4	42.1	10.9	50.7	26.5	8.26	0.50
Iron	NA	21000	25900	27600	33200	14000	28600	36200	15000	41100	21300	18300	100
Lead	600	14.9	25.4	9.75	8.6	5.29	6.23	5.21	4.19	24.8	8.59	10	0.10
Lithium	NA	6.6	5.8	7.6	7.8	<5.0	10.6	22.5	<5.0	30.2	8.4	7.8	5.0
Magnesium	NA	3030	1470	2900	2970	1830	17300	10700	4550	13600	7200	3660	100
Manganese	NA	102	438	171	201	858	382	458	110	379	423	175	0.20
Mercury	50	<0.050	0.09	<0.050	<0.050	0.105	<0.050	<0.050	<0.050	<0.050	0.056	0.066	0.050
Molybdenum	40	0.58	2.32	1.55	1.11	1.4	0.64	0.7	0.84	0.98	0.53	0.63	0.10
Nickel	89	10.2	6.59	11.1	13.5	16	45	40.6	67.9	56.7	21.8	12.5	0.80
Phosphorus	NA	351	209	337	237	1220	493	688	284	560	500	560	10
Potassium	NA	464	790	362	427	410	6640	4670	518	3950	2190	514	100
Selenium	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.119	<0.050	<0.050	<0.050	0.79	0.158	0.067	0.057	0.243	0.1	0.101	0.050
Sodium	NA	140	<100	<100	<100	143	125	211	113	189	246	173	100
Strontium	NA	17.7	9.34	14.1	11.8	31.5	35.6	21.1	11	22.2	107	20.9	0.10
Thallium	1	0.105	0.299	0.153	0.138	0.109	0.238	0.279	0.058	0.374	0.197	0.131	0.050
Tin	300	0.38	1.51	0.62	0.66	0.14	0.33	0.59	0.36	0.45	0.38	0.48	0.10
Titanium	NA	682	973	670	962	157	1540	1910	705	2140	724	714	1.0
Uranium	300	3.6	2.16	0.735	0.691	1.84	0.518	0.823	0.309	0.728	2.91	2.44	0.050
Vanadium	130	56.9	59.7	75	72	26.5	77.1	99	46.9	112	41.9	43.6	2.0
Zinc	360	40.6	45.2	33.4	34.9	27.9	62.4	64.2	20.3	97.7	62.6	47.1	1.0
Zirconium	NA	3.47	2.76	1.2	1.51	0.54	2.83	3.44	0.64	3.27	3.65	1.68	0.50
pH	6-8	4.73	5.04	4.4	4.69	4.96	5.46	5.46	4.67	5.38	7.42	4.78	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)
[3] R = replicate sample
[4] Reportable Detection Limit (RDL)

2016 Soil trace metal analysis (n=40), sample sites CCTMAS-621 to CCTMBS-629

Parameter[1]	CCME Ind[2]	CCTMBS-621	CCTMAS-622-	CCTMAS-622-R[3]	CCTMAS-623	CCTMBS-624	CCTMBS-625	CCTMBS-625-R[3]	CCTMAS-626	CCTMAS-627	CCTMAS-628	CCTMBS-629	RDL[4]
Aluminum	NA	11000	15600	17000	10200	13400	10900	9270	8130	3000	10900	25400	100
Antimony	40	0.13	0.29	0.28	1.2	11.2	0.66	0.41	0.22	0.23	0.34	0.41	0.10
Arsenic	12	2.65	7.75	9.71	20.9	16.9	11.8	5.85	1.92	2.36	6.53	8.8	0.50
Barium	2000	82.9	171	186	73	131	42.6	38.1	80.3	39.3	85.8	146	0.10
Beryllium	8	<0.40	<0.40	<0.40	<0.40	0.47	<0.40	<0.40	<0.40	<0.40	<0.40	0.4	0.40
Bismuth	NA	0.12	0.14	0.18	0.11	0.16	0.14	0.12	<0.10	<0.10	0.13	0.25	0.10
Cadmium	22	0.131	0.101	0.155	0.246	0.243	0.178	0.212	0.261	0.25	0.179	0.235	0.050
Calcium	NA	2760	2860	2740	1840	3590	1170	686	1930	958	1420	2670	100
Chromium	87	34.4	26.8	33.8	21	28.1	16.5	11.4	18.3	8.3	21.4	41	1.0
Cobalt	300	4.7	8.55	10.2	5.03	12	3.47	3.08	2.99	1.37	5.89	9.11	0.30
Copper	91	10.6	11.3	11.6	10.9	9.88	7.82	8.65	10.4	9.12	11.7	11.9	0.50
Iron	NA	14700	24300	25900	16600	28100	16200	13600	9770	6460	18700	33600	100
Lead	600	6.38	6.53	8.16	5.92	10.3	8.69	6.08	3.55	2.27	7.93	12.4	0.10
Lithium	NA	<5.0	8.9	10.3	<5.0	5.8	5.3	<5.0	<5.0	<5.0	<5.0	18.6	5.0
Magnesium	NA	4130	4420	5120	2380	6280	2050	812	2300	426	3570	6390	100
Manganese	NA	127	274	426	132	602	149	340	62.3	38.7	218	250	0.20
Mercury	50	0.061	<0.050	<0.050	0.086	<0.050	<0.050	<0.050	0.053	0.062	<0.050	<0.050	0.050
Molybdenum	40	0.56	0.85	1.36	1.2	0.9	0.82	0.83	0.64	0.64	0.74	1.34	0.10
Nickel	89	10.9	14.6	16.2	10.6	10.6	6.84	3.64	7.75	3.57	11	22.1	0.80
Phosphorus	NA	500	283	356	460	393	264	214	491	643	390	234	10
Potassium	NA	1090	610	736	559	2480	582	393	533	340	590	1170	100
Selenium	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.068	0.055	0.072	0.082	0.082	0.053	0.073	0.096	0.112	0.064	0.077	0.050
Sodium	NA	110	153	122	106	<100	128	137	152	144	103	<100	100
Strontium	NA	21.2	20.1	22.8	14.5	19.5	9.74	7.77	15.5	8.9	13.1	19.9	0.10
Thallium	1	0.11	0.125	0.189	0.101	0.161	0.106	0.08	0.116	<0.050	0.12	0.206	0.050
Tin	300	0.41	0.43	0.58	0.34	0.94	0.4	0.34	0.37	0.15	0.38	0.84	0.10
Titanium	NA	702	819	1110	581	656	592	480	434	125	636	854	1.0
Uranium	300	1.17	0.49	0.526	1.43	0.893	0.545	0.676	0.985	0.369	0.507	0.612	0.050
Vanadium	130	25.8	52.4	71.2	44.2	65.6	34.6	30.5	21.3	17.5	55.3	79.8	2.0
Zinc	360	29.2	29.7	34.3	23.4	48.4	24.4	15.7	17.8	17.6	34.7	67.3	1.0
Zirconium	NA	1.58	1.02	1.33	1	0.97	0.86	0.8	0.59	0.66	1.4	3.98	0.50
pH	6-8	4.32	5.09	4.71	4.39	4.64	4.46	4.73	4.48	4.06	4.17	4.92	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)
[3] R = replicate sample
[4] Reportable Detection Limit (RDL)

2016 Soil trace metal analysis (n=40), sample sites CCTMBS-630 to CCTMRS-639-R

Parameter[1]	CCME Ind[2]	CCTMBS-630	CCTMAS-631	CCTMAS-632	CCTMBS-633	CCTMBS-634	CCTMRS-635	CCTMRS-636	CCTMRS-637	CCTMRS-638	CCTMRS-639	CCTMRS-639-R[3]	RDL[4]
Aluminum	NA	15300	12100	21300	23100	11400	7670	17500	21800	6500	13000	7550	100
Antimony	40	0.28	3.31	0.36	0.22	0.56	0.28	0.51	0.38	0.13	0.35	0.23	0.10
Arsenic	12	6.06	22.9	9.61	5.71	10	5.93	7.04	7.63	1.42	6.94	4.2	0.50
Barium	2000	110	66.6	149	222	335	197	639	129	172	138	57	0.10
Beryllium	8	0.42	<0.40	1	<0.40	0.41	<0.40	0.62	0.48	<0.40	<0.40	<0.40	0.40
Bismuth	NA	0.14	0.32	0.27	0.15	0.14	<0.10	0.16	0.13	<0.10	0.33	0.82	0.10
Cadmium	22	0.164	0.178	0.517	0.107	0.251	0.415	0.686	0.172	0.434	0.192	0.55	0.050
Calcium	NA	2910	1250	4200	7090	22100	6870	6310	3090	2420	3300	1290	100
Chromium	87	23.4	27.9	34.8	95	32.4	291	29.6	34.1	9.2	28.8	20	1.0
Cobalt	300	7.64	6.36	9.15	14.8	10.7	26.5	30.5	12.1	2.9	10.4	5.7	0.30
Copper	91	10.9	11.2	21.1	35.5	21.4	58.5	33.8	24.3	36.5	22.7	21.6	0.50
Iron	NA	20200	21800	27200	20100	21600	18500	27300	31500	8230	25100	16400	100
Lead	600	5.34	20	18.3	3.72	6.37	2.54	9.22	7.62	5.42	37.6	26.5	0.10
Lithium	NA	6.2	5.3	11.3	11.7	8.5	<5.0	6.5	12.7	<5.0	9	<5.0	5.0
Magnesium	NA	4700	3330	7160	11300	6090	15300	2620	6700	654	6540	3030	100
Manganese	NA	143	392	444	214	420	999	11600	357	41.4	332	163	0.20
Mercury	50	<0.050	0.095	<0.050	<0.050	0.061	0.07	0.137	<0.050	0.065	<0.050	0.056	0.050
Molybdenum	40	0.53	1.19	1.57	0.19	0.57	0.56	2.66	0.94	0.79	0.93	0.74	0.10
Nickel	89	13.4	13.2	16.8	53.5	23.1	290	36.4	23.8	9.02	16.9	8.51	0.80
Phosphorus	NA	390	421	502	343	472	686	1310	417	629	537	613	10
Potassium	NA	1310	686	1500	915	2300	378	589	739	361	685	555	100
Selenium	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50	0.50
Silver	40	0.101	0.111	0.37	<0.050	0.098	0.13	0.428	<0.050	0.203	0.144	0.229	0.050
Sodium	NA	<100	<100	209	345	178	<100	143	<100	143	123	119	100
Strontium	NA	19.2	10.7	34	67.1	173	25.1	38.9	20.1	20.5	22.3	12.4	0.10
Thallium	1	0.133	0.114	0.269	0.127	0.173	0.105	0.233	0.088	<0.050	0.093	<0.050	0.050
Tin	300	0.64	0.61	1.05	0.32	0.35	<0.10	0.3	0.51	0.11	0.32	0.22	0.10
Titanium	NA	808	672	1040	672	673	248	248	781	95.6	940	419	1.0
Uranium	300	1.88	1.3	3.36	0.505	1.9	0.23	1.43	0.852	1.5	0.473	0.403	0.050
Vanadium	130	41	50.6	65	36.2	37.8	22.5	45	65.8	13.2	58.9	40.8	2.0
Zinc	360	27.5	33.2	80.3	29.3	39.1	41.4	72.2	54.6	11.7	53.3	30	1.0
Zirconium	NA	1.54	0.88	3.31	1.15	4	0.61	0.61	1.19	<0.50	1.03	0.7	0.50
pH	6-8	4.76	4.31	5.14	6.2	6.85	6.72	5.57	5.18	4.54	4.73	4.02	NA

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] Industrial Soil Quality Guidelines provided by the Canadian Council of Ministers of the Environment (CCME)

[3] R = replicate sample

[4] Reportable Detection Limit (RDL)

APPENDIX I. VEGETATION AND SOIL TRACE METALS SAMPLING CERTIFICATE OF ANALYSIS, QUALITY ASSURANCE REPORT & RAW LABORATORY RESULTS

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

Attention:Anne MacLeod
EDI ENVIRONMENTAL DYNAMICS INC.
2195 2nd Avenue
WHITEHORSE, YT
CANADA Y1A 3T8

Your C.O.C. #: 08396125, 08396126, 08396127, 08396128, 08396129, 08396130, 08396131, 08396132, 08396133, 08396134, 08396135, 08396136, 08396122, 08396123, 08396124

Report Date: 2014/10/31
Report #: R1675669
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B473400
Received: 2014/08/21, 14:45

Sample Matrix: VEGETATION
Samples Received: 110

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by CRC ICPMS (total) - Plant	18	2014/10/03	2014/10/09	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total) - Plant	18	2014/10/08	2014/10/11	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total) - Plant	10	2014/10/16	2014/10/18	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total) - Plant	24	2014/10/17	2014/10/24	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total) - Plant	39	2014/10/17	2014/10/29	BBY7SOP-00002	EPA 6020A R1 m
Elements by CRC ICPMS (total) - Plant	1	2014/10/17	2014/10/31	BBY7SOP-00002	EPA 6020A R1 m

Sample Matrix: Soil
Samples Received: 42

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	40	2014/08/24	2014/08/26	BBY7SOP-00001	EPA 6020a R1 m
Elements by ICPMS (total)	2	2014/08/25	2014/08/27	BBY7SOP-00001	EPA 6020a R1 m
pH (2:1 DI Water Extract)	40	2014/08/25	2014/08/25	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	2	2014/08/26	2014/08/26	BBY6SOP-00028	BCMOE BCLM Mar2005 m

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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

Your Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

Attention:Anne MacLeod

EDI ENVIRONMENTAL DYNAMICS INC.
2195 2nd Avenue
WHITEHORSE, YT
CANADA Y1A 3T8

Your C.O.C. #: 08396125, 08396126, 08396127, 08396128, 08396129, 08396130, 08396131, 08396132, 08396133, 08396134, 08396135, 08396136, 08396122, 08396123, 08396124

Report Date: 2014/10/31
Report #: R1675669
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B473400
Received: 2014/08/21, 14:45

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Graham Rudkin, Project Manager, Environmental
Email: [phone number redacted]
Phone# [email redacted]
==
This report has been generated and distributed using a secure automated process.
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 #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2326	KK2327	KK2328	KK2329	KK2330	KK2331		
Sampling Date		2014/08/04	2014/08/04	2014/08/04	2014/08/03	2014/08/03	2014/08/01		
COC Number		08396125	08396125	08396125	08396125	08396125	08396125		
	Units	**CCHMWC-59**	**CCHMCA-50**	**CCHMLC-55**	**CCHMWA-851**	**CCHMWA-851 REP2**	**CCHMCA-21**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9.3	52.5	139	136	295	53.1	1.0	7665088
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	0.0083	0.0446	0.0982	<0.0050	0.0050	7665088
Total Arsenic (As)	mg/kg	<0.050	0.058	0.109	0.679	1.48	<0.050	0.050	7665088
Total Barium (Ba)	mg/kg	14.9	36.0	5.11	42.6	54.6	41.5	0.10	7665088
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Boron (B)	mg/kg	4.6	6.1	<2.0	<2.0	3.7	3.3	2.0	7665088
Total Cadmium (Cd)	mg/kg	0.951	<0.010	0.025	0.522	0.484	0.027	0.010	7665088
Total Calcium (Ca)	mg/kg	5880	3640	727	5720	6920	3560	10	7665088
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.24	1.18	1.71	<0.20	0.20	7665088
Total Cobalt (Co)	mg/kg	0.283	<0.020	0.101	1.04	1.61	0.027	0.020	7665088
Total Copper (Cu)	mg/kg	3.39	2.78	1.04	3.10	3.35	2.88	0.050	7665088
Total Iron (Fe)	mg/kg	58	27	180	234	490	40	10	7665088
Total Lead (Pb)	mg/kg	0.022	0.019	0.155	0.078	0.154	0.024	0.010	7665088
Total Magnesium (Mg)	mg/kg	2140	808	300	2090	3090	737	10	7665088
Total Manganese (Mn)	mg/kg	241	1710	121	171	266	1230	0.10	7665088
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7665088
Total Molybdenum (Mo)	mg/kg	0.070	0.055	<0.050	0.063	0.139	0.058	0.050	7665088
Total Nickel (Ni)	mg/kg	0.915	0.201	0.429	2.84	2.95	0.359	0.050	7665088
Total Phosphorus (P)	mg/kg	927	482	367	1440	1810	682	10	7665088
Total Potassium (K)	mg/kg	4760	2600	894	6550	7390	3090	10	7665088
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7665088
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7665088
Total Sodium (Na)	mg/kg	<10	<10	15	<10	<10	<10	10	7665088
Total Strontium (Sr)	mg/kg	29.3	3.35	2.22	41.5	44.1	3.85	0.10	7665088
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0026	0.0042	0.0070	<0.0020	0.0020	7665088
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Titanium (Ti)	mg/kg	<1.0	<1.0	6.5	10.0	14.4	1.3	1.0	7665088
Total Uranium (U)	mg/kg	<0.0020	<0.0020	0.0065	0.0096	0.0201	<0.0020	0.0020	7665088
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.36	0.47	0.96	<0.20	0.20	7665088
Total Zinc (Zn)	mg/kg	107	14.5	9.66	28.6	79.5	16.8	0.20	7665088
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2332	KK2333	KK2334	KK2335	KK2336	KK2337		
Sampling Date		2014/08/04	2014/08/03	2014/08/01	2014/08/04	2014/08/01	2014/08/04		
COC Number		08396125	08396125	08396125	08396125	08396125	08396125		
	Units	**CCHMWA-50**	**CCHMCA-851 REP2**	**CCHMWB-20**	**CCHMLB-49**	**CCHMLB-20**	**CCHMCC-55**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	16.8	123	11.8	136	95.2	67.4	1.0	7665088
Total Antimony (Sb)	mg/kg	<0.0050	0.0221	<0.0050	0.0087	0.0184	<0.0050	0.0050	7665088
Total Arsenic (As)	mg/kg	0.124	0.396	<0.050	0.155	0.291	<0.050	0.050	7665088
Total Barium (Ba)	mg/kg	11.0	41.7	15.6	5.48	13.6	34.3	0.10	7665088
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Boron (B)	mg/kg	3.8	4.2	6.9	<2.0	<2.0	3.3	2.0	7665088
Total Cadmium (Cd)	mg/kg	0.951	<0.010	0.671	0.035	0.026	<0.010	0.010	7665088
Total Calcium (Ca)	mg/kg	3310	3020	8530	692	1600	3050	10	7665088
Total Chromium (Cr)	mg/kg	<0.20	0.41	<0.20	0.22	0.24	<0.20	0.20	7665088
Total Cobalt (Co)	mg/kg	0.186	0.055	0.257	0.123	0.072	0.025	0.020	7665088
Total Copper (Cu)	mg/kg	1.99	2.41	2.72	1.24	1.51	2.52	0.050	7665088
Total Iron (Fe)	mg/kg	44	111	41	175	145	24	10	7665088
Total Lead (Pb)	mg/kg	0.022	0.049	0.023	0.185	0.125	0.019	0.010	7665088
Total Magnesium (Mg)	mg/kg	1030	789	1240	284	260	810	10	7665088
Total Manganese (Mn)	mg/kg	503	1090	136	138	23.4	1170	0.10	7665088
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7665088
Total Molybdenum (Mo)	mg/kg	0.082	0.069	0.160	<0.050	0.057	0.059	0.050	7665088
Total Nickel (Ni)	mg/kg	0.888	0.313	1.49	0.405	0.319	0.208	0.050	7665088
Total Phosphorus (P)	mg/kg	736	629	749	361	404	641	10	7665088
Total Potassium (K)	mg/kg	5000	3110	11400	916	1150	2720	10	7665088
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7665088
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7665088
Total Sodium (Na)	mg/kg	11	<10	<10	13	12	<10	10	7665088
Total Strontium (Sr)	mg/kg	19.3	3.50	18.3	2.28	4.33	3.07	0.10	7665088
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7665088
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Titanium (Ti)	mg/kg	<1.0	4.9	<1.0	6.6	4.7	<1.0	1.0	7665088
Total Uranium (U)	mg/kg	<0.0020	0.0053	<0.0020	0.0117	0.0048	<0.0020	0.0020	7665088
Total Vanadium (V)	mg/kg	<0.20	0.23	<0.20	0.33	0.24	<0.20	0.20	7665088
Total Zinc (Zn)	mg/kg	135	10.2	94.1	9.57	10.2	13.6	0.20	7665088
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2359	KK2360	KK2361	KK2362	KK2363	KK2364		
Sampling Date		2014/08/04	2014/08/04	2014/08/02	2014/08/03	2014/08/02	2014/08/02		
COC Number		08396126	08396126	08396126	08396126	08396126	08396126		
	Units	CCHMLA-21	CCHMWC-55	CCHMWB-28A	CCHMLA-39	CCHMCB-28A	CCHMHA-30A	RDL	QC Batch
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	136	36.3	18.0	96.1	76.4	35.1	1.0	7665088
Total Antimony (Sb)	mg/kg	0.0117	<0.0050	<0.0050	0.0123	<0.0050	<0.0050	0.0050	7665088
Total Arsenic (As)	mg/kg	0.223	<0.050	<0.050	0.166	<0.050	0.208	0.050	7665088
Total Barium (Ba)	mg/kg	6.65	28.8	13.9	5.58	49.2	32.5	0.10	7665088
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Boron (B)	mg/kg	<2.0	4.3	4.7	<2.0	4.9	12.0	2.0	7665088
Total Cadmium (Cd)	mg/kg	0.031	0.606	0.589	0.038	<0.010	0.045	0.010	7665088
Total Calcium (Ca)	mg/kg	822	7160	4680	694	4010	15500	10	7665088
Total Chromium (Cr)	mg/kg	0.32	<0.20	<0.20	0.21	<0.20	<0.20	0.20	7665088
Total Cobalt (Co)	mg/kg	0.109	0.686	1.91	0.077	0.029	0.160	0.020	7665088
Total Copper (Cu)	mg/kg	0.928	4.26	2.29	1.04	2.07	5.51	0.050	7665088
Total Iron (Fe)	mg/kg	201	67	56	135	31	80	10	7665088
Total Lead (Pb)	mg/kg	0.169	0.034	0.021	0.118	0.026	0.064	0.010	7665088
Total Magnesium (Mg)	mg/kg	227	2950	1270	205	862	2040	10	7665088
Total Manganese (Mn)	mg/kg	51.1	166	517	82.0	1580	96.2	0.10	7665088
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.010	7665088
Total Molybdenum (Mo)	mg/kg	<0.050	0.059	0.093	<0.050	<0.050	0.460	0.050	7665088
Total Nickel (Ni)	mg/kg	0.389	3.21	1.02	0.287	0.169	0.206	0.050	7665088
Total Phosphorus (P)	mg/kg	272	1040	834	258	480	1100	10	7665088
Total Potassium (K)	mg/kg	663	5370	5990	831	2420	27000	10	7665088
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7665088
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7665088
Total Sodium (Na)	mg/kg	11	<10	11	11	<10	25	10	7665088
Total Strontium (Sr)	mg/kg	2.58	38.5	22.8	1.79	3.80	120	0.10	7665088
Total Thallium (Tl)	mg/kg	<0.0020	0.0028	<0.0020	<0.0020	<0.0020	0.0029	0.0020	7665088
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7665088
Total Titanium (Ti)	mg/kg	7.2	1.4	<1.0	5.1	<1.0	2.2	1.0	7665088
Total Uranium (U)	mg/kg	0.0067	<0.0020	<0.0020	0.0068	<0.0020	0.0105	0.0020	7665088
Total Vanadium (V)	mg/kg	0.36	<0.20	<0.20	0.23	<0.20	<0.20	0.20	7665088
Total Zinc (Zn)	mg/kg	11.6	35.0	92.9	8.49	11.2	14.3	0.20	7665088
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2365	KK2366	KK2367	KK2368	KK2369	KK2370		
Sampling Date		2014/08/04	2014/08/02	2014/08/04	2014/08/04	2014/08/04	2014/08/03		
COC Number		08396126	08396126	08396126	08396126	08396126	08396126		
	Units	**CCHMCB-49**	**CCHMLB-28A**	**CCHMHC-59**	**CCHMWB-49**	**CCHMLA-49**	**CCHMLA-38**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	39.1	117	12.6	24.1	121	140	1.0	7671661
Total Antimony (Sb)	mg/kg	<0.0050	0.0117	<0.0050	<0.0050	0.0447	0.0128	0.0050	7671661
Total Arsenic (As)	mg/kg	<0.050	0.131	<0.050	0.063	3.11	0.175	0.050	7671661
Total Barium (Ba)	mg/kg	22.1	4.31	82.6	22.4	5.03	7.03	0.10	7671661
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Boron (B)	mg/kg	3.4	<2.0	14.2	6.2	<2.0	<2.0	2.0	7671661
Total Cadmium (Cd)	mg/kg	<0.010	0.051	0.083	1.20	0.027	0.027	0.010	7671661
Total Calcium (Ca)	mg/kg	2140	691	21800	5810	798	548	10	7671661
Total Chromium (Cr)	mg/kg	<0.20	0.29	<0.20	<0.20	0.26	0.35	0.20	7671661
Total Cobalt (Co)	mg/kg	<0.020	0.120	0.552	0.282	0.096	0.117	0.020	7671661
Total Copper (Cu)	mg/kg	1.78	3.38	4.30	3.31	1.30	1.27	0.050	7671661
Total Iron (Fe)	mg/kg	13	203	140	56	185	206	10	7671661
Total Lead (Pb)	mg/kg	<0.010	0.205	0.029	0.039	0.172	0.153	0.010	7671661
Total Magnesium (Mg)	mg/kg	625	269	3990	1920	316	235	10	7671661
Total Manganese (Mn)	mg/kg	903	128	247	276	151	63.7	0.10	7671661
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7671661
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	0.133	0.053	0.054	<0.050	0.050	7671661
Total Nickel (Ni)	mg/kg	0.117	0.589	0.621	1.45	0.336	0.383	0.050	7671661
Total Phosphorus (P)	mg/kg	471	260	1230	928	454	274	10	7671661
Total Potassium (K)	mg/kg	2120	741	29200	7350	1090	621	10	7671661
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7671661
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7671661
Total Sodium (Na)	mg/kg	<10	<10	31	<10	<10	<10	10	7671661
Total Strontium (Sr)	mg/kg	2.05	1.86	113	29.9	2.05	2.08	0.10	7671661
Total Thallium (Tl)	mg/kg	<0.0020	0.0026	0.0048	0.0037	0.0026	<0.0020	0.0020	7671661
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Titanium (Ti)	mg/kg	<1.0	6.4	<1.0	1.2	5.1	7.8	1.0	7671661
Total Uranium (U)	mg/kg	<0.0020	0.0191	0.0041	<0.0020	0.0208	0.0087	0.0020	7671661
Total Vanadium (V)	mg/kg	<0.20	0.35	<0.20	<0.20	0.32	0.35	0.20	7671661
Total Zinc (Zn)	mg/kg	10.4	8.75	40.1	146	14.4	9.71	0.20	7671661
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2384	KK2385	KK2387	KK2388	KK2390	KK2391		
Sampling Date		2014/08/01	2014/08/01	2014/08/03	2014/08/03	2014/08/03	2014/08/03		
COC Number		08396127	08396127	08396127	08396127	08396127	08396127		
	Units	**CCHMCB-20**	**CCHMWA-21**	**CCHMCA-39**	**CCHMWA-39**	**CCHMCA-38**	**CCHMCA-851**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	8.3	13.0	49.6	9.4	63.6	100	1.0	7671661
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0217	0.0050	7671661
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.320	0.050	7671661
Total Barium (Ba)	mg/kg	46.8	23.6	54.0	25.5	56.5	40.8	0.10	7671661
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Boron (B)	mg/kg	5.7	2.2	6.8	5.5	3.2	3.3	2.0	7671661
Total Cadmium (Cd)	mg/kg	<0.010	0.721	<0.010	0.627	<0.010	<0.010	0.010	7671661
Total Calcium (Ca)	mg/kg	2930	7430	4230	5670	3960	3090	10	7671661
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.25	0.54	0.20	7671661
Total Cobalt (Co)	mg/kg	<0.020	0.443	<0.020	0.244	0.028	0.054	0.020	7671661
Total Copper (Cu)	mg/kg	1.47	3.39	2.20	2.42	2.57	1.96	0.050	7671661
Total Iron (Fe)	mg/kg	15	42	37	38	41	113	10	7671661
Total Lead (Pb)	mg/kg	<0.010	0.014	0.018	0.027	0.034	0.048	0.010	7671661
Total Magnesium (Mg)	mg/kg	589	2080	864	1310	886	776	10	7671661
Total Manganese (Mn)	mg/kg	225	247	1120	200	1260	1080	0.10	7671661
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7671661
Total Molybdenum (Mo)	mg/kg	<0.050	0.087	<0.050	0.086	0.101	<0.050	0.050	7671661
Total Nickel (Ni)	mg/kg	0.080	3.83	0.156	0.276	0.254	0.446	0.050	7671661
Total Phosphorus (P)	mg/kg	512	1020	546	657	748	777	10	7671661
Total Potassium (K)	mg/kg	2850	7040	2740	8300	3040	3040	10	7671661
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7671661
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7671661
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	7671661
Total Strontium (Sr)	mg/kg	3.59	21.4	3.42	18.5	3.87	2.77	0.10	7671661
Total Thallium (Tl)	mg/kg	<0.0020	0.0040	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	7671661
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.0	<1.0	1.2	5.2	1.0	7671661
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0057	0.0020	7671661
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7671661
Total Zinc (Zn)	mg/kg	11.9	49.2	13.9	65.6	13.6	12.0	0.20	7671661

RDL = Reportable Detection Limit

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

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2394	KK2416	KK2428	KK2430	KK2431	KK2432		
Sampling Date		2014/08/03	2014/08/02	2014/08/09	2014/08/08	2014/08/06	2014/08/10		
COC Number		08396127	08396128	08396129	08396129	08396129	08396129		
	Units	**CCHMWA-38**	**CCHMWA-30A**	**CCHMHB-419**	**CCHMLA-98**	**CCHMWB-76**	**CCHMCC-438**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	27.0	6.2	11.9	104	26.8	69.5	1.0	7671661
Total Antimony (Sb)	mg/kg	0.0052	<0.0050	<0.0050	0.0095	<0.0050	<0.0050	0.0050	7671661
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.136	<0.050	<0.050	0.050	7671661
Total Barium (Ba)	mg/kg	35.2	8.25	12.5	5.29	12.5	49.2	0.10	7671661
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Boron (B)	mg/kg	3.3	3.5	5.5	<2.0	7.9	3.6	2.0	7671661
Total Cadmium (Cd)	mg/kg	0.592	0.290	1.98	0.040	0.804	0.016	0.010	7671661
Total Calcium (Ca)	mg/kg	7820	3860	6720	791	13500	3230	10	7671661
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	0.35	0.24	<0.20	0.20	7671661
Total Cobalt (Co)	mg/kg	1.51	0.575	0.204	0.129	0.180	0.068	0.020	7671661
Total Copper (Cu)	mg/kg	4.49	2.76	3.04	1.61	2.17	3.49	0.050	7671661
Total Iron (Fe)	mg/kg	64	44	40	189	58	32	10	7671661
Total Lead (Pb)	mg/kg	0.042	0.013	0.018	0.155	0.031	0.018	0.010	7671661
Total Magnesium (Mg)	mg/kg	3080	805	1960	235	3110	719	10	7671661
Total Manganese (Mn)	mg/kg	164	328	632	113	195	1050	0.10	7671661
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7671661
Total Molybdenum (Mo)	mg/kg	0.323	0.109	<0.050	0.072	0.514	<0.050	0.050	7671661
Total Nickel (Ni)	mg/kg	3.66	0.635	0.905	0.448	0.997	0.435	0.050	7671661
Total Phosphorus (P)	mg/kg	2310	960	862	323	664	746	10	7671661
Total Potassium (K)	mg/kg	10900	7600	4560	839	5060	3210	10	7671661
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7671661
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7671661
Total Sodium (Na)	mg/kg	<10	17	12	<10	<10	<10	10	7671661
Total Strontium (Sr)	mg/kg	44.5	29.1	32.8	2.90	37.3	7.03	0.10	7671661
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0020	<0.0020	0.0023	<0.0020	0.0020	7671661
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7671661
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	6.2	1.8	<1.0	1.0	7671661
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	0.0075	<0.0020	0.0065	0.0020	7671661
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	0.32	<0.20	<0.20	0.20	7671661
Total Zinc (Zn)	mg/kg	43.1	39.7	201	9.66	147	9.58	0.20	7671661

RDL = Reportable Detection Limit

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

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2433	KK2434	KK2435	KK2436	KK2437	KK2438		
Sampling Date		2014/08/10	2014/08/03	2014/08/08	2014/08/11	2014/08/12	2014/08/05		
COC Number		08396129	08396129	08396129	08396129	08396129	08396129		
	Units	**CCHMWC-438**	**CCHMLA-851 REP1**	**CCHMWB-410**	**CCHMCB-440**	**CCHMHB-138**	**CCHMCC-69**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9.6	375	28.5	52.3	16.2	68.7	1.0	7680437
Total Antimony (Sb)	mg/kg	<0.0050	0.0991	0.0057	<0.0050	<0.0050	0.0053	0.0050	7680437
Total Arsenic (As)	mg/kg	<0.050	1.67	0.053	<0.050	0.062	<0.050	0.050	7680437
Total Barium (Ba)	mg/kg	13.0	6.32	19.8	143	59.3	66.7	0.10	7680437
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7680437
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7680437
Total Boron (B)	mg/kg	7.5	<2.0	4.7	10.2	17.6	7.3	2.0	7680437
Total Cadmium (Cd)	mg/kg	0.526	0.048	0.558	0.024	0.079	0.014	0.010	7680437
Total Calcium (Ca)	mg/kg	8120	812	5340	7340	20700	5940	10	7680437
Total Chromium (Cr)	mg/kg	<0.20	1.07	<0.20	<0.20	<0.20	<0.20	0.20	7680437
Total Cobalt (Co)	mg/kg	1.00	0.276	0.263	0.036	0.052	<0.020	0.020	7680437
Total Copper (Cu)	mg/kg	3.27	2.21	4.07	3.39	4.00	9.12	0.050	7680437
Total Iron (Fe)	mg/kg	50	525	66	60	40	63	10	7680437
Total Lead (Pb)	mg/kg	0.027	0.290	0.042	0.038	0.018	0.151	0.010	7680437
Total Magnesium (Mg)	mg/kg	2170	483	1840	1250	2960	1100	10	7680437
Total Manganese (Mn)	mg/kg	308	158	92.6	527	50.8	2130	0.10	7680437
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7680437
Total Molybdenum (Mo)	mg/kg	0.106	0.062	0.101	<0.050	0.217	0.053	0.050	7680437
Total Nickel (Ni)	mg/kg	0.702	0.923	1.91	0.457	0.262	0.187	0.050	7680437
Total Phosphorus (P)	mg/kg	1330	630	1030	1010	882	677	10	7680437
Total Potassium (K)	mg/kg	9840	1390	6340	3930	27300	3130	10	7680437
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7680437
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7680437
Total Sodium (Na)	mg/kg	<10	23	<10	<10	27	<10	10	7680437
Total Strontium (Sr)	mg/kg	28.6	2.35	23.0	20.1	117	9.92	0.10	7680437
Total Thallium (Tl)	mg/kg	<0.0020	0.0067	<0.0020	<0.0020	0.0035	<0.0020	0.0020	7680437
Total Tin (Sn)	mg/kg	<0.10	0.12	<0.10	<0.10	<0.10	0.14	0.10	7680437
Total Titanium (Ti)	mg/kg	<1.0	24.1	1.4	1.7	<1.0	<1.0	1.0	7680437
Total Uranium (U)	mg/kg	<0.0020	0.0354	<0.0020	0.0025	0.0135	<0.0020	0.0020	7680437
Total Vanadium (V)	mg/kg	<0.20	1.07	<0.20	<0.20	<0.20	<0.20	0.20	7680437
Total Zinc (Zn)	mg/kg	38.1	19.3	57.2	26.5	30.8	20.6	0.20	7680437
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2439	KK2497	KK2498	KK2499		KK2500		
Sampling Date		2014/08/09	2014/08/09	2014/08/10	2014/08/10		2014/08/12		
COC Number		08396129	08396130	08396130	08396130		08396130		
	Units	**CCHMHB-422**	**CCHMWA-106**	**CCHMWB-120**	**CCHMHC-438**	**QC Batch**	**CCHMCB-138**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	43.7	27.1	94.7	8.4	7680437	70.5	1.0	7682773
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	7680437	<0.0050	0.0050	7682773
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	7680437	<0.050	0.050	7682773
Total Barium (Ba)	mg/kg	142	76.7	84.3	54.6	7680437	59.6	0.10	7682773
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	7680437	<0.10	0.10	7682773
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	7680437	<0.10	0.10	7682773
Total Boron (B)	mg/kg	11.8	2.2	11.1	8.9	7680437	5.7	2.0	7682773
Total Cadmium (Cd)	mg/kg	0.097	0.912	0.911	0.118	7680437	0.022	0.010	7682773
Total Calcium (Ca)	mg/kg	21500	13600	12100	18800	7680437	4820	10	7682773
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.35	<0.20	7680437	<0.20	0.20	7682773
Total Cobalt (Co)	mg/kg	0.326	1.98	1.31	0.144	7680437	<0.020	0.020	7682773
Total Copper (Cu)	mg/kg	2.98	3.22	2.99	3.61	7680437	2.56	0.050	7682773
Total Iron (Fe)	mg/kg	28	49	97	41	7680437	31	10	7682773
Total Lead (Pb)	mg/kg	0.031	0.059	0.057	0.042	7680437	0.026	0.010	7682773
Total Magnesium (Mg)	mg/kg	3120	2400	4000	3680	7680437	968	10	7682773
Total Manganese (Mn)	mg/kg	153	451	214	62.5	7680437	924	0.10	7682773
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	0.010	7680437	<0.010	0.010	7682773
Total Molybdenum (Mo)	mg/kg	0.186	0.081	0.109	0.188	7680437	0.064	0.050	7682773
Total Nickel (Ni)	mg/kg	1.18	3.84	3.15	0.328	7680437	0.199	0.050	7682773
Total Phosphorus (P)	mg/kg	1040	2300	2730	837	7680437	653	10	7682773
Total Potassium (K)	mg/kg	15600	8550	9730	22500	7680437	3100	10	7682773
Total Selenium (Se)	mg/kg	0.241	0.119	<0.050	<0.050	7680437	<0.050	0.050	7682773
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	7680437	<0.020	0.020	7682773
Total Sodium (Na)	mg/kg	<10	12	<10	<10	7680437	<10	10	7682773
Total Strontium (Sr)	mg/kg	71.8	66.3	86.1	88.4	7680437	9.87	0.10	7682773
Total Thallium (Tl)	mg/kg	0.0021	0.0025	0.0036	0.0070	7680437	<0.0020	0.0020	7682773
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	7680437	<0.10	0.10	7682773
Total Titanium (Ti)	mg/kg	<1.0	1.2	3.3	<1.0	7680437	1.0	1.0	7682773
Total Uranium (U)	mg/kg	<0.0020	0.0034	0.0040	<0.0020	7680437	<0.0020	0.0020	7682773
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	7680437	<0.20	0.20	7682773
Total Zinc (Zn)	mg/kg	23.2	26.3	77.2	9.30	7680437	22.4	0.20	7682773
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2501	KK2502	KK2503		KK2504	KK2505		
Sampling Date		2014/08/12	2014/08/05	2014/08/10		2014/08/06	2014/08/10		
COC Number		08396130	08396130	08396130		08396130	08396130		
	Units	**CCHMHA-135**	**CCHMHC-69**	**CCHMWC-436**	**QC Batch**	**CCHMLC-400**	**CCHMCB-120**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	5.8	17.0	6.1	7682773	112	37.2	1.0	7682966
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	7682773	<0.0050	<0.0050	0.0050	7682966
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	7682773	<0.050	<0.050	0.050	7682966
Total Barium (Ba)	mg/kg	18.6	38.0	33.4	7682773	53.0	62.1	0.10	7682966
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	7682773	<0.10	<0.10	0.10	7682966
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	7682773	<0.10	<0.10	0.10	7682966
Total Boron (B)	mg/kg	6.8	12.6	2.7	7682773	7.4	8.0	2.0	7682966
Total Cadmium (Cd)	mg/kg	0.081	0.133	0.780	7682773	0.040	<0.010	0.010	7682966
Total Calcium (Ca)	mg/kg	14000	18900	10600	7682773	4220	5890	10	7682966
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	7682773	<0.20	<0.20	0.20	7682966
Total Cobalt (Co)	mg/kg	0.067	0.419	0.535	7682773	0.042	0.022	0.020	7682966
Total Copper (Cu)	mg/kg	1.94	2.84	2.86	7682773	2.56	1.59	0.050	7682966
Total Iron (Fe)	mg/kg	19	65	30	7682773	57	66	10	7682966
Total Lead (Pb)	mg/kg	0.015	0.020	0.012	7682773	0.030	0.039	0.010	7682966
Total Magnesium (Mg)	mg/kg	1290	3120	1200	7682773	1150	761	10	7682966
Total Manganese (Mn)	mg/kg	32.1	228	33.0	7682773	1560	898	0.10	7682966
Total Mercury (Hg)	mg/kg	0.013	<0.010	<0.010	7682773	<0.010	<0.010	0.010	7682966
Total Molybdenum (Mo)	mg/kg	0.057	0.065	0.140	7682773	0.160	0.138	0.050	7682966
Total Nickel (Ni)	mg/kg	0.168	0.576	2.61	7682773	0.251	0.129	0.050	7682966
Total Phosphorus (P)	mg/kg	556	638	1060	7682773	795	480	10	7682966
Total Potassium (K)	mg/kg	13900	9500	9100	7682773	3350	2450	10	7682966
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.061	7682773	<0.050	<0.050	0.050	7682966
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	7682773	<0.020	<0.020	0.020	7682966
Total Sodium (Na)	mg/kg	<10	70	<10	7682773	<10	<10	10	7682966
Total Strontium (Sr)	mg/kg	48.7	99.1	36.7	7682773	6.01	11.7	0.10	7682966
Total Thallium (Tl)	mg/kg	<0.0020	0.0023	<0.0020	7682773	<0.0020	<0.0020	0.0020	7682966
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	7682773	<0.10	<0.10	0.10	7682966
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	7682773	1.8	2.5	1.0	7682966
Total Uranium (U)	mg/kg	<0.0020	0.0056	<0.0020	7682773	<0.0020	<0.0020	0.0020	7682966
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	7682773	<0.20	<0.20	0.20	7682966
Total Zinc (Zn)	mg/kg	6.04	38.3	16.2	7682773	16.7	16.0	0.20	7682966
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2506	KK2507	KK2508	KK2544	KK2545	KK2546		
Sampling Date		2014/08/06	2014/08/10	2014/08/09	2014/08/07	2014/08/10	2014/08/06		
COC Number		08396130	08396130	08396130	08396131	08396131	08396131		
	Units	**CCHMCB-76**	**CCHMHC-436**	**CCHMLA-106**	**CCHMWC-81**	**CCHMWB-113**	**CCHMWC-400**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	4.5	73.0	88.8	33.7	19.8	32.1	1.0	7682966
Total Antimony (Sb)	mg/kg	<0.0050	0.0059	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7682966
Total Arsenic (As)	mg/kg	<0.050	0.062	0.074	<0.050	<0.050	<0.050	0.050	7682966
Total Barium (Ba)	mg/kg	77.6	7.95	8.83	39.2	31.2	57.1	0.10	7682966
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Boron (B)	mg/kg	4.3	<2.0	<2.0	3.5	10.4	3.3	2.0	7682966
Total Cadmium (Cd)	mg/kg	0.107	0.045	0.049	0.669	0.973	1.24	0.010	7682966
Total Calcium (Ca)	mg/kg	16600	889	830	8640	9740	7450	10	7682966
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7682966
Total Cobalt (Co)	mg/kg	0.057	0.077	0.091	2.05	0.570	0.944	0.020	7682966
Total Copper (Cu)	mg/kg	3.11	1.20	1.24	3.03	2.81	2.52	0.050	7682966
Total Iron (Fe)	mg/kg	27	118	111	118	50	60	10	7682966
Total Lead (Pb)	mg/kg	<0.010	0.110	0.118	0.030	0.020	0.044	0.010	7682966
Total Magnesium (Mg)	mg/kg	1450	405	410	2580	2640	3080	10	7682966
Total Manganese (Mn)	mg/kg	39.1	129	134	331	141	250	0.10	7682966
Total Mercury (Hg)	mg/kg	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7682966
Total Molybdenum (Mo)	mg/kg	0.130	<0.050	<0.050	0.070	0.180	0.056	0.050	7682966
Total Nickel (Ni)	mg/kg	0.325	0.325	0.312	2.81	1.54	2.71	0.050	7682966
Total Phosphorus (P)	mg/kg	643	544	561	1170	2830	1810	10	7682966
Total Potassium (K)	mg/kg	12900	1310	1360	7110	7790	7290	10	7682966
Total Selenium (Se)	mg/kg	0.199	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682966
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682966
Total Sodium (Na)	mg/kg	<10	<10	13	<10	<10	244	10	7682966
Total Strontium (Sr)	mg/kg	50.7	2.84	2.99	54.6	31.0	54.3	0.10	7682966
Total Thallium (Tl)	mg/kg	<0.0020	0.0020	<0.0020	0.0040	0.0025	0.0038	0.0020	7682966
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Titanium (Ti)	mg/kg	<1.0	3.4	4.1	1.2	1.1	1.2	1.0	7682966
Total Uranium (U)	mg/kg	<0.0020	0.0031	0.0041	0.0048	<0.0020	<0.0020	0.0020	7682966
Total Vanadium (V)	mg/kg	<0.20	0.24	<0.20	<0.20	<0.20	<0.20	0.20	7682966
Total Zinc (Zn)	mg/kg	7.21	11.5	12.3	27.4	86.3	43.1	0.20	7682966
RDL = Reportable Detection Limit									

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

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2547	KK2548	KK2549	KK2551	KK2554	KK2571		
Sampling Date		2014/08/06	2014/08/10	2014/08/09	2014/08/08	2014/08/08	2014/08/09		
COC Number		08396131	08396131	08396131	08396131	08396131	08396132		
	Units	**CCHMCC-400**	**CCHMCC-436**	**CCHMHA-299**	**CCHMCA-98**	**CCHMLB-410**	**CCHMCB-422**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	117	34.1	35.0	58.0	107	73.1	1.0	7682966
Total Antimony (Sb)	mg/kg	0.0131	<0.0050	<0.0050	<0.0050	0.0125	<0.0050	0.0050	7682966
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.126	<0.050	0.050	7682966
Total Barium (Ba)	mg/kg	54.5	73.2	104	54.5	4.80	103	0.10	7682966
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Boron (B)	mg/kg	5.1	7.4	7.9	11.0	<2.0	4.6	2.0	7682966
Total Cadmium (Cd)	mg/kg	0.011	0.020	0.024	<0.010	0.030	<0.010	0.010	7682966
Total Calcium (Ca)	mg/kg	4130	3730	14100	5120	653	6270	10	7682966
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.24	<0.20	0.20	7682966
Total Cobalt (Co)	mg/kg	0.045	<0.020	0.084	<0.020	0.081	0.032	0.020	7682966
Total Copper (Cu)	mg/kg	3.07	2.16	2.04	3.72	1.52	2.41	0.050	7682966
Total Iron (Fe)	mg/kg	47	25	22	38	165	45	10	7682966
Total Lead (Pb)	mg/kg	0.055	0.027	0.049	0.018	0.159	0.026	0.010	7682966
Total Magnesium (Mg)	mg/kg	886	939	1990	1060	280	1170	10	7682966
Total Manganese (Mn)	mg/kg	1490	691	84.4	2010	103	1390	0.10	7682966
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7682966
Total Molybdenum (Mo)	mg/kg	0.072	0.109	0.063	0.077	<0.050	0.162	0.050	7682966
Total Nickel (Ni)	mg/kg	0.274	0.404	0.576	0.339	0.354	0.313	0.050	7682966
Total Phosphorus (P)	mg/kg	737	903	842	1090	361	711	10	7682966
Total Potassium (K)	mg/kg	3130	4190	12400	5190	951	3270	10	7682966
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682966
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682966
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	13	<10	10	7682966
Total Strontium (Sr)	mg/kg	5.90	3.29	68.4	3.54	1.73	8.91	0.10	7682966
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020	0.0020	7682966
Total Tin (Sn)	mg/kg	<0.10	0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Titanium (Ti)	mg/kg	1.2	<1.0	<1.0	<1.0	5.9	1.6	1.0	7682966
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	0.0065	<0.0020	0.0020	7682966
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.25	<0.20	0.20	7682966
Total Zinc (Zn)	mg/kg	16.4	17.3	12.7	20.6	10.4	14.9	0.20	7682966
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2572	KK2600	KK2606	KK2608	KK2610	KK2611		
Sampling Date		2014/08/09	2014/08/09	2014/08/07	2014/08/05	2014/08/09	2014/08/05		
COC Number		08396132	08396133	08396133	08396133	08396133	08396133		
	Units	CCHMWB-422	CCHMLB-422	CCHMLC-81	CCHMLC-62	CCHMCA-106	CCHMWC-62	RDL	QC Batch
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	28.2	98.0	140	140	59.8	41.4	1.0	7682966
Total Antimony (Sb)	mg/kg	<0.0050	0.0069	0.0120	0.0094	<0.0050	<0.0050	0.0050	7682966
Total Arsenic (As)	mg/kg	<0.050	0.097	0.148	0.137	<0.050	<0.050	0.050	7682966
Total Barium (Ba)	mg/kg	51.6	4.87	3.53	6.41	72.9	52.8	0.10	7682966
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Boron (B)	mg/kg	3.6	<2.0	<2.0	<2.0	4.4	3.8	2.0	7682966
Total Cadmium (Cd)	mg/kg	0.523	0.024	0.038	0.021	<0.010	1.80	0.010	7682966
Total Calcium (Ca)	mg/kg	11800	708	554	809	3790	12300	10	7682966
Total Chromium (Cr)	mg/kg	<0.20	0.24	0.28	0.31	<0.20	<0.20	0.20	7682966
Total Cobalt (Co)	mg/kg	1.34	0.081	0.111	0.117	0.038	1.01	0.020	7682966
Total Copper (Cu)	mg/kg	3.95	0.989	1.35	1.33	2.55	3.84	0.050	7682966
Total Iron (Fe)	mg/kg	78	156	198	217	35	72	10	7682966
Total Lead (Pb)	mg/kg	0.019	0.126	0.195	0.153	0.014	0.032	0.010	7682966
Total Magnesium (Mg)	mg/kg	2430	235	271	392	1070	3800	10	7682966
Total Manganese (Mn)	mg/kg	349	110	72.6	176	986	298	0.10	7682966
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7682966
Total Molybdenum (Mo)	mg/kg	0.144	<0.050	<0.050	<0.050	0.162	0.094	0.050	7682966
Total Nickel (Ni)	mg/kg	4.12	0.330	0.437	0.458	0.355	3.10	0.050	7682966
Total Phosphorus (P)	mg/kg	1880	339	295	454	919	1880	10	7682966
Total Potassium (K)	mg/kg	9910	933	853	1160	3880	9230	10	7682966
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682966
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682966
Total Sodium (Na)	mg/kg	<10	<10	14	31	<10	<10	10	7682966
Total Strontium (Sr)	mg/kg	34.3	1.94	1.70	2.19	6.84	81.9	0.10	7682966
Total Thallium (Tl)	mg/kg	<0.0020	0.0023	<0.0020	0.0025	<0.0020	0.0025	0.0020	7682966
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682966
Total Titanium (Ti)	mg/kg	1.3	4.9	7.5	6.7	<1.0	1.6	1.0	7682966
Total Uranium (U)	mg/kg	<0.0020	0.0047	0.0076	0.0066	<0.0020	0.0021	0.0020	7682966
Total Vanadium (V)	mg/kg	<0.20	0.24	0.39	0.38	<0.20	<0.20	0.20	7682966
Total Zinc (Zn)	mg/kg	75.4	10.8	8.31	8.01	15.7	43.9	0.20	7682966
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2617	KK2618	KK2619	KK2621	KK2625	KK2626		
Sampling Date		2014/08/08	2014/08/07	2014/08/06	2014/08/08	2014/08/05	2014/08/11		
COC Number		08396134	08396134	08396134	08396134	08396134	08396134		
	Units	**CCHMHB-92**	**CCHMCC-81**	**CCHMLB-76**	**CCHMCB-410**	**CCHMCC-62**	**CCHMCB-164**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	47.6	96.5	138	78.7	93.9	98.9	1.0	7682971
Total Antimony (Sb)	mg/kg	<0.0050	0.0055	0.0111	<0.0050	<0.0050	<0.0050	0.0050	7682971
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.127	<0.050	<0.050	0.051	0.050	7682971
Total Barium (Ba)	mg/kg	32.9	71.2	5.93	77.6	71.9	87.8	0.10	7682971
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682971
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682971
Total Boron (B)	mg/kg	12.4	6.1	<2.0	7.2	5.2	4.3	2.0	7682971
Total Cadmium (Cd)	mg/kg	0.131	0.017	0.042	0.010	<0.010	<0.010	0.010	7682971
Total Calcium (Ca)	mg/kg	17000	5540	962	5520	5650	5920	10	7682971
Total Chromium (Cr)	mg/kg	<0.20	<0.20	1.48	<0.20	<0.20	<0.20	0.20	7682971
Total Cobalt (Co)	mg/kg	0.098	0.036	0.134	0.026	0.027	0.054	0.020	7682971
Total Copper (Cu)	mg/kg	3.59	2.92	1.43	3.61	2.88	2.28	0.050	7682971
Total Iron (Fe)	mg/kg	30	52	207	56	41	45	10	7682971
Total Lead (Pb)	mg/kg	<0.010	0.036	0.187	0.035	0.024	0.026	0.010	7682971
Total Magnesium (Mg)	mg/kg	2010	1310	250	1370	1320	1260	10	7682971
Total Manganese (Mn)	mg/kg	45.4	2060	26.1	1540	1890	1800	0.10	7682971
Total Mercury (Hg)	mg/kg	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7682971
Total Molybdenum (Mo)	mg/kg	0.306	0.063	0.057	<0.050	0.128	0.105	0.050	7682971
Total Nickel (Ni)	mg/kg	0.378	0.260	1.17	0.290	0.268	0.290	0.050	7682971
Total Phosphorus (P)	mg/kg	1370	822	267	1170	947	848	10	7682971
Total Potassium (K)	mg/kg	28900	2950	978	4160	3390	3160	10	7682971
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682971
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682971
Total Sodium (Na)	mg/kg	35	<10	30	<10	<10	<10	10	7682971
Total Strontium (Sr)	mg/kg	76.2	5.30	2.86	7.05	6.22	11.1	0.10	7682971
Total Thallium (Tl)	mg/kg	0.0058	<0.0020	0.0021	<0.0020	0.0026	<0.0020	0.0020	7682971
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.30	<0.10	<0.10	<0.10	0.10	7682971
Total Titanium (Ti)	mg/kg	<1.0	2.9	7.4	1.2	1.1	1.3	1.0	7682971
Total Uranium (U)	mg/kg	0.0028	<0.0020	0.0084	0.0020	<0.0020	<0.0020	0.0020	7682971
Total Vanadium (V)	mg/kg	<0.20	<0.20	0.44	<0.20	<0.20	<0.20	0.20	7682971
Total Zinc (Zn)	mg/kg	22.9	21.0	12.8	28.7	12.9	22.2	0.20	7682971
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2628	KK2629	KK2630	KK2631	KK2632	KK2633		
Sampling Date		2014/08/13	2014/08/12	2014/08/12	2014/08/11	2014/08/11	2014/08/11		
COC Number		08396134	08396135	08396135	08396135	08396135	08396135		
	Units	**CCTMCC-BD1**	**CCHMWB-138**	**CCHMHB-455**	**CCHMCB-843**	**CCHMWB-164**	**CCHMCB-130**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	135	11.2	12500	76.9	36.7	177	1.0	7682971
Total Antimony (Sb)	mg/kg	0.0067	<0.0050	0.238	0.0289	<0.0050	<0.0050	0.0050	7682971
Total Arsenic (As)	mg/kg	<0.050	<0.050	6.13	0.205	<0.050	<0.050	0.050	7682971
Total Barium (Ba)	mg/kg	61.7	24.7	178	37.2	49.9	136	0.10	7682971
Total Beryllium (Be)	mg/kg	<0.10	<0.10	0.77	<0.10	<0.10	<0.10	0.10	7682971
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	0.26	<0.10	<0.10	<0.10	0.10	7682971
Total Boron (B)	mg/kg	9.2	7.7	<2.0	6.6	3.9	11.2	2.0	7682971
Total Cadmium (Cd)	mg/kg	<0.010	2.70	0.071	0.014	0.702	0.118	0.010	7682971
Total Calcium (Ca)	mg/kg	6660	8330	3920	3790	14200	6380	10	7682971
Total Chromium (Cr)	mg/kg	0.21	<0.20	44.7	0.28	<0.20	<0.20	0.20	7682971
Total Cobalt (Co)	mg/kg	0.034	0.218	10.4	0.040	1.98	0.103	0.020	7682971
Total Copper (Cu)	mg/kg	2.84	4.20	17.4	2.55	2.99	2.15	0.050	7682971
Total Iron (Fe)	mg/kg	71	55	27400	98	64	74	10	7682971
Total Lead (Pb)	mg/kg	0.050	0.015	11.0	0.047	0.032	0.039	0.010	7682971
Total Magnesium (Mg)	mg/kg	738	2250	4240	767	3040	1340	10	7682971
Total Manganese (Mn)	mg/kg	2580	434	402	1490	315	2870	0.10	7682971
Total Mercury (Hg)	mg/kg	<0.010	<0.010	0.032	<0.010	<0.010	<0.010	0.010	7682971
Total Molybdenum (Mo)	mg/kg	0.083	0.196	0.725	0.062	0.059	1.43	0.050	7682971
Total Nickel (Ni)	mg/kg	0.233	2.36	26.0	0.378	3.32	0.303	0.050	7682971
Total Phosphorus (P)	mg/kg	541	1510	713	951	1500	772	10	7682971
Total Potassium (K)	mg/kg	3170	7480	1540	4000	8410	3770	10	7682971
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.332	<0.050	<0.050	<0.050	0.050	7682971
Total Silver (Ag)	mg/kg	<0.020	<0.020	0.067	<0.020	<0.020	<0.020	0.020	7682971
Total Sodium (Na)	mg/kg	<10	<10	84	<10	<10	<10	10	7682971
Total Strontium (Sr)	mg/kg	4.13	45.0	27.6	4.56	67.3	9.66	0.10	7682971
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.154	0.0050	0.0075	0.0088	0.0020	7682971
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.44	<0.10	<0.10	<0.10	0.10	7682971
Total Titanium (Ti)	mg/kg	2.1	<1.0	349	3.1	1.3	1.9	1.0	7682971
Total Uranium (U)	mg/kg	0.0039	<0.0020	2.17	0.0079	<0.0020	0.0030	0.0020	7682971
Total Vanadium (V)	mg/kg	<0.20	<0.20	36.5	<0.20	<0.20	<0.20	0.20	7682971
Total Zinc (Zn)	mg/kg	17.9	294	52.3	18.5	31.2	18.1	0.20	7682971
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2634	KK2635	KK2636	KK2637	KK2638	KK2639		
Sampling Date		2014/08/11	2014/08/11	2014/08/13	2014/08/11	2014/08/11	2014/08/11		
COC Number		08396135	08396135	08396135	08396135	08396135	08396135		
	Units	**CCHMWB-843**	**CCHMWB-130**	**CCTMWC-BD1**	**CCHMLB-843**	**CCHMLB-164**	**CCHMHB-440**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	53.7	52.0	42.8	295	122	6.7	1.0	7682971
Total Antimony (Sb)	mg/kg	0.0139	<0.0050	<0.0050	0.236	0.0128	0.0062	0.0050	7682971
Total Arsenic (As)	mg/kg	0.126	<0.050	<0.050	2.63	0.199	<0.050	0.050	7682971
Total Barium (Ba)	mg/kg	40.2	133	36.3	9.25	5.77	77.8	0.10	7682971
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682971
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682971
Total Boron (B)	mg/kg	4.3	16.6	4.9	2.6	<2.0	17.0	2.0	7682971
Total Cadmium (Cd)	mg/kg	0.626	2.74	0.805	0.051	0.057	0.119	0.010	7682971
Total Calcium (Ca)	mg/kg	7970	10300	4820	1060	727	18100	10	7682971
Total Chromium (Cr)	mg/kg	0.25	<0.20	<0.20	1.43	0.25	0.20	0.20	7682971
Total Cobalt (Co)	mg/kg	1.49	1.27	0.616	0.245	0.105	0.043	0.020	7682971
Total Copper (Cu)	mg/kg	2.86	3.12	2.59	2.11	1.39	4.16	0.050	7682971
Total Iron (Fe)	mg/kg	104	57	80	514	183	36	10	7682971
Total Lead (Pb)	mg/kg	0.036	0.025	0.037	0.339	0.167	0.018	0.010	7682971
Total Magnesium (Mg)	mg/kg	2780	1910	1230	512	313	3460	10	7682971
Total Manganese (Mn)	mg/kg	589	376	557	177	95.5	32.9	0.10	7682971
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	0.010	7682971
Total Molybdenum (Mo)	mg/kg	0.139	0.614	0.108	0.208	<0.050	0.157	0.050	7682971
Total Nickel (Ni)	mg/kg	2.48	2.60	0.514	0.754	0.406	0.493	0.050	7682971
Total Phosphorus (P)	mg/kg	1370	3620	638	532	418	871	10	7682971
Total Potassium (K)	mg/kg	8360	9550	4270	1320	1010	21600	10	7682971
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682971
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682971
Total Sodium (Na)	mg/kg	<10	<10	<10	15	<10	<10	10	7682971
Total Strontium (Sr)	mg/kg	41.5	64.0	26.5	2.89	2.50	73.8	0.10	7682971
Total Thallium (Tl)	mg/kg	0.0032	<0.0020	0.0036	0.0104	0.0023	0.0034	0.0020	7682971
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682971
Total Titanium (Ti)	mg/kg	3.3	1.4	2.6	17.9	6.1	<1.0	1.0	7682971
Total Uranium (U)	mg/kg	0.0043	0.0021	0.0028	0.0898	0.0062	<0.0020	0.0020	7682971
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	0.76	0.35	<0.20	0.20	7682971
Total Zinc (Zn)	mg/kg	69.7	90.6	105	15.6	8.90	12.1	0.20	7682971
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2640		KK2641		KK2642	KK2643	KK2658		
Sampling Date		2014/08/12		2014/08/11		2014/08/13	2014/08/12			
COC Number		08396135		08396136		08396136	08396136	08396122		
	Units	**CCHMCA-135**	**QC Batch**	**CCHMHB-130**	**QC Batch**	**CCHMH-BD3**	**CCHMSB-455**	**CCTML-BD7**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	40.6	7682971	90.4	7696757	5.1	28.7	116	1.0	7682974
Total Antimony (Sb)	mg/kg	<0.0050	7682971	<0.0050	7696757	<0.0050	<0.0050	0.0075	0.0050	7682974
Total Arsenic (As)	mg/kg	<0.050	7682971	<0.050	7696757	<0.050	<0.050	0.128	0.050	7682974
Total Barium (Ba)	mg/kg	63.7	7682971	227	7696757	92.2	188	5.92	0.10	7682974
Total Beryllium (Be)	mg/kg	<0.10	7682971	<0.10	7696757	<0.10	<0.10	<0.10	0.10	7682974
Total Bismuth (Bi)	mg/kg	<0.10	7682971	<0.10	7696757	<0.10	<0.10	<0.10	0.10	7682974
Total Boron (B)	mg/kg	7.3	7682971	26.1	7696757	7.9	11.4	<2.0	2.0	7682974
Total Cadmium (Cd)	mg/kg	<0.010	7682971	0.077	7696757	0.032	0.119	0.033	0.010	7682974
Total Calcium (Ca)	mg/kg	5030	7682971	15900	7696757	13800	19800	903	10	7682974
Total Chromium (Cr)	mg/kg	<0.20	7682971	0.46	7696757	<0.20	<0.20	0.27	0.20	7682974
Total Cobalt (Co)	mg/kg	0.044	7682971	0.605	7696757	0.376	2.47	0.085	0.020	7682974
Total Copper (Cu)	mg/kg	2.56	7682971	2.85	7696757	2.43	3.71	0.953	0.050	7682974
Total Iron (Fe)	mg/kg	32	7682971	34	7696757	51	55	174	10	7682974
Total Lead (Pb)	mg/kg	0.016	7682971	0.023	7696757	0.012	0.013	0.142	0.010	7682974
Total Magnesium (Mg)	mg/kg	1100	7682971	2090	7696757	2570	4310	282	10	7682974
Total Manganese (Mn)	mg/kg	959	7682971	47.6	7696757	112	256	79.6	0.10	7682974
Total Mercury (Hg)	mg/kg	<0.010	7682971	0.014	7696757	<0.010	<0.010	<0.010	0.010	7682974
Total Molybdenum (Mo)	mg/kg	0.058	7682971	0.310	7696757	0.667	0.640	<0.050	0.050	7682974
Total Nickel (Ni)	mg/kg	0.190	7682971	2.83	7696757	0.670	5.67	0.327	0.050	7682974
Total Phosphorus (P)	mg/kg	942	7682971	1240	7696757	583	1310	327	10	7682974
Total Potassium (K)	mg/kg	4390	7682971	23000	7696757	13100	20400	949	10	7682974
Total Selenium (Se)	mg/kg	<0.050	7682971	0.073	7696757	<0.050	<0.050	<0.050	0.050	7682974
Total Silver (Ag)	mg/kg	<0.020	7682971	<0.020	7696757	<0.020	<0.020	<0.020	0.020	7682974
Total Sodium (Na)	mg/kg	<10	7682971	<10	7696757	<10	<10	10	10	7682974
Total Strontium (Sr)	mg/kg	6.61	7682971	92.9	7696757	43.2	132	3.86	0.10	7682974
Total Thallium (Tl)	mg/kg	<0.0020	7682971	0.0030	7696757	0.0027	0.0105	<0.0020	0.0020	7682974
Total Tin (Sn)	mg/kg	<0.10	7682971	<0.10	7696757	<0.10	<0.10	<0.10	0.10	7682974
Total Titanium (Ti)	mg/kg	<1.0	7682971	<1.0	7696757	<1.0	<1.0	6.4	1.0	7682974
Total Uranium (U)	mg/kg	<0.0020	7682971	0.0030	7696757	<0.0020	<0.0020	0.0225	0.0020	7682974
Total Vanadium (V)	mg/kg	<0.20	7682971	<0.20	7696757	<0.20	<0.20	0.30	0.20	7682974
Total Zinc (Zn)	mg/kg	13.0	7682971	10.7	7696757	28.1	44.0	8.43	0.20	7682974
RDL = Reportable Detection Limit										

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2666	KK2667	KK2668	KK2669	KK2701	KK2703		
Sampling Date		2014/08/13	2014/08/13	2014/08/13	2014/08/13	2014/08/13	2014/08/13		
COC Number		08396122	08396122	08396122	08396122	08396123	08396123		
	Units	**CCTMLC-BD1**	**CCTMLC-BD2**	**CCTMLC-BD3**	**CCHMHC-REP3**	**CCTMLC-BD4**	**CCTMHC-BD2**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	176	113	87.5	6.6	114	33.5	1.0	7682974
Total Antimony (Sb)	mg/kg	0.0166	0.0118	0.0086	<0.0050	0.0079	<0.0050	0.0050	7682974
Total Arsenic (As)	mg/kg	0.170	0.126	0.089	<0.050	0.102	<0.050	0.050	7682974
Total Barium (Ba)	mg/kg	7.11	5.84	4.79	102	4.92	103	0.10	7682974
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Boron (B)	mg/kg	<2.0	<2.0	<2.0	7.6	<2.0	12.5	2.0	7682974
Total Cadmium (Cd)	mg/kg	0.024	0.019	0.023	0.052	0.032	0.034	0.010	7682974
Total Calcium (Ca)	mg/kg	980	926	572	15900	676	16000	10	7682974
Total Chromium (Cr)	mg/kg	0.35	0.26	0.21	<0.20	0.25	<0.20	0.20	7682974
Total Cobalt (Co)	mg/kg	0.161	0.103	0.086	0.421	0.097	0.716	0.020	7682974
Total Copper (Cu)	mg/kg	3.25	1.36	0.915	2.53	1.28	4.27	0.050	7682974
Total Iron (Fe)	mg/kg	299	187	143	82	171	59	10	7682974
Total Lead (Pb)	mg/kg	0.280	0.140	0.130	0.014	0.168	0.019	0.010	7682974
Total Magnesium (Mg)	mg/kg	375	326	229	3260	235	3270	10	7682974
Total Manganese (Mn)	mg/kg	222	286	85.0	115	89.5	241	0.10	7682974
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7682974
Total Molybdenum (Mo)	mg/kg	0.078	<0.050	<0.050	0.639	<0.050	0.218	0.050	7682974
Total Nickel (Ni)	mg/kg	0.491	0.348	0.302	0.627	0.446	1.42	0.050	7682974
Total Phosphorus (P)	mg/kg	318	233	263	817	276	774	10	7682974
Total Potassium (K)	mg/kg	1070	803	860	14300	823	15700	10	7682974
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682974
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682974
Total Sodium (Na)	mg/kg	23	11	12	<10	13	<10	10	7682974
Total Strontium (Sr)	mg/kg	2.67	1.88	1.52	56.0	2.22	45.9	0.10	7682974
Total Thallium (Tl)	mg/kg	0.0026	<0.0020	0.0023	0.0030	0.0025	0.0031	0.0020	7682974
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Titanium (Ti)	mg/kg	8.6	6.8	4.7	<1.0	6.8	<1.0	1.0	7682974
Total Uranium (U)	mg/kg	0.0094	0.0062	0.0048	<0.0020	0.0062	<0.0020	0.0020	7682974
Total Vanadium (V)	mg/kg	0.53	0.32	0.28	<0.20	0.33	<0.20	0.20	7682974
Total Zinc (Zn)	mg/kg	14.4	10.9	6.87	26.5	7.82	59.7	0.20	7682974
RDL = Reportable Detection Limit									

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Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2704	KK2705	KK2706	KK2707	KK2709	KK2710		
Sampling Date		2014/08/13	2014/08/13	2014/08/13	2014/08/13	2014/08/13	2014/08/13		
COC Number		08396123	08396123	08396123	08396123	08396123	08396123		
	Units	**CCTMWC-REP3**	**CCTMLC-BD3**	**CCTMWC-BD4**	**CCTMHA-REP4**	**CCTMCC-REP3**	**CCTMWC-BD3**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	19.6	49.7	20.9	32.8	54.0	17.3	1.0	7682974
Total Antimony (Sb)	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7682974
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.068	<0.050	<0.050	0.050	7682974
Total Barium (Ba)	mg/kg	15.9	44.3	12.8	57.5	40.1	26.6	0.10	7682974
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Boron (B)	mg/kg	5.5	8.6	7.5	8.0	7.2	6.0	2.0	7682974
Total Cadmium (Cd)	mg/kg	0.561	0.011	1.30	0.067	0.011	0.289	0.010	7682974
Total Calcium (Ca)	mg/kg	8110	5980	6880	21400	5840	8730	10	7682974
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7682974
Total Cobalt (Co)	mg/kg	0.296	0.031	0.619	0.111	0.034	0.328	0.020	7682974
Total Copper (Cu)	mg/kg	2.26	2.01	3.20	3.81	1.73	1.67	0.050	7682974
Total Iron (Fe)	mg/kg	58	55	75	92	68	55	10	7682974
Total Lead (Pb)	mg/kg	0.030	0.039	0.023	0.045	0.045	0.014	0.010	7682974
Total Magnesium (Mg)	mg/kg	1350	819	2620	2240	775	1710	10	7682974
Total Manganese (Mn)	mg/kg	369	1140	690	61.1	946	217	0.10	7682974
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	0.010	7682974
Total Molybdenum (Mo)	mg/kg	0.246	0.056	0.351	2.32	<0.050	0.278	0.050	7682974
Total Nickel (Ni)	mg/kg	0.460	0.153	1.37	0.333	0.179	0.840	0.050	7682974
Total Phosphorus (P)	mg/kg	651	573	1050	1040	512	739	10	7682974
Total Potassium (K)	mg/kg	7730	4160	6090	17100	3880	8760	10	7682974
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7682974
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682974
Total Sodium (Na)	mg/kg	13	<10	44	13	<10	23	10	7682974
Total Strontium (Sr)	mg/kg	18.6	5.80	35.9	67.2	5.91	20.9	0.10	7682974
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0047	<0.0020	<0.0020	0.0020	7682974
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Titanium (Ti)	mg/kg	1.3	1.7	1.4	1.9	2.4	1.3	1.0	7682974
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	0.0081	<0.0020	<0.0020	0.0020	7682974
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7682974
Total Zinc (Zn)	mg/kg	71.9	22.1	155	13.3	20.1	71.1	0.20	7682974
RDL = Reportable Detection Limit									

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EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (VEGETATION)

Maxxam ID		KK2711	KK2713	KK2714	KK2715	KK2716		
Sampling Date		2014/08/13	2014/08/13	2014/08/13	2014/08/13	2014/08/13		
COC Number		08396123	08396124	08396124	08396124	08396124		
	Units	CCTMCC-BD2	CCTMLC-REP3	CCTMHA-BD5	CCTMWA-REP4	CCTMWA-BD5	RDL	QC Batch
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	82.1	112	25.0	100	104	1.0	7682974
Total Antimony (Sb)	mg/kg	<0.0050	0.0100	<0.0050	0.0091	0.0096	0.0050	7682974
Total Arsenic (As)	mg/kg	<0.050	0.122	<0.050	0.078	0.089	0.050	7682974
Total Barium (Ba)	mg/kg	40.8	10.4	46.9	47.1	48.0	0.10	7682974
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Boron (B)	mg/kg	7.3	<2.0	9.9	9.8	5.8	2.0	7682974
Total Cadmium (Cd)	mg/kg	<0.010	0.017	0.073	1.67	1.45	0.010	7682974
Total Calcium (Ca)	mg/kg	5710	955	16200	19000	21100	10	7682974
Total Chromium (Cr)	mg/kg	<0.20	0.27	<0.20	0.41	0.36	0.20	7682974
Total Cobalt (Co)	mg/kg	0.023	0.103	0.096	0.548	0.440	0.020	7682974
Total Copper (Cu)	mg/kg	3.37	1.39	3.42	4.72	4.34	0.050	7682974
Total Iron (Fe)	mg/kg	44	187	73	230	253	10	7682974
Total Lead (Pb)	mg/kg	0.032	0.114	0.025	0.068	0.071	0.010	7682974
Total Magnesium (Mg)	mg/kg	689	344	2230	2210	2210	10	7682974
Total Manganese (Mn)	mg/kg	2740	85.7	58.6	45.9	44.9	0.10	7682974
Total Mercury (Hg)	mg/kg	<0.010	<0.010	0.012	<0.010	<0.010	0.010	7682974
Total Molybdenum (Mo)	mg/kg	0.145	<0.050	1.86	1.37	1.60	0.050	7682974
Total Nickel (Ni)	mg/kg	0.170	0.316	0.254	1.76	1.38	0.050	7682974
Total Phosphorus (P)	mg/kg	466	294	1010	1440	1270	10	7682974
Total Potassium (K)	mg/kg	2840	896	21400	9370	7200	10	7682974
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.079	0.051	<0.050	0.050	7682974
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7682974
Total Sodium (Na)	mg/kg	<10	16	37	<10	<10	10	7682974
Total Strontium (Sr)	mg/kg	2.72	3.28	51.4	67.3	71.9	0.10	7682974
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0032	0.0029	0.0064	0.0020	7682974
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7682974
Total Titanium (Ti)	mg/kg	1.4	7.3	1.6	5.2	6.2	1.0	7682974
Total Uranium (U)	mg/kg	<0.0020	0.0182	0.0031	0.0069	0.0088	0.0020	7682974
Total Vanadium (V)	mg/kg	<0.20	0.36	<0.20	0.26	0.27	0.20	7682974
Total Zinc (Zn)	mg/kg	17.8	7.92	14.0	79.1	68.8	0.20	7682974
RDL = Reportable Detection Limit								

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Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		KK2389	KK2392	KK2393		KK2395	KK2414	KK2415	
Sampling Date		2014/08/03	2014/08/02	2014/08/01		2014/08/03	2014/08/01	2014/08/03	
COC Number		08396127	08396127	08396127		08396127	08396128	08396128	
	Units	CCHMSA-39	CCHMSB-28A	CCHMSBB-20	QC Batch	CCHMSA-851	CCHMSAB-20	CCHMSA-38	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	5.88	5.44	7.09	7612689	4.36	6.51	6.08	7612694

Maxxam ID		KK2417	KK2418	KK2419	KK2420		KK2421	KK2422	
Sampling Date		2014/08/04	2014/08/03	2014/08/04	2014/08/02		2014/08/01	2014/08/04	
COC Number		08396128	08396128	08396128	08396128		08396128	08396128	
	Units	CCHMSA-50	CCHMSA-851 REP2	CCHMSB-49	CCHMSA-30A	QC Batch	CCHMSA-21	CCHMSC-55	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	5.41	4.86	4.13	6.13	7612689	6.12	5.19	7612694

Maxxam ID		KK2423	KK2550	KK2552	KK2555		KK2568	KK2569	
Sampling Date		2014/08/04	2014/08/10	2014/08/11	2014/08/10		2014/08/10	2014/08/11	
COC Number		08396128	08396131	08396131	08396131		08396132	08396132	
	Units	CCHMSC-59	CCHMSC-438	CCHMSB-440	CCHMSC-436	QC Batch	CCHMSB-113	CCHMSB-130	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	5.77	5.55	5.57	5.77	7612689	5.95	5.78	7612694

Maxxam ID		KK2570	KK2573		KK2601		KK2602		KK2603	
Sampling Date		2014/08/10	2014/08/06		2014/08/08		2014/08/06		2014/08/08	
COC Number		08396132	08396132		08396133		08396133		08396133	
	Units	CCHMSB-120	CCHMSC-400	QC Batch	CCHMSB-92	QC Batch	CCHMSB-76	QC Batch	CCHMSB-410	QC Batch
Physical Properties										
Soluble (2:1) pH	pH	5.15	5.01	7612694	5.86	7612689	6.32	7612989	6.23	7612694

Maxxam ID		KK2604	KK2605	KK2607	KK2609		KK2620	KK2622	
Sampling Date		2014/08/05	2014/08/05	2014/08/09	2014/08/09		2014/08/09	2014/08/07	
COC Number		08396133	08396133	08396133	08396133		08396134	08396134	
	Units	CCHMSC-69	CCHMSC-62	CCHMSA-299	CCHMSA-106	QC Batch	CCHMSB-422	CCHMSC-81	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	5.72	4.87	4.46	5.54	7612694	4.94	5.69	7612689

Maxxam ID		KK2623	KK2624	KK2627		KK2659		KK2660	
Sampling Date		2014/08/09	2014/08/08	2014/08/12		2014/08/13		2014/08/13	
COC Number		08396134	08396134	08396134		08396122		08396122	
	Units	CCHMSB-419	CCHMSA-98	CCHMSB-138	QC Batch	CCTMSC-BD2	QC Batch	CCTMSC-BD1	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	4.38	6.20	6.21	7612689	5.36	7612989	4.79	7612694

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EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		KK2661	KK2662		KK2663		KK2664		KK2665	
Sampling Date		2014/08/13	2014/08/13		2014/08/11		2014/08/12		2014/08/11	
COC Number		08396122	08396122		08396122		08396122		08396122	
	Units	**CCTMSC-BD3**	**CCTMSC-BD4**	**QC Batch**	**CCTMSB-843**	**QC Batch**	**CCHMSA-135**	**QC Batch**	**CCHMSB-164**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	6.62	5.83	7612694	5.32	7612689	4.48	7612694	5.37	7612689

Maxxam ID		KK2702	KK2708		KK2712	
Sampling Date		2014/08/13	2014/08/13		2014/08/13	
COC Number		08396123	08396123		08396123	
	Units	**CCTMSA-BD5**	**CCTMSA-REP4**	**QC Batch**	**CCTMSC-REP3**	**QC Batch**
Physical Properties						
Soluble (2:1) pH	pH	6.93	6.94	7612694	6.82	7612689

Maxxam Job #: B473400
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EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2389	KK2392	KK2393		KK2395	KK2414	KK2415		
Sampling Date		2014/08/03	2014/08/02	2014/08/01		2014/08/03	2014/08/01	2014/08/03		
COC Number		08396127	08396127	08396127		08396127	08396128	08396128		
	Units	**CCHMSA-39**	**CCHMSB-28A**	**CCHMSBB-20**	**QC Batch**	**CCHMSA-851**	**CCHMSAB-20**	**CCHMSA-38**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	17600	12000	18800	7612683	13600	13200	24600	100	7612691
Total Antimony (Sb)	mg/kg	3.83	0.88	2.44	7612683	8.31	2.07	1.67	0.10	7612691
Total Arsenic (As)	mg/kg	30.0	10.5	52.4	7612683	93.1	41.6	22.4	0.50	7612691
Total Barium (Ba)	mg/kg	223	114	320	7612683	72.3	388	175	0.10	7612691
Total Beryllium (Be)	mg/kg	0.49	0.44	0.67	7612683	0.73	0.47	0.64	0.40	7612691
Total Bismuth (Bi)	mg/kg	0.39	0.34	0.14	7612683	0.16	0.11	0.29	0.10	7612691
Total Cadmium (Cd)	mg/kg	0.135	0.136	0.263	7612683	0.149	0.224	0.300	0.050	7612691
Total Calcium (Ca)	mg/kg	5380	2160	14400	7612683	2550	24600	3320	100	7612691
Total Chromium (Cr)	mg/kg	55.5	34.6	54.8	7612683	21.1	46.0	45.5	1.0	7612691
Total Cobalt (Co)	mg/kg	15.2	8.43	14.2	7612683	9.67	9.92	12.9	0.30	7612691
Total Copper (Cu)	mg/kg	12.4	12.0	19.1	7612683	16.2	18.3	22.1	0.50	7612691
Total Iron (Fe)	mg/kg	25400	21800	31700	7612683	24600	20900	35500	100	7612691
Total Lead (Pb)	mg/kg	5.54	5.25	10.6	7612683	9.27	7.39	10.8	0.10	7612691
Total Magnesium (Mg)	mg/kg	11300	4130	8870	7612683	6740	5650	7830	100	7612691
Total Manganese (Mn)	mg/kg	520	293	565	7612683	279	538	341	0.20	7612691
Total Mercury (Hg)	mg/kg	0.050	<0.050	0.296	7612683	0.079	0.235	<0.050	0.050	7612691
Total Molybdenum (Mo)	mg/kg	0.74	1.00	0.55	7612683	0.73	0.53	1.06	0.10	7612691
Total Nickel (Ni)	mg/kg	25.9	15.3	39.8	7612683	12.0	33.4	29.7	0.80	7612691
Total Phosphorus (P)	mg/kg	480	307	605	7612683	666	537	359	10	7612691
Total Potassium (K)	mg/kg	3360	927	3000	7612683	2980	1050	831	100	7612691
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	7612683	<0.50	<0.50	<0.50	0.50	7612691
Total Silver (Ag)	mg/kg	0.070	0.053	0.097	7612683	0.079	0.102	0.127	0.050	7612691
Total Sodium (Na)	mg/kg	148	101	340	7612683	124	237	135	100	7612691
Total Strontium (Sr)	mg/kg	27.8	22.7	69.4	7612683	19.8	92.9	24.9	0.10	7612691
Total Thallium (Tl)	mg/kg	0.227	0.106	0.760	7612683	0.393	0.419	0.154	0.050	7612691
Total Tin (Sn)	mg/kg	0.96	0.58	0.60	7612683	0.74	0.37	0.59	0.10	7612691
Total Titanium (Ti)	mg/kg	1070	721	1080	7612683	921	588	1010	1.0	7612691
Total Vanadium (V)	mg/kg	46.1	42.2	69.0	7612683	59.7	38.8	68.1	2.0	7612691
Total Zinc (Zn)	mg/kg	40.2	32.9	56.7	7612683	36.7	40.4	54.0	1.0	7612691
Total Zirconium (Zr)	mg/kg	1.87	1.41	3.99	7612683	1.16	2.98	8.69	0.50	7612691
RDL = Reportable Detection Limit										

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2417	KK2418	KK2419	KK2420		KK2421		
Sampling Date		2014/08/04	2014/08/03	2014/08/04	2014/08/02		2014/08/01		
COC Number		08396128	08396128	08396128	08396128		08396128		
	Units	**CCHMSA-50**	**CCHMSA-851 REP2**	**CCHMSB-49**	**CCHMSA-30A**	**QC Batch**	**CCHMSA-21**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	8920	15900	7290	11800	7612683	20700	100	7612691
Total Antimony (Sb)	mg/kg	2.28	13.2	0.60	0.28	7612683	0.68	0.10	7612691
Total Arsenic (As)	mg/kg	41.5	204	65.2	11.0	7612683	47.4	0.50	7612691
Total Barium (Ba)	mg/kg	114	118	55.9	85.2	7612683	128	0.10	7612691
Total Beryllium (Be)	mg/kg	<0.40	0.90	<0.40	<0.40	7612683	0.63	0.40	7612691
Total Bismuth (Bi)	mg/kg	<0.10	0.12	0.17	0.14	7612683	0.21	0.10	7612691
Total Cadmium (Cd)	mg/kg	0.120	0.156	0.109	0.069	7612683	0.123	0.050	7612691
Total Calcium (Ca)	mg/kg	2210	3720	1080	4370	7612683	5590	100	7612691
Total Chromium (Cr)	mg/kg	12.6	24.6	14.7	49.1	7612683	115	1.0	7612691
Total Cobalt (Co)	mg/kg	2.10	10.3	3.27	6.92	7612683	19.6	0.30	7612691
Total Copper (Cu)	mg/kg	10.8	17.5	8.85	10.7	7612683	48.5	0.50	7612691
Total Iron (Fe)	mg/kg	10000	30500	17000	15400	7612683	28600	100	7612691
Total Lead (Pb)	mg/kg	3.52	9.13	7.09	4.44	7612683	3.39	0.10	7612691
Total Magnesium (Mg)	mg/kg	1600	7670	1750	6730	7612683	16200	100	7612691
Total Manganese (Mn)	mg/kg	185	395	281	222	7612683	491	0.20	7612691
Total Mercury (Hg)	mg/kg	0.054	0.204	<0.050	<0.050	7612683	<0.050	0.050	7612691
Total Molybdenum (Mo)	mg/kg	0.51	0.59	1.35	0.30	7612683	0.39	0.10	7612691
Total Nickel (Ni)	mg/kg	7.28	14.5	6.64	22.2	7612683	49.3	0.80	7612691
Total Phosphorus (P)	mg/kg	762	734	405	309	7612683	341	10	7612691
Total Potassium (K)	mg/kg	355	2190	598	1510	7612683	3550	100	7612691
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	7612683	<0.50	0.50	7612691
Total Silver (Ag)	mg/kg	0.167	0.058	0.058	<0.050	7612683	0.051	0.050	7612691
Total Sodium (Na)	mg/kg	223	111	133	326	7612683	<100	100	7612691
Total Strontium (Sr)	mg/kg	22.2	27.7	13.6	42.5	7612683	19.4	0.10	7612691
Total Thallium (Tl)	mg/kg	0.113	0.495	0.116	0.117	7612683	0.310	0.050	7612691
Total Tin (Sn)	mg/kg	0.25	0.67	0.57	0.55	7612683	0.98	0.10	7612691
Total Titanium (Ti)	mg/kg	188	1050	649	626	7612683	727	1.0	7612691
Total Vanadium (V)	mg/kg	17.2	74.0	54.3	28.2	7612683	64.3	2.0	7612691
Total Zinc (Zn)	mg/kg	21.0	46.5	27.6	27.0	7612683	32.9	1.0	7612691
Total Zirconium (Zr)	mg/kg	<0.50	2.79	0.79	0.72	7612683	3.43	0.50	7612691
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2422		KK2423	KK2550	KK2552	KK2555		
Sampling Date		2014/08/04		2014/08/04	2014/08/10	2014/08/11	2014/08/10		
COC Number		08396128		08396128	08396131	08396131	08396131		
	Units	**CCHMSC-55**	**QC Batch**	**CCHMSC-59**	**CCHMSC-438**	**CCHMSB-440**	**CCHMSC-436**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	16900	7612691	20300	8060	15400	15000	100	7612683
Total Antimony (Sb)	mg/kg	0.41	7612691	1.00	0.68	0.69	1.14	0.10	7612683
Total Arsenic (As)	mg/kg	6.19	7612691	7.90	7.21	13.4	8.52	0.50	7612683
Total Barium (Ba)	mg/kg	100	7612691	174	58.4	175	188	0.10	7612683
Total Beryllium (Be)	mg/kg	0.46	7612691	0.54	<0.40	0.47	0.50	0.40	7612683
Total Bismuth (Bi)	mg/kg	0.10	7612691	0.12	0.12	0.19	0.20	0.10	7612683
Total Cadmium (Cd)	mg/kg	0.214	7612691	0.344	0.122	0.230	0.210	0.050	7612683
Total Calcium (Ca)	mg/kg	3050	7612691	5030	2400	5040	4150	100	7612683
Total Chromium (Cr)	mg/kg	24.2	7612691	27.4	13.4	29.0	21.2	1.0	7612683
Total Cobalt (Co)	mg/kg	7.88	7612691	6.59	5.85	10.7	6.73	0.30	7612683
Total Copper (Cu)	mg/kg	17.2	7612691	16.1	5.44	20.2	12.0	0.50	7612683
Total Iron (Fe)	mg/kg	26600	7612691	19800	15500	26600	22500	100	7612683
Total Lead (Pb)	mg/kg	8.52	7612691	12.2	5.55	7.86	10.9	0.10	7612683
Total Magnesium (Mg)	mg/kg	4670	7612691	4570	3570	6630	4110	100	7612683
Total Manganese (Mn)	mg/kg	404	7612691	212	233	599	322	0.20	7612683
Total Mercury (Hg)	mg/kg	0.071	7612691	0.144	<0.050	<0.050	<0.050	0.050	7612683
Total Molybdenum (Mo)	mg/kg	0.78	7612691	0.71	0.61	1.49	0.77	0.10	7612683
Total Nickel (Ni)	mg/kg	16.9	7612691	17.0	8.35	19.5	12.8	0.80	7612683
Total Phosphorus (P)	mg/kg	448	7612691	526	273	545	262	10	7612683
Total Potassium (K)	mg/kg	638	7612691	612	838	1940	799	100	7612683
Total Selenium (Se)	mg/kg	<0.50	7612691	<0.50	<0.50	<0.50	<0.50	0.50	7612683
Total Silver (Ag)	mg/kg	0.064	7612691	0.136	<0.050	0.083	0.161	0.050	7612683
Total Sodium (Na)	mg/kg	144	7612691	188	<100	257	124	100	7612683
Total Strontium (Sr)	mg/kg	22.7	7612691	33.7	16.7	32.0	25.3	0.10	7612683
Total Thallium (Tl)	mg/kg	0.121	7612691	0.173	0.107	0.216	0.128	0.050	7612683
Total Tin (Sn)	mg/kg	0.49	7612691	0.57	0.38	0.57	0.59	0.10	7612683
Total Titanium (Ti)	mg/kg	947	7612691	761	498	987	704	1.0	7612683
Total Vanadium (V)	mg/kg	60.0	7612691	45.0	31.3	57.6	44.2	2.0	7612683
Total Zinc (Zn)	mg/kg	52.2	7612691	61.8	25.3	61.4	39.2	1.0	7612683
Total Zirconium (Zr)	mg/kg	2.45	7612691	2.78	2.17	2.52	4.52	0.50	7612683
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2568	KK2569	KK2570	KK2573		KK2601		
Sampling Date		2014/08/10	2014/08/11	2014/08/10	2014/08/06		2014/08/08		
COC Number		08396132	08396132	08396132	08396132		08396133		
	Units	**CCHMSB-113**	**CCHMSB-130**	**CCHMSB-120**	**CCHMSC-400**	**QC Batch**	**CCHMSB-92**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	21100	20400	11300	22000	7612691	17400	100	7612683
Total Antimony (Sb)	mg/kg	0.39	0.76	0.25	1.51	7612691	11.3	0.10	7612683
Total Arsenic (As)	mg/kg	6.69	20.8	2.92	7.47	7612691	90.6	0.50	7612683
Total Barium (Ba)	mg/kg	190	277	66.7	102	7612691	206	0.10	7612683
Total Beryllium (Be)	mg/kg	0.54	0.71	0.60	0.59	7612691	<0.40	0.40	7612683
Total Bismuth (Bi)	mg/kg	0.13	0.43	0.14	0.13	7612691	0.21	0.10	7612683
Total Cadmium (Cd)	mg/kg	0.121	0.409	0.121	0.180	7612691	0.343	0.050	7612683
Total Calcium (Ca)	mg/kg	5580	4270	1270	2770	7612691	4360	100	7612683
Total Chromium (Cr)	mg/kg	56.5	50.6	11.5	38.5	7612691	22.8	1.0	7612683
Total Cobalt (Co)	mg/kg	14.0	13.8	4.90	13.7	7612691	12.4	0.30	7612683
Total Copper (Cu)	mg/kg	19.3	30.6	6.13	18.7	7612691	27.1	0.50	7612683
Total Iron (Fe)	mg/kg	29800	31300	17300	32100	7612691	30800	100	7612683
Total Lead (Pb)	mg/kg	7.11	10.4	6.66	9.23	7612691	5.58	0.10	7612683
Total Magnesium (Mg)	mg/kg	9400	7390	3190	7140	7612691	6710	100	7612683
Total Manganese (Mn)	mg/kg	591	391	316	651	7612691	733	0.20	7612683
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	0.052	7612691	<0.050	0.050	7612683
Total Molybdenum (Mo)	mg/kg	0.82	0.82	0.31	1.06	7612691	1.41	0.10	7612683
Total Nickel (Ni)	mg/kg	32.5	28.3	7.03	18.8	7612691	17.1	0.80	7612683
Total Phosphorus (P)	mg/kg	589	404	249	517	7612691	705	10	7612683
Total Potassium (K)	mg/kg	854	1060	2210	1390	7612691	944	100	7612683
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	7612691	<0.50	0.50	7612683
Total Silver (Ag)	mg/kg	0.066	0.094	<0.050	0.072	7612691	0.109	0.050	7612683
Total Sodium (Na)	mg/kg	161	179	<100	104	7612691	315	100	7612683
Total Strontium (Sr)	mg/kg	30.3	31.2	11.1	23.1	7612691	27.0	0.10	7612683
Total Thallium (Tl)	mg/kg	0.155	0.207	0.341	0.210	7612691	0.227	0.050	7612683
Total Tin (Sn)	mg/kg	0.68	0.70	0.45	0.60	7612691	0.45	0.10	7612683
Total Titanium (Ti)	mg/kg	1010	1100	685	1100	7612691	1290	1.0	7612683
Total Vanadium (V)	mg/kg	70.4	65.1	23.1	76.1	7612691	74.3	2.0	7612683
Total Zinc (Zn)	mg/kg	44.1	49.7	31.9	51.2	7612691	54.5	1.0	7612683
Total Zirconium (Zr)	mg/kg	1.42	12.9	0.95	2.99	7612691	3.24	0.50	7612683
RDL = Reportable Detection Limit									

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2602		KK2603	KK2604	KK2605	KK2607	KK2609		
Sampling Date		2014/08/06		2014/08/08	2014/08/05	2014/08/05	2014/08/09	2014/08/09		
COC Number		08396133		08396133	08396133	08396133	08396133	08396133		
	Units	**CCHMSB-76**	**QC Batch**	**CCHMSB-410**	**CCHMSC-69**	**CCHMSC-62**	**CCHMSA-299**	**CCHMSA-106**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	4910	7612980	24100	13100	14800	11000	20900	100	7612691
Total Antimony (Sb)	mg/kg	0.48	7612980	49.2	0.26	1.20	0.48	0.52	0.10	7612691
Total Arsenic (As)	mg/kg	2.14	7612980	50.6	2.53	14.6	4.71	7.90	0.50	7612691
Total Barium (Ba)	mg/kg	215	7612980	298	112	103	56.5	150	0.10	7612691
Total Beryllium (Be)	mg/kg	<0.40	7612980	0.64	<0.40	<0.40	<0.40	0.83	0.40	7612691
Total Bismuth (Bi)	mg/kg	<0.10	7612980	0.17	<0.10	0.16	0.35	0.25	0.10	7612691
Total Cadmium (Cd)	mg/kg	0.314	7612980	0.436	0.164	0.190	0.117	0.241	0.050	7612691
Total Calcium (Ca)	mg/kg	32000	7612980	7830	2720	1690	771	1460	100	7612691
Total Chromium (Cr)	mg/kg	10.4	7612980	32.2	17.5	22.1	14.2	30.8	1.0	7612691
Total Cobalt (Co)	mg/kg	2.91	7612980	5.43	5.43	5.20	2.96	8.21	0.30	7612691
Total Copper (Cu)	mg/kg	23.9	7612980	37.4	8.33	11.5	7.39	17.6	0.50	7612691
Total Iron (Fe)	mg/kg	7750	7612980	24000	17000	28700	19200	33300	100	7612691
Total Lead (Pb)	mg/kg	2.02	7612980	7.48	7.94	12.4	16.0	14.2	0.10	7612691
Total Magnesium (Mg)	mg/kg	2610	7612980	4360	2730	3750	1710	3320	100	7612691
Total Manganese (Mn)	mg/kg	225	7612980	162	399	221	141	248	0.20	7612691
Total Mercury (Hg)	mg/kg	0.053	7612980	0.123	0.061	<0.050	<0.050	<0.050	0.050	7612691
Total Molybdenum (Mo)	mg/kg	0.60	7612980	0.67	0.48	2.19	1.07	1.69	0.10	7612691
Total Nickel (Ni)	mg/kg	13.8	7612980	15.2	9.05	11.4	6.18	16.6	0.80	7612691
Total Phosphorus (P)	mg/kg	907	7612980	907	367	217	189	468	10	7612691
Total Potassium (K)	mg/kg	192	7612980	787	396	568	389	581	100	7612691
Total Selenium (Se)	mg/kg	0.65	7612980	0.67	<0.50	<0.50	<0.50	<0.50	0.50	7612691
Total Silver (Ag)	mg/kg	0.077	7612980	0.282	0.068	0.076	0.057	0.134	0.050	7612691
Total Sodium (Na)	mg/kg	129	7612980	124	130	<100	<100	<100	100	7612691
Total Strontium (Sr)	mg/kg	124	7612980	50.1	18.3	16.0	9.62	13.5	0.10	7612691
Total Thallium (Tl)	mg/kg	<0.050	7612980	0.201	0.160	0.139	0.109	0.123	0.050	7612691
Total Tin (Sn)	mg/kg	0.10	7612980	0.50	0.51	0.57	0.73	0.96	0.10	7612691
Total Titanium (Ti)	mg/kg	137	7612980	649	618	967	660	587	1.0	7612691
Total Vanadium (V)	mg/kg	13.7	7612980	44.1	36.1	82.1	55.1	62.2	2.0	7612691
Total Zinc (Zn)	mg/kg	16.2	7612980	37.6	37.3	40.9	24.8	38.9	1.0	7612691
Total Zirconium (Zr)	mg/kg	2.58	7612980	3.61	1.26	2.48	1.72	7.86	0.50	7612691
RDL = Reportable Detection Limit										

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2620	KK2622	KK2623	KK2624	KK2627		KK2659		
Sampling Date		2014/08/09	2014/08/07	2014/08/09	2014/08/08	2014/08/12		2014/08/13		
COC Number		08396134	08396134	08396134	08396134	08396134		08396122		
	Units	**CCHMSB-422**	**CCHMSC-81**	**CCHMSB-419**	**CCHMSA-98**	**CCHMSB-138**	**QC Batch**	**CCTMSC-BD2**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	22800	19400	16000	24700	16300	7612683	4290	100	7612980
Total Antimony (Sb)	mg/kg	0.55	0.45	0.22	1.99	0.89	7612683	0.61	0.10	7612980
Total Arsenic (As)	mg/kg	7.94	16.8	2.83	51.4	26.5	7612683	4.36	0.50	7612980
Total Barium (Ba)	mg/kg	176	121	137	260	148	7612683	159	0.10	7612980
Total Beryllium (Be)	mg/kg	0.58	0.42	0.99	0.50	0.53	7612683	0.62	0.40	7612980
Total Bismuth (Bi)	mg/kg	0.20	0.15	0.36	0.14	0.17	7612683	0.28	0.10	7612980
Total Cadmium (Cd)	mg/kg	0.142	0.242	0.198	0.343	0.285	7612683	0.230	0.050	7612980
Total Calcium (Ca)	mg/kg	1940	2440	1910	5120	4980	7612683	7420	100	7612980
Total Chromium (Cr)	mg/kg	43.7	26.8	21.9	59.6	33.2	7612683	12.9	1.0	7612980
Total Cobalt (Co)	mg/kg	11.7	7.65	4.84	14.9	10.9	7612683	44.5	0.30	7612980
Total Copper (Cu)	mg/kg	16.8	13.1	17.3	46.8	16.1	7612683	17.1	0.50	7612980
Total Iron (Fe)	mg/kg	38900	27900	17000	34600	26400	7612683	44600	100	7612980
Total Lead (Pb)	mg/kg	10.7	9.22	8.37	10.3	14.5	7612683	7.24	0.10	7612980
Total Magnesium (Mg)	mg/kg	4820	4640	3210	9030	6740	7612683	1290	100	7612980
Total Manganese (Mn)	mg/kg	344	367	229	500	1080	7612683	3420	0.20	7612980
Total Mercury (Hg)	mg/kg	<0.050	<0.050	0.060	<0.050	0.062	7612683	0.086	0.050	7612980
Total Molybdenum (Mo)	mg/kg	1.97	1.03	0.64	0.98	1.05	7612683	5.55	0.10	7612980
Total Nickel (Ni)	mg/kg	27.0	14.7	12.2	42.0	17.7	7612683	6.83	0.80	7612980
Total Phosphorus (P)	mg/kg	249	299	516	583	447	7612683	1370	10	7612980
Total Potassium (K)	mg/kg	775	661	1060	1410	1640	7612683	229	100	7612980
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	7612683	0.61	0.50	7612980
Total Silver (Ag)	mg/kg	0.065	0.064	0.136	0.184	0.086	7612683	0.298	0.050	7612980
Total Sodium (Na)	mg/kg	104	114	<100	254	237	7612683	<100	100	7612980
Total Strontium (Sr)	mg/kg	16.6	21.8	20.6	32.0	41.2	7612683	33.6	0.10	7612980
Total Thallium (Tl)	mg/kg	0.174	0.189	0.194	0.162	0.243	7612683	0.088	0.050	7612980
Total Tin (Sn)	mg/kg	0.87	0.96	1.23	0.56	0.70	7612683	0.19	0.10	7612980
Total Titanium (Ti)	mg/kg	840	1010	418	1380	933	7612683	107	1.0	7612980
Total Vanadium (V)	mg/kg	77.6	64.0	30.7	87.2	53.3	7612683	36.8	2.0	7612980
Total Zinc (Zn)	mg/kg	42.2	47.6	36.9	82.0	61.9	7612683	19.0	1.0	7612980
Total Zirconium (Zr)	mg/kg	2.64	5.01	0.81	4.48	2.52	7612683	0.55	0.50	7612980
RDL = Reportable Detection Limit										

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

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2660	KK2661	KK2662		KK2663		KK2664		
Sampling Date		2014/08/13	2014/08/13	2014/08/13		2014/08/11		2014/08/12		
COC Number		08396122	08396122	08396122		08396122		08396122		
	Units	**CCTMSC-BD1**	**CCTMSC-BD3**	**CCTMSC-BD4**	**QC Batch**	**CCTMSB-843**	**QC Batch**	**CCHMSA-135**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	11700	14800	18200	7612691	23100	7612683	16100	100	7612691
Total Antimony (Sb)	mg/kg	0.23	0.31	0.85	7612691	8.41	7612683	0.33	0.10	7612691
Total Arsenic (As)	mg/kg	4.33	3.59	10.2	7612691	78.8	7612683	6.15	0.50	7612691
Total Barium (Ba)	mg/kg	176	373	196	7612691	162	7612683	164	0.10	7612691
Total Beryllium (Be)	mg/kg	<0.40	0.66	0.61	7612691	0.65	7612683	0.41	0.40	7612691
Total Bismuth (Bi)	mg/kg	0.11	0.21	0.21	7612691	0.19	7612683	0.18	0.10	7612691
Total Cadmium (Cd)	mg/kg	0.116	0.586	0.296	7612691	0.158	7612683	0.277	0.050	7612691
Total Calcium (Ca)	mg/kg	3430	11800	4130	7612691	3470	7612683	4300	100	7612691
Total Chromium (Cr)	mg/kg	10.3	15.7	29.1	7612691	39.1	7612683	18.8	1.0	7612691
Total Cobalt (Co)	mg/kg	7.17	6.32	8.79	7612691	9.29	7612683	8.13	0.30	7612691
Total Copper (Cu)	mg/kg	8.95	18.2	21.7	7612691	20.8	7612683	13.0	0.50	7612691
Total Iron (Fe)	mg/kg	21700	21000	23900	7612691	27800	7612683	21500	100	7612691
Total Lead (Pb)	mg/kg	3.72	12.0	13.6	7612691	9.52	7612683	10.8	0.10	7612691
Total Magnesium (Mg)	mg/kg	5490	3340	3910	7612691	5940	7612683	6740	100	7612691
Total Manganese (Mn)	mg/kg	282	535	418	7612691	367	7612683	707	0.20	7612691
Total Mercury (Hg)	mg/kg	<0.050	0.051	0.077	7612691	0.103	7612683	<0.050	0.050	7612691
Total Molybdenum (Mo)	mg/kg	0.77	0.73	0.66	7612691	1.26	7612683	1.69	0.10	7612691
Total Nickel (Ni)	mg/kg	6.68	11.6	16.7	7612691	21.2	7612683	11.0	0.80	7612691
Total Phosphorus (P)	mg/kg	441	460	307	7612691	408	7612683	450	10	7612691
Total Potassium (K)	mg/kg	387	1110	421	7612691	983	7612683	1900	100	7612691
Total Selenium (Se)	mg/kg	<0.50	0.98	<0.50	7612691	<0.50	7612683	<0.50	0.50	7612691
Total Silver (Ag)	mg/kg	<0.050	0.193	0.127	7612691	0.113	7612683	0.374	0.050	7612691
Total Sodium (Na)	mg/kg	226	<100	143	7612691	132	7612683	261	100	7612691
Total Strontium (Sr)	mg/kg	24.5	41.6	31.7	7612691	28.5	7612683	92.3	0.10	7612691
Total Thallium (Tl)	mg/kg	0.109	0.126	0.139	7612691	0.285	7612683	0.251	0.050	7612691
Total Tin (Sn)	mg/kg	0.38	0.74	1.09	7612691	0.72	7612683	0.61	0.10	7612691
Total Titanium (Ti)	mg/kg	1160	436	751	7612691	861	7612683	838	1.0	7612691
Total Vanadium (V)	mg/kg	60.4	36.2	52.0	7612691	67.6	7612683	54.1	2.0	7612691
Total Zinc (Zn)	mg/kg	38.0	31.3	48.2	7612691	44.9	7612683	45.7	1.0	7612691
Total Zirconium (Zr)	mg/kg	0.95	4.13	5.87	7612691	1.42	7612683	2.03	0.50	7612691
RDL = Reportable Detection Limit										

Maxxam Job #: B473400
Report Date: 2014/10/31

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		KK2665		KK2702	KK2708		KK2712		
Sampling Date		2014/08/11		2014/08/13	2014/08/13		2014/08/13		
COC Number		08396122		08396123	08396123		08396123		
	Units	CCHMSB-164	QC Batch	CCTMSA-BD5	CCTMSA-REP4	QC Batch	CCTMSC-REP3	RDL	QC Batch
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	15000	7612683	9620	10400	7612691	14900	100	7612683
Total Antimony (Sb)	mg/kg	0.33	7612683	0.38	0.38	7612691	0.27	0.10	7612683
Total Arsenic (As)	mg/kg	4.71	7612683	5.87	6.38	7612691	2.83	0.50	7612683
Total Barium (Ba)	mg/kg	75.1	7612683	149	164	7612691	349	0.10	7612683
Total Beryllium (Be)	mg/kg	<0.40	7612683	<0.40	<0.40	7612691	0.66	0.40	7612683
Total Bismuth (Bi)	mg/kg	<0.10	7612683	<0.10	<0.10	7612691	0.18	0.10	7612683
Total Cadmium (Cd)	mg/kg	0.098	7612683	0.152	0.136	7612691	0.562	0.050	7612683
Total Calcium (Ca)	mg/kg	1900	7612683	7270	8270	7612691	10300	100	7612683
Total Chromium (Cr)	mg/kg	39.8	7612683	18.6	19.4	7612691	14.2	1.0	7612683
Total Cobalt (Co)	mg/kg	5.90	7612683	5.86	6.17	7612691	5.81	0.30	7612683
Total Copper (Cu)	mg/kg	14.4	7612683	13.6	14.0	7612691	16.7	0.50	7612683
Total Iron (Fe)	mg/kg	19300	7612683	18100	18900	7612691	18400	100	7612683
Total Lead (Pb)	mg/kg	4.82	7612683	4.93	5.50	7612691	10.5	0.10	7612683
Total Magnesium (Mg)	mg/kg	4960	7612683	3510	3660	7612691	3500	100	7612683
Total Manganese (Mn)	mg/kg	164	7612683	196	204	7612691	472	0.20	7612683
Total Mercury (Hg)	mg/kg	<0.050	7612683	<0.050	<0.050	7612691	<0.050	0.050	7612683
Total Molybdenum (Mo)	mg/kg	0.84	7612683	0.53	0.58	7612691	0.61	0.10	7612683
Total Nickel (Ni)	mg/kg	18.9	7612683	14.4	14.7	7612691	10.7	0.80	7612683
Total Phosphorus (P)	mg/kg	181	7612683	453	501	7612691	372	10	7612683
Total Potassium (K)	mg/kg	446	7612683	562	517	7612691	1180	100	7612683
Total Selenium (Se)	mg/kg	<0.50	7612683	<0.50	<0.50	7612691	0.92	0.50	7612683
Total Silver (Ag)	mg/kg	<0.050	7612683	0.060	0.059	7612691	0.173	0.050	7612683
Total Sodium (Na)	mg/kg	206	7612683	179	223	7612691	<100	100	7612683
Total Strontium (Sr)	mg/kg	18.1	7612683	40.1	46.2	7612691	36.5	0.10	7612683
Total Thallium (Tl)	mg/kg	0.107	7612683	0.064	0.064	7612691	0.114	0.050	7612683
Total Tin (Sn)	mg/kg	0.38	7612683	0.27	0.31	7612691	0.72	0.10	7612683
Total Titanium (Ti)	mg/kg	782	7612683	487	557	7612691	452	1.0	7612683
Total Vanadium (V)	mg/kg	44.4	7612683	34.3	38.0	7612691	32.5	2.0	7612683
Total Zinc (Zn)	mg/kg	24.3	7612683	38.8	39.9	7612691	28.2	1.0	7612683
Total Zirconium (Zr)	mg/kg	1.04	7612683	2.13	2.14	7612691	3.56	0.50	7612683

RDL = Reportable Detection Limit

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam
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Success Through Science®

Maxxam Job #: B473400
Report Date: 2014/10/31

QUALITY ASSURANCE REPORT

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

			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
7612683	Total Aluminum (Al)	2014/08/26					<100	mg/kg	3.6	35	99	70 - 130
7612683	Total Antimony (Sb)	2014/08/26	91	75 - 125	97	75 - 125	<0.10	mg/kg	NC	30	98	70 - 130
7612683	Total Arsenic (As)	2014/08/26	92	75 - 125	100	75 - 125	<0.50	mg/kg	0.46	30	91	70 - 130
7612683	Total Barium (Ba)	2014/08/26	NC	75 - 125	100	75 - 125	<0.10	mg/kg	0.13	35	97	70 - 130
7612683	Total Beryllium (Be)	2014/08/26	100	75 - 125	109	75 - 125	<0.40	mg/kg	NC	30		
7612683	Total Bismuth (Bi)	2014/08/26					<0.10	mg/kg	NC	30		
7612683	Total Cadmium (Cd)	2014/08/26	94	75 - 125	96	75 - 125	<0.050	mg/kg	NC	30	98	70 - 130
7612683	Total Calcium (Ca)	2014/08/26					<100	mg/kg	6.3	30	98	70 - 130
7612683	Total Chromium (Cr)	2014/08/26	NC	75 - 125	99	75 - 125	<1.0	mg/kg	4.1	30	97	70 - 130
7612683	Total Cobalt (Co)	2014/08/26	95	75 - 125	100	75 - 125	<0.30	mg/kg	0.76	30	89	70 - 130
7612683	Total Copper (Cu)	2014/08/26	98	75 - 125	105	75 - 125	<0.50	mg/kg	0.056	30	93	70 - 130
7612683	Total Iron (Fe)	2014/08/26					<100	mg/kg	0.85	30	97	70 - 130
7612683	Total Lead (Pb)	2014/08/26	97	75 - 125	102	75 - 125	<0.10	mg/kg	0.40	35	97	70 - 130
7612683	Total Magnesium (Mg)	2014/08/26					<100	mg/kg	2.8	30	90	70 - 130
7612683	Total Manganese (Mn)	2014/08/26	NC	75 - 125	102	75 - 125	<0.20	mg/kg	2.5	30	96	70 - 130
7612683	Total Mercury (Hg)	2014/08/26	88	75 - 125	89	75 - 125	<0.050	mg/kg	NC	35	86	70 - 130
7612683	Total Molybdenum (Mo)	2014/08/26	102	75 - 125	103	75 - 125	<0.10	mg/kg	2.9	35	109	70 - 130
7612683	Total Nickel (Ni)	2014/08/26	99	75 - 125	102	75 - 125	<0.80	mg/kg	2.9	30	91	70 - 130
7612683	Total Phosphorus (P)	2014/08/26					<10	mg/kg	0.21	30	77	70 - 130
7612683	Total Potassium (K)	2014/08/26					<100	mg/kg	4.5	35		
7612683	Total Selenium (Se)	2014/08/26	87	75 - 125	105	75 - 125	<0.50	mg/kg	NC	30		
7612683	Total Silver (Ag)	2014/08/26	81	75 - 125	84	75 - 125	<0.050	mg/kg	NC	35		
7612683	Total Sodium (Na)	2014/08/26					<100	mg/kg	NC	35		
7612683	Total Strontium (Sr)	2014/08/26	110	75 - 125	109	75 - 125	<0.10	mg/kg	0.93	35	104	70 - 130
7612683	Total Thallium (Tl)	2014/08/26	98	75 - 125	105	75 - 125	<0.050	mg/kg	NC	30	94	70 - 130
7612683	Total Tin (Sn)	2014/08/26	92	75 - 125	98	75 - 125	<0.10	mg/kg	7.5	35		
7612683	Total Titanium (Ti)	2014/08/26	NC	75 - 125	99	75 - 125	1.8, RDL=1.0	mg/kg	3.2	35	103	70 - 130
7612683	Total Vanadium (V)	2014/08/26	NC	75 - 125	93	75 - 125	<2.0	mg/kg	1.8	30	95	70 - 130
7612683	Total Zinc (Zn)	2014/08/26	NC	75 - 125	98	75 - 125	<1.0	mg/kg	0.30	30	87	70 - 130
7612683	Total Zirconium (Zr)	2014/08/26					<0.50	mg/kg	3.1	30		
7612689	Soluble (2:1) pH	2014/08/25			101	97 - 103			0.18	N/A		
7612691	Total Aluminum (Al)	2014/08/26					<100	mg/kg	1.3	35	96	70 - 130

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

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
7612691	Total Antimony (Sb)	2014/08/26	95	75 - 125	98	75 - 125	<0.10	mg/kg	NC	30	98	70 - 130
7612691	Total Arsenic (As)	2014/08/26	95	75 - 125	93	75 - 125	<0.50	mg/kg	6.7	30	90	70 - 130
7612691	Total Barium (Ba)	2014/08/26	NC	75 - 125	97	75 - 125	<0.10	mg/kg	2.5	35	95	70 - 130
7612691	Total Beryllium (Be)	2014/08/26	104	75 - 125	105	75 - 125	<0.40	mg/kg	NC	30		
7612691	Total Bismuth (Bi)	2014/08/26					<0.10	mg/kg	NC	30		
7612691	Total Cadmium (Cd)	2014/08/26	98	75 - 125	97	75 - 125	<0.050	mg/kg	NC	30	95	70 - 130
7612691	Total Calcium (Ca)	2014/08/26					<100	mg/kg	1.4	30	93	70 - 130
7612691	Total Chromium (Cr)	2014/08/26	101	75 - 125	98	75 - 125	<1.0	mg/kg	2.4	30	97	70 - 130
7612691	Total Cobalt (Co)	2014/08/26	101	75 - 125	102	75 - 125	<0.30	mg/kg	2.1	30	86	70 - 130
7612691	Total Copper (Cu)	2014/08/26	103	75 - 125	105	75 - 125	<0.50	mg/kg	0.48	30	89	70 - 130
7612691	Total Iron (Fe)	2014/08/26					<100	mg/kg	1.4	30	99	70 - 130
7612691	Total Lead (Pb)	2014/08/26	104	75 - 125	99	75 - 125	<0.10	mg/kg	2.1	35	90	70 - 130
7612691	Total Magnesium (Mg)	2014/08/26					<100	mg/kg	2.2	30	88	70 - 130
7612691	Total Manganese (Mn)	2014/08/26	NC	75 - 125	102	75 - 125	<0.20	mg/kg	0.35	30	95	70 - 130
7612691	Total Mercury (Hg)	2014/08/26	95	75 - 125	88	75 - 125	<0.050	mg/kg	NC	35	70	70 - 130
7612691	Total Molybdenum (Mo)	2014/08/26	105	75 - 125	100	75 - 125	<0.10	mg/kg	NC	35	108	70 - 130
7612691	Total Nickel (Ni)	2014/08/26	102	75 - 125	101	75 - 125	<0.80	mg/kg	1.3	30	93	70 - 130
7612691	Total Phosphorus (P)	2014/08/26					<10	mg/kg	0.41	30	78	70 - 130
7612691	Total Potassium (K)	2014/08/26					<100	mg/kg	NC	35		
7612691	Total Selenium (Se)	2014/08/26	95	75 - 125	93	75 - 125	<0.50	mg/kg	NC	30		
7612691	Total Silver (Ag)	2014/08/26	85	75 - 125	87	75 - 125	<0.050	mg/kg	NC	35		
7612691	Total Sodium (Na)	2014/08/26					<100	mg/kg	NC	35		
7612691	Total Strontium (Sr)	2014/08/26	111	75 - 125	104	75 - 125	<0.10	mg/kg	1.8	35	100	70 - 130
7612691	Total Thallium (Tl)	2014/08/26	104	75 - 125	102	75 - 125	<0.050	mg/kg	NC	30	88	70 - 130
7612691	Total Tin (Sn)	2014/08/26	96	75 - 125	95	75 - 125	<0.10	mg/kg	NC	35		
7612691	Total Titanium (Ti)	2014/08/26	NC	75 - 125	96	75 - 125	1.2, RDL=1.0	mg/kg	4.0	35	105	70 - 130
7612691	Total Vanadium (V)	2014/08/26	NC	75 - 125	95	75 - 125	<2.0	mg/kg	2.1	30	97	70 - 130
7612691	Total Zinc (Zn)	2014/08/26	NC	75 - 125	98	75 - 125	<1.0	mg/kg	1.4	30	85	70 - 130
7612691	Total Zirconium (Zr)	2014/08/26					<0.50	mg/kg	NC	30		
7612694	Soluble (2:1) pH	2014/08/25			100	97 - 103			0.70	N/A		
7612980	Total Aluminum (Al)	2014/08/27					<100	mg/kg			91	70 - 130
7612980	Total Antimony (Sb)	2014/08/27	87	75 - 125	104	75 - 125	<0.10	mg/kg			100	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
7612980	Total Arsenic (As)	2014/08/27	96	75 - 125	97	75 - 125	<0.50	mg/kg	0.81	30	93	70 - 130
7612980	Total Barium (Ba)	2014/08/27	NC	75 - 125	107	75 - 125	<0.10	mg/kg	1.2	35	102	70 - 130
7612980	Total Beryllium (Be)	2014/08/27	110	75 - 125	108	75 - 125	<0.40	mg/kg				
7612980	Total Bismuth (Bi)	2014/08/27					<0.10	mg/kg				
7612980	Total Cadmium (Cd)	2014/08/27	100	75 - 125	100	75 - 125	<0.050	mg/kg			97	70 - 130
7612980	Total Calcium (Ca)	2014/08/27					<100	mg/kg			89	70 - 130
7612980	Total Chromium (Cr)	2014/08/27	101	75 - 125	100	75 - 125	<1.0	mg/kg	3.9	30	100	70 - 130
7612980	Total Cobalt (Co)	2014/08/27	100	75 - 125	103	75 - 125	<0.30	mg/kg			88	70 - 130
7612980	Total Copper (Cu)	2014/08/27	NC	75 - 125	100	75 - 125	<0.50	mg/kg	3.7	30	89	70 - 130
7612980	Total Iron (Fe)	2014/08/27					<100	mg/kg			95	70 - 130
7612980	Total Lead (Pb)	2014/08/27	98	75 - 125	104	75 - 125	<0.10	mg/kg	5.5	35	92	70 - 130
7612980	Total Magnesium (Mg)	2014/08/27					<100	mg/kg			92	70 - 130
7612980	Total Manganese (Mn)	2014/08/27	NC	75 - 125	104	75 - 125	<0.20	mg/kg			95	70 - 130
7612980	Total Mercury (Hg)	2014/08/27	87	75 - 125	100	75 - 125	<0.050	mg/kg			83	70 - 130
7612980	Total Molybdenum (Mo)	2014/08/27	93	75 - 125	105	75 - 125	<0.10	mg/kg			110	70 - 130
7612980	Total Nickel (Ni)	2014/08/27	98	75 - 125	100	75 - 125	<0.80	mg/kg			92	70 - 130
7612980	Total Phosphorus (P)	2014/08/27					<10	mg/kg			85	70 - 130
7612980	Total Potassium (K)	2014/08/27					<100	mg/kg				
7612980	Total Selenium (Se)	2014/08/27	101	75 - 125	102	75 - 125	<0.50	mg/kg				
7612980	Total Silver (Ag)	2014/08/27	82	75 - 125	82	75 - 125	<0.050	mg/kg				
7612980	Total Sodium (Na)	2014/08/27					<100	mg/kg				
7612980	Total Strontium (Sr)	2014/08/27	NC	75 - 125	99	75 - 125	<0.10	mg/kg			96	70 - 130
7612980	Total Thallium (Tl)	2014/08/27	101	75 - 125	105	75 - 125	<0.050	mg/kg			95	70 - 130
7612980	Total Tin (Sn)	2014/08/27	85	75 - 125	101	75 - 125	<0.10	mg/kg				
7612980	Total Titanium (Ti)	2014/08/27	NC	75 - 125	98	75 - 125	<1.0	mg/kg			105	70 - 130
7612980	Total Vanadium (V)	2014/08/27	NC	75 - 125	100	75 - 125	<2.0	mg/kg			98	70 - 130
7612980	Total Zinc (Zn)	2014/08/27	NC	75 - 125	106	75 - 125	<1.0	mg/kg	2.4	30	91	70 - 130
7612980	Total Zirconium (Zr)	2014/08/27					<0.50	mg/kg				
7612989	Soluble (2:1) pH	2014/08/26			101	97 - 103			0.32	N/A		
7665088	Total Aluminum (Al)	2014/10/09					1.7, RDL=1.0	mg/kg	6.8	35	36	20 - 93
7665088	Total Antimony (Sb)	2014/10/09	99	75 - 125	103	75 - 125	<0.0050	mg/kg	NC	35	83	75 - 125
7665088	Total Arsenic (As)	2014/10/09	104	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	91	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
7665088	Total Barium (Ba)	2014/10/09	NC	75 - 125	99	75 - 125	<0.10	mg/kg	7.2	35	87	75 - 125
7665088	Total Beryllium (Be)	2014/10/09	99	75 - 125	99	75 - 125	<0.10	mg/kg	NC	35		
7665088	Total Bismuth (Bi)	2014/10/09					<0.10	mg/kg	NC	35		
7665088	Total Boron (B)	2014/10/09					<2.0	mg/kg	NC	35	92	75 - 125
7665088	Total Cadmium (Cd)	2014/10/09	98	75 - 125	101	75 - 125	<0.010	mg/kg	NC	35	93	75 - 125
7665088	Total Calcium (Ca)	2014/10/09					<10	mg/kg	8.2	35		
7665088	Total Chromium (Cr)	2014/10/09	101	75 - 125	102	75 - 125	<0.20	mg/kg	NC	35	45	28 - 97
7665088	Total Cobalt (Co)	2014/10/09	102	75 - 125	104	75 - 125	<0.020	mg/kg	8.1	35	89	75 - 125
7665088	Total Copper (Cu)	2014/10/09	108	75 - 125	106	75 - 125	<0.050	mg/kg	14	35	92	75 - 125
7665088	Total Iron (Fe)	2014/10/09					<10	mg/kg	8.5	35	85	75 - 125
7665088	Total Lead (Pb)	2014/10/09	100	75 - 125	102	75 - 125	<0.010	mg/kg	7.0	35		
7665088	Total Magnesium (Mg)	2014/10/09					<10	mg/kg	17	35	88	75 - 125
7665088	Total Manganese (Mn)	2014/10/09	NC	75 - 125	104	75 - 125	<0.10	mg/kg	11	35	94	75 - 125
7665088	Total Mercury (Hg)	2014/10/09	101	75 - 125	109	75 - 125	<0.010	mg/kg	NC	35	100	75 - 125
7665088	Total Molybdenum (Mo)	2014/10/09	97	75 - 125	102	75 - 125	<0.050	mg/kg	NC	35	85	75 - 125
7665088	Total Nickel (Ni)	2014/10/09	103	75 - 125	104	75 - 125	0.052, RDL=0.050	mg/kg	5.4	35	75	58 - 126
7665088	Total Phosphorus (P)	2014/10/09					<10	mg/kg	9.5	35		
7665088	Total Potassium (K)	2014/10/09					<10	mg/kg	8.0	35		
7665088	Total Selenium (Se)	2014/10/09	100	75 - 125	99	75 - 125	<0.050	mg/kg	NC	35	119	75 - 125
7665088	Total Silver (Ag)	2014/10/09	83	75 - 125	79	75 - 125	<0.020	mg/kg	NC	35		
7665088	Total Sodium (Na)	2014/10/09					<10	mg/kg	NC	35	80	75 - 125
7665088	Total Strontium (Sr)	2014/10/09	101	75 - 125	100	75 - 125	<0.10	mg/kg	7.3	35	100	75 - 125
7665088	Total Thallium (Tl)	2014/10/09	84	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
7665088	Total Tin (Sn)	2014/10/09					<0.10	mg/kg	NC	35		
7665088	Total Titanium (Ti)	2014/10/09					<1.0	mg/kg	18	35		
7665088	Total Uranium (U)	2014/10/09	96	75 - 125	99	75 - 125	<0.0020	mg/kg	NC	35		
7665088	Total Vanadium (V)	2014/10/09	102	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
7665088	Total Zinc (Zn)	2014/10/09	NC	75 - 125	104	75 - 125	<0.20	mg/kg	12	35	90	75 - 125
7671661	Total Aluminum (Al)	2014/10/11					<1.0	mg/kg	6.6	35	35	20 - 93
7671661	Total Antimony (Sb)	2014/10/11	100	75 - 125	107	75 - 125	<0.0050	mg/kg	NC	35	84	75 - 125
7671661	Total Arsenic (As)	2014/10/11	95	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	83	75 - 125

Maxxam Job #: B473400
Report Date: 2014/10/31

QUALITY ASSURANCE REPORT(CONT'D)

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG. & SOIL
Site Location: KAMINAK-COFFEE CREEK

			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
7671661	Total Barium (Ba)	2014/10/11	NC	75 - 125	104	75 - 125	<0.10	mg/kg	11	35	88	75 - 125
7671661	Total Beryllium (Be)	2014/10/11	98	75 - 125	101	75 - 125	<0.10	mg/kg	NC	35		
7671661	Total Bismuth (Bi)	2014/10/11					<0.10	mg/kg	NC	35		
7671661	Total Boron (B)	2014/10/11					<2.0	mg/kg	NC	35	89	75 - 125
7671661	Total Cadmium (Cd)	2014/10/11	101	75 - 125	103	75 - 125	<0.010	mg/kg	12	35	91	75 - 125
7671661	Total Calcium (Ca)	2014/10/11					<10	mg/kg	16	35		
7671661	Total Chromium (Cr)	2014/10/11	98	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35	47	28 - 97
7671661	Total Cobalt (Co)	2014/10/11	96	75 - 125	106	75 - 125	<0.020	mg/kg	6.1	35	84	75 - 125
7671661	Total Copper (Cu)	2014/10/11	101	75 - 125	106	75 - 125	<0.050	mg/kg	14	35	87	75 - 125
7671661	Total Iron (Fe)	2014/10/11					<10	mg/kg	17	35	84	75 - 125
7671661	Total Lead (Pb)	2014/10/11	99	75 - 125	103	75 - 125	<0.010	mg/kg	NC	35		
7671661	Total Magnesium (Mg)	2014/10/11					<10	mg/kg	13	35	82	75 - 125
7671661	Total Manganese (Mn)	2014/10/11	NC	75 - 125	107	75 - 125	<0.10	mg/kg	14	35	90	75 - 125
7671661	Total Mercury (Hg)	2014/10/11	99	75 - 125	109	75 - 125	<0.010	mg/kg	NC	35	89	75 - 125
7671661	Total Molybdenum (Mo)	2014/10/11	110	75 - 125	107	75 - 125	<0.050	mg/kg	16	35	82	75 - 125
7671661	Total Nickel (Ni)	2014/10/11	106	75 - 125	106	75 - 125	<0.050	mg/kg	10	35	73	58 - 126
7671661	Total Phosphorus (P)	2014/10/11					<10	mg/kg	14	35		
7671661	Total Potassium (K)	2014/10/11					<10	mg/kg	14	35		
7671661	Total Selenium (Se)	2014/10/11	92	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	104	75 - 125
7671661	Total Silver (Ag)	2014/10/11	77	75 - 125	78	75 - 125	<0.020	mg/kg	NC	35		
7671661	Total Sodium (Na)	2014/10/11					<10	mg/kg	NC	35	89	75 - 125
7671661	Total Strontium (Sr)	2014/10/11	NC	75 - 125	104	75 - 125	<0.10	mg/kg	13	35	96	75 - 125
7671661	Total Thallium (Tl)	2014/10/11	95	75 - 125	87	75 - 125	<0.0020	mg/kg	NC	35		
7671661	Total Tin (Sn)	2014/10/11					<0.10	mg/kg	NC	35		
7671661	Total Titanium (Ti)	2014/10/11					<1.0	mg/kg	NC	35		
7671661	Total Uranium (U)	2014/10/11	100	75 - 125	101	75 - 125	<0.0020	mg/kg	NC	35		
7671661	Total Vanadium (V)	2014/10/11	99	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
7671661	Total Zinc (Zn)	2014/10/11	NC	75 - 125	103	75 - 125	<0.20	mg/kg	14	35	84	75 - 125
7680437	Total Aluminum (Al)	2014/10/18					<1.0	mg/kg	5.2	35	29	20 - 93
7680437	Total Antimony (Sb)	2014/10/18	97	75 - 125	99	75 - 125	<0.0050	mg/kg	NC	35	77	75 - 125
7680437	Total Arsenic (As)	2014/10/18	96	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35	85	75 - 125
7680437	Total Barium (Ba)	2014/10/18	NC	75 - 125	92	75 - 125	<0.10	mg/kg	1.9	35	90	75 - 125

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

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
7680437	Total Beryllium (Be)	2014/10/18	94	75 - 125	92	75 - 125	<0.10	mg/kg	NC	35		
7680437	Total Bismuth (Bi)	2014/10/18					<0.10	mg/kg	NC	35		
7680437	Total Boron (B)	2014/10/18					<2.0	mg/kg	1.1	35	80	75 - 125
7680437	Total Cadmium (Cd)	2014/10/18	91	75 - 125	92	75 - 125	<0.010	mg/kg	6.9	35	79	75 - 125
7680437	Total Calcium (Ca)	2014/10/18					<10	mg/kg	5.5	35		
7680437	Total Chromium (Cr)	2014/10/18	87	75 - 125	92	75 - 125	<0.20	mg/kg	NC	35	33	28 - 97
7680437	Total Cobalt (Co)	2014/10/18	88	75 - 125	93	75 - 125	<0.020	mg/kg	5.8	35	76	75 - 125
7680437	Total Copper (Cu)	2014/10/18	NC	75 - 125	96	75 - 125	<0.050	mg/kg	1.2	35	79	75 - 125
7680437	Total Iron (Fe)	2014/10/18					<10	mg/kg	6.4	35	83	75 - 125
7680437	Total Lead (Pb)	2014/10/18	91	75 - 125	94	75 - 125	<0.010	mg/kg	9.4	35		
7680437	Total Magnesium (Mg)	2014/10/18					<10	mg/kg	5.3	35	91	75 - 125
7680437	Total Manganese (Mn)	2014/10/18	NC	75 - 125	95	75 - 125	<0.10	mg/kg	6.8	35	82	75 - 125
7680437	Total Mercury (Hg)	2014/10/18	97	75 - 125	104	75 - 125	<0.010	mg/kg	NC	35	85	75 - 125
7680437	Total Molybdenum (Mo)	2014/10/18	100	75 - 125	98	75 - 125	<0.050	mg/kg	7.7	35	76	75 - 125
7680437	Total Nickel (Ni)	2014/10/18	87	75 - 125	96	75 - 125	<0.050	mg/kg	9.8	35	59	58 - 126
7680437	Total Phosphorus (P)	2014/10/18					<10	mg/kg	5.4	35		
7680437	Total Potassium (K)	2014/10/18					<10	mg/kg	6.5	35		
7680437	Total Selenium (Se)	2014/10/18	91	75 - 125	102	75 - 125	<0.050	mg/kg	NC	35	97	75 - 125
7680437	Total Silver (Ag)	2014/10/18	79	75 - 125	81	75 - 125	<0.020	mg/kg	NC	35		
7680437	Total Sodium (Na)	2014/10/18					<10	mg/kg	NC	35	98	75 - 125
7680437	Total Strontium (Sr)	2014/10/18	NC	75 - 125	91	75 - 125	<0.10	mg/kg	3.4	35	83	75 - 125
7680437	Total Thallium (Tl)	2014/10/18	92	75 - 125	84	75 - 125	<0.0020	mg/kg	NC	35		
7680437	Total Tin (Sn)	2014/10/18					<0.10	mg/kg	NC	35		
7680437	Total Titanium (Ti)	2014/10/18					<1.0	mg/kg	NC	35		
7680437	Total Uranium (U)	2014/10/18	93	75 - 125	92	75 - 125	<0.0020	mg/kg	NC	35		
7680437	Total Vanadium (V)	2014/10/18	92	75 - 125	92	75 - 125	<0.20	mg/kg	NC	35		
7680437	Total Zinc (Zn)	2014/10/18	NC	75 - 125	96	75 - 125	<0.20	mg/kg	4.8	35	78	75 - 125
7682773	Total Aluminum (Al)	2014/10/24					1.2, RDL=1.0	mg/kg	NC	35	37	20 - 93
7682773	Total Antimony (Sb)	2014/10/24	80	75 - 125	102	75 - 125	<0.0050	mg/kg	NC	35	86	75 - 125
7682773	Total Arsenic (As)	2014/10/24	98	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	101	75 - 125
7682773	Total Barium (Ba)	2014/10/24	NC	75 - 125	99	75 - 125	<0.10	mg/kg	28	35	88	75 - 125
7682773	Total Beryllium (Be)	2014/10/24	95	75 - 125	104	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
7682773	Total Bismuth (Bi)	2014/10/24					<0.10	mg/kg	NC	35		
7682773	Total Boron (B)	2014/10/24					<2.0	mg/kg	NC	35	92	75 - 125
7682773	Total Cadmium (Cd)	2014/10/24	100	75 - 125	101	75 - 125	<0.010	mg/kg	23	35	93	75 - 125
7682773	Total Calcium (Ca)	2014/10/24					<10	mg/kg	26	35		
7682773	Total Chromium (Cr)	2014/10/24	96	75 - 125	101	75 - 125	<0.20	mg/kg	NC	35	50	28 - 97
7682773	Total Cobalt (Co)	2014/10/24	95	75 - 125	105	75 - 125	<0.020	mg/kg	NC	35	89	75 - 125
7682773	Total Copper (Cu)	2014/10/24	119	75 - 125	104	75 - 125	<0.050	mg/kg	25	35	89	75 - 125
7682773	Total Iron (Fe)	2014/10/24					<10	mg/kg	NC	35	81	75 - 125
7682773	Total Lead (Pb)	2014/10/24	92	75 - 125	100	75 - 125	<0.010	mg/kg	NC	35		
7682773	Total Magnesium (Mg)	2014/10/24					<10	mg/kg	25	35	83	75 - 125
7682773	Total Manganese (Mn)	2014/10/24	NC	75 - 125	103	75 - 125	<0.10	mg/kg	32	35	93	75 - 125
7682773	Total Mercury (Hg)	2014/10/24	91	75 - 125	117	75 - 125	<0.010	mg/kg	NC	35	124	75 - 125
7682773	Total Molybdenum (Mo)	2014/10/24	101	75 - 125	99	75 - 125	<0.050	mg/kg	NC	35	92	75 - 125
7682773	Total Nickel (Ni)	2014/10/24	94	75 - 125	101	75 - 125	<0.050	mg/kg	NC	35	76	58 - 126
7682773	Total Phosphorus (P)	2014/10/24					<10	mg/kg	24	35		
7682773	Total Potassium (K)	2014/10/24					<10	mg/kg	27	35		
7682773	Total Selenium (Se)	2014/10/24	93	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35	118	75 - 125
7682773	Total Silver (Ag)	2014/10/24	93	75 - 125	91	75 - 125	<0.020	mg/kg	NC	35		
7682773	Total Sodium (Na)	2014/10/24					<10	mg/kg	NC	35	77	75 - 125
7682773	Total Strontium (Sr)	2014/10/24	NC	75 - 125	103	75 - 125	<0.10	mg/kg	29	35	97	75 - 125
7682773	Total Thallium (Tl)	2014/10/24	89	75 - 125	87	75 - 125	<0.0020	mg/kg	NC	35		
7682773	Total Tin (Sn)	2014/10/24					<0.10	mg/kg	NC	35		
7682773	Total Titanium (Ti)	2014/10/24					<1.0	mg/kg	NC	35		
7682773	Total Uranium (U)	2014/10/24	90	75 - 125	97	75 - 125	<0.0020	mg/kg	NC	35		
7682773	Total Vanadium (V)	2014/10/24	94	75 - 125	104	75 - 125	<0.20	mg/kg	NC	35		
7682773	Total Zinc (Zn)	2014/10/24	NC	75 - 125	103	75 - 125	<0.20	mg/kg	23	35	88	75 - 125
7682966	Total Aluminum (Al)	2014/10/24					<1.0	mg/kg	7.8	35	36	20 - 93
7682966	Total Antimony (Sb)	2014/10/24	102	75 - 125	94	75 - 125	<0.0050	mg/kg	NC	35	88	75 - 125
7682966	Total Arsenic (As)	2014/10/24	97	75 - 125	95	75 - 125	<0.050	mg/kg	NC	35	106	75 - 125
7682966	Total Barium (Ba)	2014/10/24	NC	75 - 125	93	75 - 125	<0.10	mg/kg	4.4	35	90	75 - 125
7682966	Total Beryllium (Be)	2014/10/24	100	75 - 125	95	75 - 125	<0.10	mg/kg	NC	35		
7682966	Total Bismuth (Bi)	2014/10/24			0.00000	N/A	<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
7682966	Total Boron (B)	2014/10/24			0.00000	N/A	<2.0	mg/kg	NC	35	89	75 - 125
7682966	Total Cadmium (Cd)	2014/10/24	102	75 - 125	94	75 - 125	<0.010	mg/kg	NC	35	96	75 - 125
7682966	Total Calcium (Ca)	2014/10/24			0.00000	N/A	<10	mg/kg	4.0	35		
7682966	Total Chromium (Cr)	2014/10/24	102	75 - 125	101	75 - 125	<0.20	mg/kg	NC	35	62	28 - 97
7682966	Total Cobalt (Co)	2014/10/24	103	75 - 125	102	75 - 125	<0.020	mg/kg	NC	35	91	75 - 125
7682966	Total Copper (Cu)	2014/10/24	106	75 - 125	104	75 - 125	<0.050	mg/kg	16	35	95	75 - 125
7682966	Total Iron (Fe)	2014/10/24			0.00000	N/A	<10	mg/kg	7.9	35	83	75 - 125
7682966	Total Lead (Pb)	2014/10/24	101	75 - 125	95	75 - 125	<0.010	mg/kg	4.6	35		
7682966	Total Magnesium (Mg)	2014/10/24			0.00000	N/A	<10	mg/kg	2.0	35	87	75 - 125
7682966	Total Manganese (Mn)	2014/10/24	NC	75 - 125	103	75 - 125	<0.10	mg/kg	1.9	35	97	75 - 125
7682966	Total Mercury (Hg)	2014/10/24	97	75 - 125	92	75 - 125	<0.010	mg/kg	NC	35	98	75 - 125
7682966	Total Molybdenum (Mo)	2014/10/24	101	75 - 125	93	75 - 125	<0.050	mg/kg	NC	35	92	75 - 125
7682966	Total Nickel (Ni)	2014/10/24	103	75 - 125	103	75 - 125	<0.050	mg/kg	12	35	111	58 - 126
7682966	Total Phosphorus (P)	2014/10/24			0.00000	N/A	<10	mg/kg	4.3	35		
7682966	Total Potassium (K)	2014/10/24			0.00000	N/A	<10	mg/kg	0.32	35		
7682966	Total Selenium (Se)	2014/10/24	94	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	106	75 - 125
7682966	Total Silver (Ag)	2014/10/24	94	75 - 125	92	75 - 125	<0.020	mg/kg	NC	35		
7682966	Total Sodium (Na)	2014/10/24			0.00000	N/A	<10	mg/kg	NC	35	86	75 - 125
7682966	Total Strontium (Sr)	2014/10/24	NC	75 - 125	96	75 - 125	<0.10	mg/kg	1.7	35	100	75 - 125
7682966	Total Thallium (Tl)	2014/10/24	96	75 - 125	85	75 - 125	<0.0020	mg/kg	NC	35		
7682966	Total Tin (Sn)	2014/10/24			0.00000	N/A	<0.10	mg/kg	NC	35		
7682966	Total Titanium (Ti)	2014/10/24			0.00000	N/A	<1.0	mg/kg	NC	35		
7682966	Total Uranium (U)	2014/10/24	98	75 - 125	92	75 - 125	<0.0020	mg/kg	NC	35		
7682966	Total Vanadium (V)	2014/10/24	104	75 - 125	105	75 - 125	<0.20	mg/kg	NC	35		
7682966	Total Zinc (Zn)	2014/10/24	NC	75 - 125	99	75 - 125	<0.20	mg/kg	2.5	35	90	75 - 125
7682971	Total Aluminum (Al)	2014/10/29					<1.0	mg/kg	5.7	35	38	20 - 93
7682971	Total Antimony (Sb)	2014/10/29	97	75 - 125	102	75 - 125	<0.0050	mg/kg	NC	35	89	75 - 125
7682971	Total Arsenic (As)	2014/10/29	104	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	101	75 - 125
7682971	Total Barium (Ba)	2014/10/29	NC	75 - 125	100	75 - 125	<0.10	mg/kg	1.3	35	88	75 - 125
7682971	Total Beryllium (Be)	2014/10/29	105	75 - 125	99	75 - 125	<0.10	mg/kg	NC	35		
7682971	Total Bismuth (Bi)	2014/10/29					<0.10	mg/kg	NC	35		
7682971	Total Boron (B)	2014/10/29					<2.0	mg/kg	NC	35	88	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
7682971	Total Cadmium (Cd)	2014/10/29	104	75 - 125	103	75 - 125	<0.010	mg/kg	2.0	35	96	75 - 125
7682971	Total Calcium (Ca)	2014/10/29					<10	mg/kg	2.5	35		
7682971	Total Chromium (Cr)	2014/10/29	106	75 - 125	102	75 - 125	<0.20	mg/kg	NC	35	56	28 - 97
7682971	Total Cobalt (Co)	2014/10/29	108	75 - 125	103	75 - 125	<0.020	mg/kg	2.0	35	94	75 - 125
7682971	Total Copper (Cu)	2014/10/29	NC	75 - 125	107	75 - 125	<0.050	mg/kg	10	35	98	75 - 125
7682971	Total Iron (Fe)	2014/10/29					<10	mg/kg	0.32	35	86	75 - 125
7682971	Total Lead (Pb)	2014/10/29	102	75 - 125	100	75 - 125	<0.010	mg/kg	NC	35		
7682971	Total Magnesium (Mg)	2014/10/29					<10	mg/kg	3.0	35	94	75 - 125
7682971	Total Manganese (Mn)	2014/10/29	NC	75 - 125	106	75 - 125	<0.10	mg/kg	2.0	35	102	75 - 125
7682971	Total Mercury (Hg)	2014/10/29	87	75 - 125	102	75 - 125	<0.010	mg/kg	NC	35	107	75 - 125
7682971	Total Molybdenum (Mo)	2014/10/29	101	75 - 125	99	75 - 125	<0.050	mg/kg	NC	35	90	75 - 125
7682971	Total Nickel (Ni)	2014/10/29	NC	75 - 125	103	75 - 125	<0.050	mg/kg	3.7	35	83	58 - 126
7682971	Total Phosphorus (P)	2014/10/29					<10	mg/kg	0.94	35		
7682971	Total Potassium (K)	2014/10/29					<10	mg/kg	2.2	35		
7682971	Total Selenium (Se)	2014/10/29	99	75 - 125	101	75 - 125	<0.050	mg/kg	NC	35	119	75 - 125
7682971	Total Silver (Ag)	2014/10/29	92	75 - 125	95	75 - 125	<0.020	mg/kg	NC	35		
7682971	Total Sodium (Na)	2014/10/29					<10	mg/kg	NC	35	88	75 - 125
7682971	Total Strontium (Sr)	2014/10/29	NC	75 - 125	102	75 - 125	<0.10	mg/kg	0.56	35	100	75 - 125
7682971	Total Thallium (Tl)	2014/10/29	97	75 - 125	91	75 - 125	<0.0020	mg/kg	NC	35		
7682971	Total Tin (Sn)	2014/10/29					<0.10	mg/kg	NC	35		
7682971	Total Titanium (Ti)	2014/10/29					<1.0	mg/kg	NC	35		
7682971	Total Uranium (U)	2014/10/29	102	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
7682971	Total Vanadium (V)	2014/10/29	108	75 - 125	104	75 - 125	<0.20	mg/kg	NC	35		
7682971	Total Zinc (Zn)	2014/10/29	NC	75 - 125	104	75 - 125	<0.20	mg/kg	5.6	35	97	75 - 125
7682974	Total Aluminum (Al)	2014/10/29					<1.0	mg/kg	9.0	35	39	20 - 93
7682974	Total Antimony (Sb)	2014/10/29	97	75 - 125	104	75 - 125	<0.0050	mg/kg	NC	35	94	75 - 125
7682974	Total Arsenic (As)	2014/10/29	101	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	101	75 - 125
7682974	Total Barium (Ba)	2014/10/29	NC	75 - 125	101	75 - 125	<0.10	mg/kg	10	35	87	75 - 125
7682974	Total Beryllium (Be)	2014/10/29	101	75 - 125	98	75 - 125	<0.10	mg/kg	NC	35		
7682974	Total Bismuth (Bi)	2014/10/29					<0.10	mg/kg	NC	35		
7682974	Total Boron (B)	2014/10/29					<2.0	mg/kg	NC	35	87	75 - 125
7682974	Total Cadmium (Cd)	2014/10/29	98	75 - 125	100	75 - 125	<0.010	mg/kg	NC	35	93	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
7682974	Total Calcium (Ca)	2014/10/29					<10	mg/kg	2.4	35		
7682974	Total Chromium (Cr)	2014/10/29	104	75 - 125	110	75 - 125	<0.20	mg/kg	NC	35	66	28 - 97
7682974	Total Cobalt (Co)	2014/10/29	103	75 - 125	113	75 - 125	<0.020	mg/kg	NC	35	94	75 - 125
7682974	Total Copper (Cu)	2014/10/29	100	75 - 125	111	75 - 125	<0.050	mg/kg	8.6	35	92	75 - 125
7682974	Total Iron (Fe)	2014/10/29					<10	mg/kg	3.3	35	88	75 - 125
7682974	Total Lead (Pb)	2014/10/29	98	75 - 125	100	75 - 125	<0.010	mg/kg	10	35		
7682974	Total Magnesium (Mg)	2014/10/29					<10	mg/kg	4.4	35	93	75 - 125
7682974	Total Manganese (Mn)	2014/10/29	NC	75 - 125	108	75 - 125	<0.10	mg/kg	7.5	35	95	75 - 125
7682974	Total Mercury (Hg)	2014/10/29	101	75 - 125	108	75 - 125	<0.010	mg/kg	NC	35	95	75 - 125
7682974	Total Molybdenum (Mo)	2014/10/29	92	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	85	75 - 125
7682974	Total Nickel (Ni)	2014/10/29	104	75 - 125	108	75 - 125	<0.050	mg/kg	11	35	88	58 - 126
7682974	Total Phosphorus (P)	2014/10/29					<10	mg/kg	4.4	35		
7682974	Total Potassium (K)	2014/10/29					<10	mg/kg	2.8	35		
7682974	Total Selenium (Se)	2014/10/29	103	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	123	75 - 125
7682974	Total Silver (Ag)	2014/10/29	93	75 - 125	94	75 - 125	<0.020	mg/kg	NC	35		
7682974	Total Sodium (Na)	2014/10/29					<10	mg/kg	NC	35	90	75 - 125
7682974	Total Strontium (Sr)	2014/10/29	98	75 - 125	96	75 - 125	<0.10	mg/kg	9.4	35	101	75 - 125
7682974	Total Thallium (Tl)	2014/10/29	96	75 - 125	97	75 - 125	<0.0020	mg/kg	NC	35		
7682974	Total Tin (Sn)	2014/10/29					<0.10	mg/kg	NC	35		
7682974	Total Titanium (Ti)	2014/10/29					<1.0	mg/kg	12	35		
7682974	Total Uranium (U)	2014/10/29	95	75 - 125	99	75 - 125	<0.0020	mg/kg	NC	35		
7682974	Total Vanadium (V)	2014/10/29	100	75 - 125	113	75 - 125	<0.20	mg/kg	NC	35		
7682974	Total Zinc (Zn)	2014/10/29	NC	75 - 125	114	75 - 125	<0.20	mg/kg	5.4	35	94	75 - 125
7696757	Total Aluminum (Al)	2014/10/31					<1.0	mg/kg	0.058	35	36	20 - 93
7696757	Total Antimony (Sb)	2014/10/31	81	75 - 125	95	75 - 125	<0.0050	mg/kg	NC	35	89	75 - 125
7696757	Total Arsenic (As)	2014/10/31	104	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	100	75 - 125
7696757	Total Barium (Ba)	2014/10/31	NC	75 - 125	98	75 - 125	<0.10	mg/kg	1.2	35	88	75 - 125
7696757	Total Beryllium (Be)	2014/10/31	96	75 - 125	94	75 - 125	<0.10	mg/kg	NC	35		
7696757	Total Bismuth (Bi)	2014/10/31					<0.10	mg/kg	NC	35		
7696757	Total Boron (B)	2014/10/31					<2.0	mg/kg	1.6	35	95	75 - 125
7696757	Total Cadmium (Cd)	2014/10/31	98	75 - 125	100	75 - 125	<0.010	mg/kg	0.90	35	92	75 - 125
7696757	Total Calcium (Ca)	2014/10/31					<10	mg/kg	2.4	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
7696757	Total Chromium (Cr)	2014/10/31	100	75 - 125	105	75 - 125	<0.20	mg/kg	NC	35	51	28 - 97
7696757	Total Cobalt (Co)	2014/10/31	96	75 - 125	104	75 - 125	<0.020	mg/kg	2.3	35	90	75 - 125
7696757	Total Copper (Cu)	2014/10/31	NC	75 - 125	104	75 - 125	<0.050	mg/kg	1.3	35	87	75 - 125
7696757	Total Iron (Fe)	2014/10/31					<10	mg/kg	NC	35	86	75 - 125
7696757	Total Lead (Pb)	2014/10/31	94	75 - 125	101	75 - 125	<0.010	mg/kg	NC	35		
7696757	Total Magnesium (Mg)	2014/10/31					<10	mg/kg	0.72	35	89	75 - 125
7696757	Total Manganese (Mn)	2014/10/31	NC	75 - 125	104	75 - 125	<0.10	mg/kg	1.6	35	95	75 - 125
7696757	Total Mercury (Hg)	2014/10/31	102	75 - 125	95	75 - 125	<0.010	mg/kg	NC	35	95	75 - 125
7696757	Total Molybdenum (Mo)	2014/10/31	103	75 - 125	89	75 - 125	<0.050	mg/kg	0.39	35	88	75 - 125
7696757	Total Nickel (Ni)	2014/10/31	NC	75 - 125	104	75 - 125	<0.050	mg/kg	3.0	35	76	58 - 126
7696757	Total Phosphorus (P)	2014/10/31					<10	mg/kg	0.92	35		
7696757	Total Potassium (K)	2014/10/31					<10	mg/kg	3.3	35		
7696757	Total Selenium (Se)	2014/10/31	98	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	108	75 - 125
7696757	Total Silver (Ag)	2014/10/31	88	75 - 125	92	75 - 125	<0.020	mg/kg	NC	35		
7696757	Total Sodium (Na)	2014/10/31					<10	mg/kg	NC	35	81	75 - 125
7696757	Total Strontium (Sr)	2014/10/31	NC	75 - 125	101	75 - 125	<0.10	mg/kg	1.4	35	100	75 - 125
7696757	Total Thallium (Tl)	2014/10/31	95	75 - 125	96	75 - 125	<0.0020	mg/kg	NC	35		
7696757	Total Tin (Sn)	2014/10/31					<0.10	mg/kg	NC	35		
7696757	Total Titanium (Ti)	2014/10/31					<1.0	mg/kg	NC	35		
7696757	Total Uranium (U)	2014/10/31	95	75 - 125	97	75 - 125	<0.0020	mg/kg	NC	35		
7696757	Total Vanadium (V)	2014/10/31	98	75 - 125	102	75 - 125	<0.20	mg/kg	NC	35		
7696757	Total Zinc (Zn)	2014/10/31	NC	75 - 125	102	75 - 125	<0.20	mg/kg	1.2	35	90	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).

VALIDATION SIGNATURE PAGE

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

[siganture redacted]

Rob Reinert, Data Validation Coordinator

Your Project #: 14-Y-0306 KAMINAK VEG AND SOIL
Site Location: KAMINAK-COFFEE CREEK
Your C.O.C. #: 08412523, 08412524

Attention:Anne MacLeod

EDI ENVIRONMENTAL DYNAMICS INC.
2195 2nd Avenue
WHITEHORSE, YT
CANADA Y1A 3T8

Report Date: 2015/08/10
Report #: R2019466
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

MAXXAM JOB #: B566854
Received: 2015/08/05, 10:25

Sample Matrix: Soil
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	4	2015/08/08	2015/08/10	BBY7SOP-00001	EPA 6020a R1 m
pH (2:1 DI Water Extract)	4	2015/08/08	2015/08/10	BBY6SOP-00028	BCMOE BCLM Mar2005 m

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

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Graham Rudkin, Project Manager, Environmental
Email: [phone number redacted]
Phone# [email redacted]
==
This report has been generated and distributed using a secure automated process.
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
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Success Through Science®

Maxxam Job #: B566854
Report Date: 2015/08/10

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG AND SOIL
Site Location: KAMINAK-COFFEE CREEK
Sampler Initials: SE

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		MV1428	MV1441	MV1442	MV1443		
Sampling Date		2015/07/25	2015/07/25	2015/07/25	2015/07/25		
COC Number		08412523	08412524	08412524	08412524		
	Units	**CCTM502-SOIL**	**CCTM500-SOIL**	**CCTM501-SOIL**	**CCTM503-SOIL**	**RDL**	**QC Batch**
Physical Properties							
Soluble (2:1) pH	pH	5.85	8.29	5.92	4.79	N/A	7995170
Total Metals by ICPMS							
Total Aluminum (Al)	mg/kg	12300	10400	16800	15800	100	7995169
Total Antimony (Sb)	mg/kg	0.25	1.73	0.51	0.20	0.10	7995169
Total Arsenic (As)	mg/kg	4.77	17.7	8.33	4.74	0.50	7995169
Total Barium (Ba)	mg/kg	336	585	181	182	0.10	7995169
Total Beryllium (Be)	mg/kg	<0.40	0.55	0.40	<0.40	0.40	7995169
Total Bismuth (Bi)	mg/kg	<0.10	0.25	0.14	<0.10	0.10	7995169
Total Cadmium (Cd)	mg/kg	0.185	1.43	0.197	0.149	0.050	7995169
Total Calcium (Ca)	mg/kg	7740	16700	5670	2460	100	7995169
Total Chromium (Cr)	mg/kg	18.4	21.1	34.7	22.2	1.0	7995169
Total Cobalt (Co)	mg/kg	13.3	13.0	9.69	6.67	0.30	7995169
Total Copper (Cu)	mg/kg	22.3	37.5	18.5	15.8	0.50	7995169
Total Iron (Fe)	mg/kg	22800	29100	25100	25700	100	7995169
Total Lead (Pb)	mg/kg	5.07	15.9	7.79	8.18	0.10	7995169
Total Lithium (Li)	mg/kg	8.2	19.8	12.5	8.0	5.0	7995169
Total Magnesium (Mg)	mg/kg	6640	6470	6510	4780	100	7995169
Total Manganese (Mn)	mg/kg	796	953	254	183	0.20	7995169
Total Mercury (Hg)	mg/kg	<0.050	0.095	<0.050	0.051	0.050	7995169
Total Molybdenum (Mo)	mg/kg	0.84	3.34	0.67	0.56	0.10	7995169
Total Nickel (Ni)	mg/kg	10.4	40.5	20.4	11.2	0.80	7995169
Total Phosphorus (P)	mg/kg	695	889	613	477	10	7995169
Total Potassium (K)	mg/kg	1400	939	619	1030	100	7995169
Total Selenium (Se)	mg/kg	<0.50	1.28	<0.50	<0.50	0.50	7995169
Total Silver (Ag)	mg/kg	0.127	0.282	0.066	0.149	0.050	7995169
Total Sodium (Na)	mg/kg	162	101	240	138	100	7995169
Total Strontium (Sr)	mg/kg	34.3	66.0	36.8	18.6	0.10	7995169
Total Thallium (Tl)	mg/kg	0.120	0.117	0.123	0.102	0.050	7995169
Total Tin (Sn)	mg/kg	0.27	0.31	0.52	0.42	0.10	7995169
Total Titanium (Ti)	mg/kg	859	120	1000	840	1.0	7995169
Total Uranium (U)	mg/kg	0.774	1.18	1.36	0.614	0.050	7995169
Total Vanadium (V)	mg/kg	58.7	40.1	62.7	50.6	2.0	7995169
Total Zinc (Zn)	mg/kg	54.0	167	51.6	61.8	1.0	7995169
Total Zirconium (Zr)	mg/kg	1.21	2.60	4.28	1.14	0.50	7995169

RDL = Reportable Detection Limit
N/A = Not Applicable

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

GENERAL COMMENTS

Submission Integrity Note:
No sampling times indicated on the Chain of Custody.

Results relate only to the items tested.

Maxxam
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Success Through Science®

Maxxam Job #: B566854
Report Date: 2015/08/10

QUALITY ASSURANCE REPORT

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG AND SOIL
Site Location: KAMINAK-COFFEE CREEK
Sampler Initials: SE

			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
7995169	Total Aluminum (Al)	2015/08/10					<100	mg/kg			102	70 - 130
7995169	Total Antimony (Sb)	2015/08/10	100	75 - 125	101	75 - 125	<0.10	mg/kg			103	70 - 130
7995169	Total Arsenic (As)	2015/08/10	96	75 - 125	98	75 - 125	<0.50	mg/kg			98	70 - 130
7995169	Total Barium (Ba)	2015/08/10	98	75 - 125	105	75 - 125	0.19, RDL=0.10	mg/kg			103	70 - 130
7995169	Total Beryllium (Be)	2015/08/10	91	75 - 125	99	75 - 125	<0.40	mg/kg				
7995169	Total Bismuth (Bi)	2015/08/10					<0.10	mg/kg				
7995169	Total Cadmium (Cd)	2015/08/10	95	75 - 125	102	75 - 125	<0.050	mg/kg			102	70 - 130
7995169	Total Calcium (Ca)	2015/08/10					<100	mg/kg			100	70 - 130
7995169	Total Chromium (Cr)	2015/08/10	97	75 - 125	107	75 - 125	<1.0	mg/kg			109	70 - 130
7995169	Total Cobalt (Co)	2015/08/10	96	75 - 125	108	75 - 125	<0.30	mg/kg			95	70 - 130
7995169	Total Copper (Cu)	2015/08/10	96	75 - 125	107	75 - 125	<0.50	mg/kg			94	70 - 130
7995169	Total Iron (Fe)	2015/08/10					<100	mg/kg			99	70 - 130
7995169	Total Lead (Pb)	2015/08/10	93	75 - 125	103	75 - 125	<0.10	mg/kg	34	35	93	70 - 130
7995169	Total Lithium (Li)	2015/08/10	94	75 - 125	101	75 - 125	<5.0	mg/kg				
7995169	Total Magnesium (Mg)	2015/08/10					<100	mg/kg			94	70 - 130
7995169	Total Manganese (Mn)	2015/08/10	NC	75 - 125	106	75 - 125	<0.20	mg/kg			98	70 - 130
7995169	Total Mercury (Hg)	2015/08/10	91	75 - 125	98	75 - 125	<0.050	mg/kg			103	70 - 130
7995169	Total Molybdenum (Mo)	2015/08/10	111	75 - 125	104	75 - 125	<0.10	mg/kg			110	70 - 130
7995169	Total Nickel (Ni)	2015/08/10	96	75 - 125	103	75 - 125	<0.80	mg/kg			96	70 - 130
7995169	Total Phosphorus (P)	2015/08/10					<10	mg/kg			88	70 - 130
7995169	Total Potassium (K)	2015/08/10					<100	mg/kg				
7995169	Total Selenium (Se)	2015/08/10	97	75 - 125	98	75 - 125	<0.50	mg/kg				
7995169	Total Silver (Ag)	2015/08/10	98	75 - 125	104	75 - 125	<0.050	mg/kg			95	60 - 140
7995169	Total Sodium (Na)	2015/08/10					<100	mg/kg				
7995169	Total Strontium (Sr)	2015/08/10	NC	75 - 125	99	75 - 125	<0.10	mg/kg			100	70 - 130
7995169	Total Thallium (Tl)	2015/08/10	96	75 - 125	104	75 - 125	<0.050	mg/kg			91	70 - 130
7995169	Total Tin (Sn)	2015/08/10	96	75 - 125	99	75 - 125	<0.10	mg/kg				
7995169	Total Titanium (Ti)	2015/08/10	NC	75 - 125	99	75 - 125	<1.0	mg/kg			109	70 - 130
7995169	Total Uranium (U)	2015/08/10	99	75 - 125	101	75 - 125	<0.050	mg/kg			104	70 - 130
7995169	Total Vanadium (V)	2015/08/10	99	75 - 125	101	75 - 125	<2.0	mg/kg			105	70 - 130

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

Maxxam Job #: B566854
Report Date: 2015/08/10

QUALITY ASSURANCE REPORT(CONT'D)

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG AND SOIL
Site Location: KAMINAK-COFFEE CREEK
Sampler Initials: SE

			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
7995169	Total Zinc (Zn)	2015/08/10	91	75 - 125	99	75 - 125	<1.0	mg/kg			88	70 - 130
7995169	Total Zirconium (Zr)	2015/08/10					<0.50	mg/kg				
7995170	Soluble (2:1) pH	2015/08/10			99	97 - 103			0.24	N/A		

N/A = Not Applicable

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

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

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

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

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

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

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Maxxam Job #: B566854
Report Date: 2015/08/10

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14-Y-0306 KAMINAK VEG AND SOIL
Site Location: KAMINAK-COFFEE CREEK
Sampler Initials: SE

VALIDATION SIGNATURE PAGE

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

[signature redacted]

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.

Success Through Science®

Your Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

Attention:Brodie Smith

EDI ENVIRONMENTAL DYNAMICS INC.
2195 2nd Avenue
WHITEHORSE, YT
CANADA Y1A 3T8

Your C.O.C. #: 08426712, 08426713, 08426714, 08426715, 08426716, 08426717, 08426718, 08426719, 08426720, 08426721, 08426722, 08426723, 08426724, 08426725, 08426726, 08426727, 08426728, 08426729, 08426730, 08426731

Report Date: 2016/09/29
Report #: R2271322
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B672722
Received: 2016/08/24, 09:15

Sample Matrix: Soil
Samples Received: 44

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	28	2016/08/30	2016/08/30	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	16	2016/08/30	2016/08/31	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Moisture	44	2016/08/27	2016/08/29	BBY8SOP-00017	BCMOE BCLM Dec2000 m
pH (2:1 DI Water Extract)	28	2016/08/30	2016/08/30	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	16	2016/08/30	2016/08/31	BBY6SOP-00028	BCMOE BCLM Mar2005 m

Sample Matrix: TISSUE
Samples Received: 132

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements in Tissue by CRC ICPMS - Dry Wt	10	2016/09/21	2016/09/23	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	20	2016/09/21	2016/09/25	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	40	2016/09/22	2016/09/25	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	18	2016/09/22	2016/09/27	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	24	2016/09/23	2016/09/27	BBY7SOP-00002	EPA 6020A R1 m
Elements in Tissue by CRC ICPMS - Dry Wt	20	2016/09/23	2016/09/28	BBY7SOP-00002	EPA 6020A R1 m
Moisture in Tissue	10	N/A	2016/09/23	BBY8SOP-00017	OMOE E3139 3.1 m
Moisture in Tissue	40	N/A	2016/09/24	BBY8SOP-00017	OMOE E3139 3.1 m
Moisture in Tissue	40	N/A	2016/09/27	BBY8SOP-00017	OMOE E3139 3.1 m
Moisture in Tissue	42	N/A	2016/09/28	BBY8SOP-00017	OMOE E3139 3.1 m

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

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

Success Through Science®

Your Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

Attention:Brodie Smith

EDI ENVIRONMENTAL DYNAMICS INC.
2195 2nd Avenue
WHITEHORSE, YT
CANADA Y1A 3T8

Your C.O.C. #: 08426712, 08426713, 08426714, 08426715, 08426716, 08426717, 08426718, 08426719, 08426720, 08426721, 08426722, 08426723, 08426724, 08426725, 08426726, 08426727, 08426728, 08426729, 08426730, 08426731

Report Date: 2016/09/29
Report #: R2271322
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B672722
Received: 2016/08/24, 09:15

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Graham Rudkin, Project Manager, Environmental
Email: [phone number redacted]
Phone# [email redacted]
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

PHYSICAL TESTING (SOIL)

Maxxam ID		PJ0116		PJ0117		PJ0118	PJ0119	PJ0120		
Sampling Date		2016/07/05		2016/07/05		2016/07/05	2016/07/05	2016/07/05		
COC Number		08426712		08426712		08426712	08426712	08426712		
	UNITS	**CCTMAS-600**	**QC Batch**	**CCTMAS-601**	**QC Batch**	**CCTMBS-602**	**CCTMBS-603**	**CCTMCS-604**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	12	8378807	25	8378803	44	67	70	0.30	8378807

RDL = Reportable Detection Limit

Maxxam ID		PJ0121		PJ0123	PJ0124	PJ0125	PJ0148	PJ0149		
Sampling Date		2016/07/05		2016/07/06	2016/07/06	2016/07/06	2016/07/06	2016/08/18		
COC Number		08426712		08426712	08426712	08426712	08426713	08426713		
	UNITS	**CCTMCS-605**	**QC Batch**	**CCTMCS-607**	**CCTMCS-608**	**CCTMCS-609**	**CCTMCS-610**	**CCTMCS-611**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	25	8378807	43	53	88	37	37	0.30	8378803

RDL = Reportable Detection Limit

Maxxam ID		PJ0150		PJ0151	PJ0152	PJ0153	PJ0154	PJ0155		
Sampling Date		2016/08/18		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426713		08426713	08426713	08426713	08426713	08426713		
	UNITS	**CCTMCS-612**	**QC Batch**	**CCTMCS-613**	**CCTMCS-613-R**	**CCTMRS-614**	**CCTMRS-615**	**CCTMRS-616**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	17	8378803	38	26	72	53	17	0.30	8378807

RDL = Reportable Detection Limit

Maxxam ID		PJ0156		PJ0157		PJ0186	PJ0187		
Sampling Date		2016/08/18		2016/08/19		2016/08/19	2016/08/19		
COC Number		08426713		08426713		08426714	08426714		
	UNITS	**CCTMRS-617**	**QC Batch**	**CCTMRS-618**	**QC Batch**	**CCTMAS-619**	**CCTMBS-620**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	44	8378807	22	8378819	64	52	0.30	8378803

RDL = Reportable Detection Limit

Maxxam ID		PJ0188		PJ0189		PJ0190		PJ0191		
Sampling Date		2016/08/19		2016/08/19		2016/08/19		2016/08/19		
COC Number		08426714		08426714		08426714		08426714		
	UNITS	**CCTMBS-621**	**QC Batch**	**CCTMAS-622**	**QC Batch**	**CCTMAS-622-R**	**QC Batch**	**CCTMAS-623**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	54	8378807	34	8378803	29	8378819	40	0.30	8378803

RDL = Reportable Detection Limit

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

PHYSICAL TESTING (SOIL)

Maxxam ID		PJ0192	PJ0193		PJ0194	PJ0195	PJ0216		
Sampling Date		2016/08/19	2016/08/19		2016/08/19	2016/08/19	2016/08/19		
COC Number		08426714	08426714		08426714	08426714	08426715		
	UNITS	**CCTMBS-624**	**CCTMBS-625**	**QC Batch**	**CCTMBS-625-R**	**CCTMAS-626**	**CCTMAS-627**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	74	33	8378807	37	61	73	0.30	8378803
RDL = Reportable Detection Limit									

Maxxam ID		PJ0217		PJ0218	PJ0219		PJ0220		
Sampling Date		2016/08/19		2016/08/19	2016/08/20		2016/08/20		
COC Number		08426715		08426715	08426715		08426715		
	UNITS	**CCTMAS-628**	**QC Batch**	**CCTMBS-629**	**CCTMBS-630**	**QC Batch**	**CCTMAS-631**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	29	8378807	31	35	8378803	47	0.30	8378819
RDL = Reportable Detection Limit									

Maxxam ID		PJ0221		PJ0222	PJ0223	PJ0224		PJ0225		
Sampling Date		2016/08/20		2016/08/20	2016/08/20	2016/08/21		2016/08/21		
COC Number		08426715		08426715	08426715	08426715		08426715		
	UNITS	**CCTMAS-632**	**QC Batch**	**CCTMBS-633**	**CCTMBS-634**	**CCTMRS-635**	**QC Batch**	**CCTMRS-636**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	40	8378807	23	33	56	8378803	68	0.30	8378807
RDL = Reportable Detection Limit										

Maxxam ID		PJ0238	PJ0239		PJ0240		PJ0241		
Sampling Date		2016/08/21	2016/08/21		2016/08/21		2016/08/21		
COC Number		08426716	08426716		08426716		08426716		
	UNITS	**CCTMRS-637**	**CCTMRS-638**	**QC Batch**	**CCTMRS-639**	**QC Batch**	**CCTMRS-639-R**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	22	55	8378807	21	8378819	47	0.30	8378807
RDL = Reportable Detection Limit									

Maxxam ID		PJ2887		
Sampling Date		2016/08/19		
COC Number		08426713		
	UNITS	**CCTMCS-606**	**RDL**	**QC Batch**
Physical Properties				
Moisture	%	22	0.30	8378803
RDL = Reportable Detection Limit				

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0261	PJ0262	PJ0263	PJ0264	PJ0265	PJ0266		
Sampling Date		2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05		
COC Number		08426717	08426717	08426717	08426717	08426717	08426717		
	UNITS	**CCTMAL-600**	**CCTMAL-601**	**CCTMBL-602**	**CCTMBL-603**	**CCTMCL-604**	**CCTMCL-605**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	159	168	159	140	174	220	1.0	8405576
Total Antimony (Sb)	mg/kg	0.0686	0.0461	0.0858	0.0357	0.0201	0.0210	0.0050	8405576
Total Arsenic (As)	mg/kg	0.192	0.151	0.167	0.162	0.180	0.249	0.050	8405576
Total Barium (Ba)	mg/kg	3.88	8.30	8.44	7.45	8.19	12.3	0.10	8405576
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405576
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405576
Total Boron (B)	mg/kg	4.6	4.0	3.6	2.5	<2.0	2.2	2.0	8405576
Total Cadmium (Cd)	mg/kg	0.039	0.054	0.033	0.024	0.067	0.072	0.010	8405576
Total Calcium (Ca)	mg/kg	715	1080	911	935	785	1370	10	8405576
Total Chromium (Cr)	mg/kg	0.35	0.32	0.37	0.39	0.35	0.50	0.20	8405576
Total Cobalt (Co)	mg/kg	0.098	0.105	0.120	0.106	0.147	0.172	0.020	8405576
Total Copper (Cu)	mg/kg	1.52	1.52	3.06	1.50	1.25	1.56	0.050	8405576
Total Iron (Fe)	mg/kg	215	231	246	228	290	360	10	8405576
Total Lead (Pb)	mg/kg	0.193	0.196	0.450	0.148	0.223	0.242	0.010	8405576
Total Magnesium (Mg)	mg/kg	293	356	331	326	298	435	10	8405576
Total Manganese (Mn)	mg/kg	180	196	167	213	120	286	0.10	8405576
Total Mercury (Hg)	mg/kg	0.017	0.021	0.026	0.020	0.013	0.028	0.010	8405576
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.072	0.055	0.050	8405576
Total Nickel (Ni)	mg/kg	0.607	0.862	0.546	0.479	0.545	0.586	0.050	8405576
Total Phosphorus (P)	mg/kg	428	473	566	452	292	444	10	8405576
Total Potassium (K)	mg/kg	954	1010	1120	920	694	920	10	8405576
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8405576
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8405576
Total Sodium (Na)	mg/kg	18	15	13	17	<10	11	10	8405576
Total Strontium (Sr)	mg/kg	1.69	3.58	1.93	1.67	2.24	2.19	0.10	8405576
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0032	0.0032	0.0026	0.0032	0.0020	8405576
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405576
Total Titanium (Ti)	mg/kg	7.1	7.4	8.7	7.2	8.8	11.4	1.0	8405576
Total Uranium (U)	mg/kg	0.0087	0.0459	0.0103	0.0098	0.0103	0.0148	0.0020	8405576
Total Vanadium (V)	mg/kg	0.32	0.39	0.43	0.36	0.44	0.66	0.20	8405576
Total Zinc (Zn)	mg/kg	12.7	14.2	17.0	15.9	9.57	15.6	0.20	8405576
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0267	PJ0268	PJ0269	PJ0270		PJ0290	PJ0291		
Sampling Date		2016/07/06	2016/07/06	2016/07/06	2016/07/06		2016/07/06	2016/08/18		
COC Number		08426717	08426717	08426717	08426717		08426718	08426718		
	UNITS	**CCTMCL-606**	**CCTMCL-607**	**CCTMCL-608**	**CCTMCL-609**	**QC Batch**	**CCTMCL-610**	**CCTMCL-611**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	130	92.6	162	108	8405576	159	120	1.0	8405594
Total Antimony (Sb)	mg/kg	0.0149	0.0146	0.0200	0.0163	8405576	0.0855	0.0311	0.0050	8405594
Total Arsenic (As)	mg/kg	0.104	0.077	0.148	0.099	8405576	0.148	0.112	0.050	8405594
Total Barium (Ba)	mg/kg	16.8	15.0	6.65	7.36	8405576	12.4	7.38	0.10	8405594
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	8405576	<0.10	<0.10	0.10	8405594
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	8405576	<0.10	<0.10	0.10	8405594
Total Boron (B)	mg/kg	2.1	2.5	2.6	<2.0	8405576	2.5	<2.0	2.0	8405594
Total Cadmium (Cd)	mg/kg	0.032	0.011	0.028	0.035	8405576	0.062	0.029	0.010	8405594
Total Calcium (Ca)	mg/kg	2080	1940	888	956	8405576	1270	791	10	8405594
Total Chromium (Cr)	mg/kg	0.32	0.25	0.43	0.25	8405576	0.38	0.31	0.20	8405594
Total Cobalt (Co)	mg/kg	0.114	0.078	0.142	0.090	8405576	0.156	0.087	0.020	8405594
Total Copper (Cu)	mg/kg	1.16	0.839	1.36	1.07	8405576	1.61	1.01	0.050	8405594
Total Iron (Fe)	mg/kg	232	155	265	172	8405576	246	199	10	8405594
Total Lead (Pb)	mg/kg	0.163	0.108	0.182	0.130	8405576	0.202	0.122	0.010	8405594
Total Magnesium (Mg)	mg/kg	291	202	272	286	8405576	505	258	10	8405594
Total Manganese (Mn)	mg/kg	145	24.4	203	197	8405576	138	163	0.10	8405594
Total Mercury (Hg)	mg/kg	0.026	0.016	0.018	0.017	8405576	0.035	0.018	0.010	8405594
Total Molybdenum (Mo)	mg/kg	<0.050	0.199	<0.050	<0.050	8405576	<0.050	0.075	0.050	8405594
Total Nickel (Ni)	mg/kg	0.416	0.278	0.475	0.332	8405576	0.695	0.370	0.050	8405594
Total Phosphorus (P)	mg/kg	447	298	310	348	8405576	526	310	10	8405594
Total Potassium (K)	mg/kg	1020	763	849	924	8405576	1060	870	10	8405594
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	8405576	<0.050	<0.050	0.050	8405594
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	8405576	<0.020	<0.020	0.020	8405594
Total Sodium (Na)	mg/kg	<10	<10	10	13	8405576	16	13	10	8405594
Total Strontium (Sr)	mg/kg	4.92	5.49	2.22	2.50	8405576	4.50	1.50	0.10	8405594
Total Thallium (Tl)	mg/kg	0.0041	<0.0020	0.0022	<0.0020	8405576	0.0034	0.0020	0.0020	8405594
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	8405576	<0.10	<0.10	0.10	8405594
Total Titanium (Ti)	mg/kg	6.9	4.8	9.3	6.0	8405576	8.2	6.9	1.0	8405594
Total Uranium (U)	mg/kg	0.0074	0.0057	0.0091	0.0127	8405576	0.0095	0.0089	0.0020	8405594
Total Vanadium (V)	mg/kg	0.33	<0.20	0.40	0.27	8405576	0.46	0.29	0.20	8405594
Total Zinc (Zn)	mg/kg	20.2	11.2	10.1	12.6	8405576	18.6	10.3	0.20	8405594
RDL = Reportable Detection Limit										

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0292	PJ0293	PJ0294	PJ0295	PJ0296	PJ0297		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426718	08426718	08426718	08426718	08426718	08426718		
	UNITS	**CCTMCL-612**	**CCTMCL-613**	**CCTMCL-613R**	**CCTMRL-614**	**CCTMRL-615**	**CCTMRL-616**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	249	189	226	182	160	190	1.0	8405594
Total Antimony (Sb)	mg/kg	0.0207	0.0358	0.0263	0.0509	0.0299	0.0257	0.0050	8405594
Total Arsenic (As)	mg/kg	0.179	0.167	0.188	0.165	0.135	0.160	0.050	8405594
Total Barium (Ba)	mg/kg	5.98	5.95	6.27	7.81	10.5	11.6	0.10	8405594
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Boron (B)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8405594
Total Cadmium (Cd)	mg/kg	0.031	0.023	0.027	0.050	0.064	0.043	0.010	8405594
Total Calcium (Ca)	mg/kg	857	665	737	973	1130	1120	10	8405594
Total Chromium (Cr)	mg/kg	0.50	0.48	0.64	0.46	0.48	0.44	0.20	8405594
Total Cobalt (Co)	mg/kg	0.165	0.148	0.186	0.146	0.124	0.150	0.020	8405594
Total Copper (Cu)	mg/kg	1.16	1.29	1.20	1.21	1.19	1.31	0.050	8405594
Total Iron (Fe)	mg/kg	275	298	348	287	248	294	10	8405594
Total Lead (Pb)	mg/kg	0.181	0.207	0.199	0.177	0.131	0.178	0.010	8405594
Total Magnesium (Mg)	mg/kg	352	326	357	339	365	361	10	8405594
Total Manganese (Mn)	mg/kg	106	72.4	83.6	296	148	142	0.10	8405594
Total Mercury (Hg)	mg/kg	0.029	0.026	0.021	0.023	0.023	0.021	0.010	8405594
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.066	0.057	0.050	8405594
Total Nickel (Ni)	mg/kg	0.547	0.591	0.670	0.575	0.553	0.579	0.050	8405594
Total Phosphorus (P)	mg/kg	416	400	430	294	391	445	10	8405594
Total Potassium (K)	mg/kg	1050	899	887	839	1010	879	10	8405594
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8405594
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8405594
Total Sodium (Na)	mg/kg	11	12	15	11	14	10	10	8405594
Total Strontium (Sr)	mg/kg	2.20	2.42	2.71	2.05	3.77	4.48	0.10	8405594
Total Thallium (Tl)	mg/kg	0.0028	0.0025	0.0030	0.0028	0.0023	<0.0020	0.0020	8405594
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Titanium (Ti)	mg/kg	8.9	10.7	12.6	11.4	8.7	9.5	1.0	8405594
Total Uranium (U)	mg/kg	0.0118	0.0109	0.0113	0.0091	0.0067	0.0103	0.0020	8405594
Total Vanadium (V)	mg/kg	0.49	0.51	0.60	0.51	0.49	0.49	0.20	8405594
Total Zinc (Zn)	mg/kg	12.9	12.4	13.1	12.2	13.8	15.1	0.20	8405594
RDL = Reportable Detection Limit									

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0298	PJ0299	PJ0326	PJ0327	PJ0328	PJ0329		
Sampling Date		2016/08/18	2016/08/18	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426718	08426718	08426719	08426719	08426719	08426719		
	UNITS	**CCTMRL-617**	**CCTMRL-618**	**CCTMAL-619**	**CCTMBL-620**	**CCTMBL-621**	**CCTMAL-622**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	231	197	141	178	127	107	1.0	8405594
Total Antimony (Sb)	mg/kg	0.0301	0.0309	0.315	0.0330	0.0266	0.0311	0.0050	8405594
Total Arsenic (As)	mg/kg	0.191	0.167	0.181	0.184	0.138	0.122	0.050	8405594
Total Barium (Ba)	mg/kg	6.66	6.84	5.00	3.73	4.34	7.43	0.10	8405594
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Boron (B)	mg/kg	<2.0	<2.0	<2.0	2.1	2.3	<2.0	2.0	8405594
Total Cadmium (Cd)	mg/kg	0.041	0.045	0.023	0.018	0.020	0.030	0.010	8405594
Total Calcium (Ca)	mg/kg	752	829	1220	600	646	972	10	8405594
Total Chromium (Cr)	mg/kg	0.60	0.51	0.37	0.45	0.29	0.23	0.20	8405594
Total Cobalt (Co)	mg/kg	0.181	0.160	0.099	0.151	0.101	0.092	0.020	8405594
Total Copper (Cu)	mg/kg	1.26	1.34	1.56	1.16	0.908	0.898	0.050	8405594
Total Iron (Fe)	mg/kg	361	301	227	279	204	162	10	8405594
Total Lead (Pb)	mg/kg	0.239	0.219	0.244	0.166	0.126	0.090	0.010	8405594
Total Magnesium (Mg)	mg/kg	294	282	233	273	255	432	10	8405594
Total Manganese (Mn)	mg/kg	87.5	101	20.2	158	186	171	0.10	8405594
Total Mercury (Hg)	mg/kg	0.020	0.021	0.021	0.017	0.021	0.014	0.010	8405594
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8405594
Total Nickel (Ni)	mg/kg	0.634	0.625	0.389	0.491	0.345	0.306	0.050	8405594
Total Phosphorus (P)	mg/kg	309	348	283	250	268	511	10	8405594
Total Potassium (K)	mg/kg	828	884	865	880	954	1170	10	8405594
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8405594
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8405594
Total Sodium (Na)	mg/kg	13	14	10	12	<10	<10	10	8405594
Total Strontium (Sr)	mg/kg	2.07	1.91	3.56	1.24	1.10	2.52	0.10	8405594
Total Thallium (Tl)	mg/kg	0.0043	0.0037	0.0022	0.0026	0.0027	0.0021	0.0020	8405594
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Titanium (Ti)	mg/kg	13.4	12.3	8.7	11.5	7.4	5.9	1.0	8405594
Total Uranium (U)	mg/kg	0.0128	0.0107	0.0090	0.0095	0.0068	0.0085	0.0020	8405594
Total Vanadium (V)	mg/kg	0.59	0.49	0.35	0.49	0.34	0.23	0.20	8405594
Total Zinc (Zn)	mg/kg	9.83	10.0	12.2	9.52	7.88	12.6	0.20	8405594
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0330	PJ0331	PJ0332	PJ0333	PJ0334	PJ0335		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426719	08426719	08426719	08426719	08426719	08426719		
	UNITS	CCTMAL-622-R	CCTMAL-623	CCTMBL-624	CCTMAL-626	CCTMAL-627	CCTMAL-628	RDL	QC Batch
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	93.7	125	116	151	137	166	1.0	8405594
Total Antimony (Sb)	mg/kg	0.0438	0.0794	0.117	0.0728	0.0434	0.0250	0.0050	8405594
Total Arsenic (As)	mg/kg	0.092	0.218	0.127	0.175	0.265	0.237	0.050	8405594
Total Barium (Ba)	mg/kg	7.72	8.79	3.90	5.36	4.77	4.51	0.10	8405594
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Boron (B)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8405594
Total Cadmium (Cd)	mg/kg	0.027	0.022	0.027	0.021	0.017	0.018	0.010	8405594
Total Calcium (Ca)	mg/kg	921	702	587	672	546	639	10	8405594
Total Chromium (Cr)	mg/kg	0.21	0.36	0.31	0.43	0.36	0.45	0.20	8405594
Total Cobalt (Co)	mg/kg	0.075	0.102	0.092	0.130	0.108	0.112	0.020	8405594
Total Copper (Cu)	mg/kg	0.806	0.955	0.837	1.05	0.862	1.08	0.050	8405594
Total Iron (Fe)	mg/kg	126	199	173	244	216	231	10	8405594
Total Lead (Pb)	mg/kg	0.071	0.117	0.108	0.129	0.104	0.139	0.010	8405594
Total Magnesium (Mg)	mg/kg	386	292	234	256	246	388	10	8405594
Total Manganese (Mn)	mg/kg	164	136	203	120	113	91.8	0.10	8405594
Total Mercury (Hg)	mg/kg	0.015	0.023	0.015	0.012	0.015	0.021	0.010	8405594
Total Molybdenum (Mo)	mg/kg	<0.050	0.050	<0.050	0.060	<0.050	<0.050	0.050	8405594
Total Nickel (Ni)	mg/kg	0.259	0.366	0.337	0.372	0.378	0.408	0.050	8405594
Total Phosphorus (P)	mg/kg	497	392	257	267	362	538	10	8405594
Total Potassium (K)	mg/kg	1190	956	986	892	896	1490	10	8405594
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8405594
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8405594
Total Sodium (Na)	mg/kg	<10	11	11	12	12	<10	10	8405594
Total Strontium (Sr)	mg/kg	2.34	1.68	1.18	1.72	1.20	1.75	0.10	8405594
Total Thallium (Tl)	mg/kg	0.0027	0.0049	0.0020	0.0025	0.0040	0.0023	0.0020	8405594
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8405594
Total Titanium (Ti)	mg/kg	4.4	7.3	6.6	10.5	7.6	9.9	1.0	8405594
Total Uranium (U)	mg/kg	0.0048	0.0101	0.0057	0.0092	0.0100	0.0096	0.0020	8405594
Total Vanadium (V)	mg/kg	<0.20	0.30	0.28	0.39	0.38	0.43	0.20	8405594
Total Zinc (Zn)	mg/kg	11.6	9.35	8.84	8.67	11.2	12.2	0.20	8405594

RDL = Reportable Detection Limit

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0369	PJ0370	PJ0371	PJ0372	PJ0373	PJ0374		
Sampling Date		2016/08/20	2016/08/20	2016/08/20	2016/08/20	2016/08/20	2016/08/21		
COC Number		08426720	08426720	08426720	08426720	08426720	08426720		
	UNITS	**CCTMBL-630**	**CCTMAL-631**	**CCTMAL-632**	**CCTMBL-633**	**CCTMBL-634**	**CCTMRL-635**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	53.9	88.6	85.5	119	65.0	102	1.0	8407097
Total Antimony (Sb)	mg/kg	0.0958	0.0638	0.0922	0.0218	0.0281	0.0139	0.0050	8407097
Total Arsenic (As)	mg/kg	0.066	0.124	0.090	0.143	0.085	0.108	0.050	8407097
Total Barium (Ba)	mg/kg	5.14	6.52	5.36	5.05	8.51	4.08	0.10	8407097
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Boron (B)	mg/kg	<2.0	<2.0	2.3	2.1	3.2	<2.0	2.0	8407097
Total Cadmium (Cd)	mg/kg	0.031	0.031	0.066	0.025	0.027	0.024	0.010	8407097
Total Calcium (Ca)	mg/kg	554	745	739	811	1290	665	10	8407097
Total Chromium (Cr)	mg/kg	<0.20	0.21	0.22	0.27	<0.20	0.32	0.20	8407097
Total Cobalt (Co)	mg/kg	0.049	0.083	0.081	0.096	0.072	0.091	0.020	8407097
Total Copper (Cu)	mg/kg	0.810	0.905	0.807	0.885	0.926	0.897	0.050	8407097
Total Iron (Fe)	mg/kg	86	143	121	186	121	156	10	8407097
Total Lead (Pb)	mg/kg	0.066	0.089	0.087	0.138	0.080	0.121	0.010	8407097
Total Magnesium (Mg)	mg/kg	204	358	406	219	424	486	10	8407097
Total Manganese (Mn)	mg/kg	86.7	229	132	51.2	20.5	34.7	0.10	8407097
Total Mercury (Hg)	mg/kg	0.021	0.028	0.014	0.016	0.019	0.020	0.010	8407097
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407097
Total Nickel (Ni)	mg/kg	0.213	0.334	0.301	0.309	0.231	0.445	0.050	8407097
Total Phosphorus (P)	mg/kg	401	404	499	237	429	336	10	8407097
Total Potassium (K)	mg/kg	1130	1110	1100	865	1610	1090	10	8407097
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407097
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407097
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8407097
Total Strontium (Sr)	mg/kg	1.32	1.94	2.20	2.76	5.39	1.47	0.10	8407097
Total Thallium (Tl)	mg/kg	0.0032	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407097
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Titanium (Ti)	mg/kg	2.3	4.7	4.0	7.2	3.3	5.4	1.0	8407097
Total Uranium (U)	mg/kg	0.0078	0.0085	0.0037	0.0065	0.0035	0.0050	0.0020	8407097
Total Vanadium (V)	mg/kg	<0.20	0.22	<0.20	0.26	<0.20	0.27	0.20	8407097
Total Zinc (Zn)	mg/kg	8.14	18.6	13.6	10.5	10.9	10.1	0.20	8407097

RDL = Reportable Detection Limit

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0375	PJ0376	PJ0377	PJ0391	PJ0392		
Sampling Date		2016/08/21	2016/08/21	2016/08/21	2016/08/21	2016/08/21		
COC Number		08426720	08426720	08426720	08426721	08426721		
	UNITS	**CCTMRL-636**	**CCTMRL-637**	**CCTMRL-638**	**CCTMRL-639**	**CCTMRL-639-R**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	90.4	127	90.5	84.8	87.9	1.0	8407097
Total Antimony (Sb)	mg/kg	0.0180	0.0146	0.0634	0.0218	0.0252	0.0050	8407097
Total Arsenic (As)	mg/kg	0.086	0.068	0.085	0.084	0.085	0.050	8407097
Total Barium (Ba)	mg/kg	6.59	4.53	5.19	6.11	5.93	0.10	8407097
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Boron (B)	mg/kg	<2.0	<2.0	2.1	<2.0	<2.0	2.0	8407097
Total Cadmium (Cd)	mg/kg	0.039	0.027	0.039	0.036	0.032	0.010	8407097
Total Calcium (Ca)	mg/kg	979	693	764	909	814	10	8407097
Total Chromium (Cr)	mg/kg	0.32	0.23	0.29	0.30	0.30	0.20	8407097
Total Cobalt (Co)	mg/kg	0.078	0.082	0.112	0.092	0.100	0.020	8407097
Total Copper (Cu)	mg/kg	0.852	0.877	0.898	0.874	0.895	0.050	8407097
Total Iron (Fe)	mg/kg	141	110	150	136	134	10	8407097
Total Lead (Pb)	mg/kg	0.103	0.075	0.107	0.085	0.093	0.010	8407097
Total Magnesium (Mg)	mg/kg	305	427	305	368	351	10	8407097
Total Manganese (Mn)	mg/kg	138	121	154	193	178	0.10	8407097
Total Mercury (Hg)	mg/kg	0.019	0.017	0.016	0.020	0.019	0.010	8407097
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407097
Total Nickel (Ni)	mg/kg	0.346	0.297	0.294	0.271	0.313	0.050	8407097
Total Phosphorus (P)	mg/kg	391	571	399	482	490	10	8407097
Total Potassium (K)	mg/kg	1160	1330	1120	1180	1180	10	8407097
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407097
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407097
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	8407097
Total Strontium (Sr)	mg/kg	2.40	1.81	1.58	1.69	1.61	0.10	8407097
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	0.0020	8407097
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Titanium (Ti)	mg/kg	5.0	4.1	4.5	4.4	4.4	1.0	8407097
Total Uranium (U)	mg/kg	0.0045	0.0044	0.0047	0.0047	0.0047	0.0020	8407097
Total Vanadium (V)	mg/kg	0.25	<0.20	0.24	0.22	0.24	0.20	8407097
Total Zinc (Zn)	mg/kg	12.3	14.6	10.9	13.1	12.9	0.20	8407097
RDL = Reportable Detection Limit								

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0411	PJ0412	PJ0413	PJ0414	PJ0415	PJ0416		
Sampling Date		2016/08/21	2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05		
COC Number		08426722	08426722	08426722	08426722	08426722	08426722		
	UNITS	**CCTMAC-600**	**CCTMAC-601**	**CCTMBC-602**	**CCTMBC-603**	**CCTMCC-604**	**CCTMCC-605**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	161	119	162	146	144	157	1.0	8408741
Total Antimony (Sb)	mg/kg	<0.0050	0.0069	0.0051	0.0069	0.0058	0.0055	0.0050	8408741
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.090	<0.050	<0.050	0.050	8408741
Total Barium (Ba)	mg/kg	76.4	96.3	62.5	71.3	54.0	71.1	0.10	8408741
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Boron (B)	mg/kg	7.5	8.1	4.2	6.9	7.2	8.8	2.0	8408741
Total Cadmium (Cd)	mg/kg	<0.010	0.019	<0.010	<0.010	0.011	0.015	0.010	8408741
Total Calcium (Ca)	mg/kg	6180	6450	5430	5750	8040	5530	10	8408741
Total Chromium (Cr)	mg/kg	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	0.20	8408741
Total Cobalt (Co)	mg/kg	0.035	0.039	0.037	0.029	0.044	0.021	0.020	8408741
Total Copper (Cu)	mg/kg	6.81 (1)	4.49	3.90	3.95	3.30	4.53	0.050	8408741
Total Iron (Fe)	mg/kg	60	59	82	58	61	42	10	8408741
Total Lead (Pb)	mg/kg	0.034	0.050	0.055	0.044	0.034	0.023	0.010	8408741
Total Magnesium (Mg)	mg/kg	1230	1100	1290	1300	1170	864	10	8408741
Total Manganese (Mn)	mg/kg	3040	2620	1820	2650	2900	2500	0.10	8408741
Total Mercury (Hg)	mg/kg	0.018	0.025	0.013	0.017	0.017	<0.010	0.010	8408741
Total Molybdenum (Mo)	mg/kg	0.057	<0.050	0.088	<0.050	0.243	<0.050	0.050	8408741
Total Nickel (Ni)	mg/kg	0.303	0.349	0.436	0.254	0.321	0.404	0.050	8408741
Total Phosphorus (P)	mg/kg	1040	1160	1110	997	635	811	10	8408741
Total Potassium (K)	mg/kg	3540	4200	3590	3580	2790	3840	10	8408741
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408741
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408741
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8408741
Total Strontium (Sr)	mg/kg	6.82	10.7	5.91	6.98	6.07	4.36	0.10	8408741
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	0.0020	8408741
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Titanium (Ti)	mg/kg	1.4	1.4	1.8	1.5	1.7	<1.0	1.0	8408741
Total Uranium (U)	mg/kg	<0.0020	0.0027	<0.0020	<0.0020	<0.0020	0.0076	0.0020	8408741
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408741
Total Zinc (Zn)	mg/kg	24.2	25.5	24.0	24.1	22.1	22.9	0.20	8408741

RDL = Reportable Detection Limit

(1) Duplicate outside acceptance criteria - re-analysis yields similar results.

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0417	PJ0418	PJ0419	PJ0420	PJ0433	PJ0434		
Sampling Date		2016/07/06	2016/07/06	2016/07/06	2016/07/06	2016/07/06	2016/08/18		
COC Number		08426722	08426722	08426722	08426722	08426723	08426723		
	UNITS	**CCTMCC-606**	**CCTMCC-607**	**CCTMCC-608**	**CCTMCC-609**	**CCTMCC-610**	**CCTMCC-611**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	34.1	40.5	95.2	101	93.3	94.2	1.0	8408741
Total Antimony (Sb)	mg/kg	0.0091	0.0066	0.0069	<0.0050	0.0079	0.0116	0.0050	8408741
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408741
Total Barium (Ba)	mg/kg	121	116	73.5	75.2	86.9	61.1	0.10	8408741
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Boron (B)	mg/kg	10.1	8.8	4.4	6.9	7.3	8.1	2.0	8408741
Total Cadmium (Cd)	mg/kg	<0.010	0.014	<0.010	0.013	0.040	<0.010	0.010	8408741
Total Calcium (Ca)	mg/kg	6260	8030	5240	5390	5910	5970	10	8408741
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408741
Total Cobalt (Co)	mg/kg	0.024	0.024	0.030	0.029	0.031	0.028	0.020	8408741
Total Copper (Cu)	mg/kg	2.15	1.74	3.20	2.96	3.23	4.70	0.050	8408741
Total Iron (Fe)	mg/kg	41	35	36	46	48	43	10	8408741
Total Lead (Pb)	mg/kg	0.019	0.021	0.028	0.029	0.025	0.030	0.010	8408741
Total Magnesium (Mg)	mg/kg	1010	911	1230	712	869	993	10	8408741
Total Manganese (Mn)	mg/kg	1070	828	1920	2560	1970	2530	0.10	8408741
Total Mercury (Hg)	mg/kg	0.014	0.012	<0.010	0.012	<0.010	0.015	0.010	8408741
Total Molybdenum (Mo)	mg/kg	0.120	1.89	0.096	0.400	<0.050	0.124	0.050	8408741
Total Nickel (Ni)	mg/kg	0.134	0.137	0.317	0.184	0.187	0.253	0.050	8408741
Total Phosphorus (P)	mg/kg	930	728	649	611	1130	652	10	8408741
Total Potassium (K)	mg/kg	4380	2730	2210	3400	4170	2790	10	8408741
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408741
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408741
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8408741
Total Strontium (Sr)	mg/kg	10.8	12.7	5.52	9.08	5.02	5.14	0.10	8408741
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0024	0.0020	8408741
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Titanium (Ti)	mg/kg	1.0	<1.0	<1.0	1.1	1.4	1.0	1.0	8408741
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408741
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408741
Total Zinc (Zn)	mg/kg	27.7	15.5	20.6	17.9	24.1	20.3	0.20	8408741
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0435	PJ0436	PJ0437	PJ0438	PJ0439	PJ0440		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426723	08426723	08426723	08426723	08426723	08426723		
	UNITS	**CCTMCC-612**	**CCTMCC-613**	**CCTMCC-613-R**	**CCTMRC-614**	**CCTMRC-615**	**CCTMRC-616**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	107	111	64.7	111	111	127	1.0	8408741
Total Antimony (Sb)	mg/kg	<0.0050	0.0081	0.0097	<0.0050	0.0198	0.0134	0.0050	8408741
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408741
Total Barium (Ba)	mg/kg	93.7	76.1	95.1	77.4	91.5	116	0.10	8408741
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Boron (B)	mg/kg	5.1	5.8	5.1	8.9	8.0	8.2	2.0	8408741
Total Cadmium (Cd)	mg/kg	<0.010	<0.010	<0.010	0.025	0.013	0.017	0.010	8408741
Total Calcium (Ca)	mg/kg	6020	5870	5620	7440	7400	6710	10	8408741
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408741
Total Cobalt (Co)	mg/kg	0.039	0.037	0.052	0.020	0.025	0.035	0.020	8408741
Total Copper (Cu)	mg/kg	4.95	3.43	3.77	4.57	3.30	4.18	0.050	8408741
Total Iron (Fe)	mg/kg	46	44	41	44	46	60	10	8408741
Total Lead (Pb)	mg/kg	0.037	0.020	0.029	0.021	0.027	0.029	0.010	8408741
Total Magnesium (Mg)	mg/kg	1580	1480	1650	785	947	1130	10	8408741
Total Manganese (Mn)	mg/kg	1700	1720	1520	3260	3050	2910	0.10	8408741
Total Mercury (Hg)	mg/kg	0.012	0.013	<0.010	0.014	0.012	0.015	0.010	8408741
Total Molybdenum (Mo)	mg/kg	0.059	0.051	<0.050	0.087	0.093	0.077	0.050	8408741
Total Nickel (Ni)	mg/kg	0.387	0.352	0.390	0.266	0.421	0.331	0.050	8408741
Total Phosphorus (P)	mg/kg	1230	1260	1170	729	947	1070	10	8408741
Total Potassium (K)	mg/kg	4620	3900	3920	4010	3840	3990	10	8408741
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408741
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408741
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8408741
Total Strontium (Sr)	mg/kg	5.87	7.40	10.5	5.97	6.03	8.08	0.10	8408741
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408741
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408741
Total Titanium (Ti)	mg/kg	<1.0	1.1	<1.0	1.1	1.1	1.8	1.0	8408741
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408741
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408741
Total Zinc (Zn)	mg/kg	30.9	27.3	24.7	27.2	28.1	23.1	0.20	8408741
RDL = Reportable Detection Limit									

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0441	PJ0442		PJ0454	PJ0455	PJ0456		
Sampling Date		2016/08/18	2016/08/18		2016/08/19	2016/08/19	2016/08/19		
COC Number		08426723	08426723		08426724	08426724	08426724		
	UNITS	**CCTMRC-617**	**CCTMRC-618**	**QC Batch**	**CCTMAC-619**	**CCTMBC-620**	**CCTMBC-621**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	159	137	8408741	44.3	95.1	105	1.0	8408878
Total Antimony (Sb)	mg/kg	0.0178	0.0062	8408741	0.0249	0.0201	0.0479	0.0050	8408878
Total Arsenic (As)	mg/kg	<0.050	<0.050	8408741	<0.050	<0.050	<0.050	0.050	8408878
Total Barium (Ba)	mg/kg	117	74.8	8408741	89.4	50.1	74.8	0.10	8408878
Total Beryllium (Be)	mg/kg	<0.10	<0.10	8408741	<0.10	<0.10	<0.10	0.10	8408878
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	8408741	<0.10	<0.10	<0.10	0.10	8408878
Total Boron (B)	mg/kg	6.1	8.4	8408741	9.5	8.9	8.9	2.0	8408878
Total Cadmium (Cd)	mg/kg	0.011	0.033	8408741	<0.010	<0.010	<0.010	0.010	8408878
Total Calcium (Ca)	mg/kg	6180	6650	8408741	9620	5100	7790	10	8408878
Total Chromium (Cr)	mg/kg	<0.20	<0.20	8408741	<0.20	<0.20	<0.20	0.20	8408878
Total Cobalt (Co)	mg/kg	0.050	0.043	8408741	0.026	0.029	0.024	0.020	8408878
Total Copper (Cu)	mg/kg	3.19	4.07	8408741	3.81	3.33	3.99	0.050	8408878
Total Iron (Fe)	mg/kg	68	54	8408741	44	26	38	10	8408878
Total Lead (Pb)	mg/kg	0.035	0.032	8408741	0.029	0.021	0.024	0.010	8408878
Total Magnesium (Mg)	mg/kg	1670	1220	8408741	909	875	918	10	8408878
Total Manganese (Mn)	mg/kg	2460	2690	8408741	864	2520	3210	0.10	8408878
Total Mercury (Hg)	mg/kg	0.021	0.014	8408741	0.018 (1)	0.013	0.016	0.010	8408878
Total Molybdenum (Mo)	mg/kg	0.054	<0.050	8408741	<0.050	0.051	<0.050	0.050	8408878
Total Nickel (Ni)	mg/kg	0.432	0.358	8408741	0.574 (2)	0.173	0.195	0.050	8408878
Total Phosphorus (P)	mg/kg	1090	1090	8408741	690	645	640	10	8408878
Total Potassium (K)	mg/kg	3900	4020	8408741	3960	2860	2940	10	8408878
Total Selenium (Se)	mg/kg	<0.050	<0.050	8408741	<0.050	<0.050	<0.050	0.050	8408878
Total Silver (Ag)	mg/kg	<0.020	<0.020	8408741	<0.020	<0.020	<0.020	0.020	8408878
Total Sodium (Na)	mg/kg	<10	<10	8408741	<10	<10	<10	10	8408878
Total Strontium (Sr)	mg/kg	10.0	4.32	8408741	16.1	3.43	4.07	0.10	8408878
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	8408741	<0.0020	<0.0020	0.0029	0.0020	8408878
Total Tin (Sn)	mg/kg	<0.10	0.43	8408741	<0.10	<0.10	<0.10	0.10	8408878
Total Titanium (Ti)	mg/kg	2.0	1.4	8408741	1.1	<1.0	<1.0	1.0	8408878
Total Uranium (U)	mg/kg	0.0021	<0.0020	8408741	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Vanadium (V)	mg/kg	<0.20	<0.20	8408741	<0.20	<0.20	<0.20	0.20	8408878
Total Zinc (Zn)	mg/kg	25.9	36.5	8408741	46.8	17.7	19.1	0.20	8408878

RDL = Reportable Detection Limit
(1) Matrix Spike outside acceptance criteria (10% of analytes failure allowed).
(2) Duplicate outside acceptance criteria - re-analysis yields similar results.

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0457	PJ0458	PJ0459	PJ0460	PJ0461	PJ0462		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426724	08426724	08426724	08426724	08426724	08426724		
	UNITS	**CCTMAC-622**	**CCTMAC-622-R**	**CCTMAC-623**	**CCTMBC-624**	**CCTMBC-625**	**CCTMBC-625-R**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	49.4	47.6	144	105	155	139	1.0	8408878
Total Antimony (Sb)	mg/kg	0.0206	0.0416	0.0167	0.0209	0.0145	0.0119	0.0050	8408878
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Barium (Ba)	mg/kg	68.6	72.8	79.7	81.2	103	116	0.10	8408878
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Boron (B)	mg/kg	5.3	5.6	7.6	6.3	13.7	12.8	2.0	8408878
Total Cadmium (Cd)	mg/kg	<0.010	<0.010	0.016	<0.010	0.133	0.174	0.010	8408878
Total Calcium (Ca)	mg/kg	5250	4860	7580	5900	7370	6760	10	8408878
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Cobalt (Co)	mg/kg	0.029	0.027	0.036	<0.020	0.062	0.056	0.020	8408878
Total Copper (Cu)	mg/kg	3.40	3.68	4.67	2.75	4.13	4.65	0.050	8408878
Total Iron (Fe)	mg/kg	30	30	46	36	39	52	10	8408878
Total Lead (Pb)	mg/kg	0.021	0.028	0.038	0.020	0.015	0.068	0.010	8408878
Total Magnesium (Mg)	mg/kg	936	851	1220	1310	896	958	10	8408878
Total Manganese (Mn)	mg/kg	1830	1840	2680	2680	2690	2500	0.10	8408878
Total Mercury (Hg)	mg/kg	<0.010	0.011	0.018	0.013	0.013	0.011	0.010	8408878
Total Molybdenum (Mo)	mg/kg	0.181	0.158	0.107	0.088	0.457	0.317	0.050	8408878
Total Nickel (Ni)	mg/kg	0.238	0.299	0.247	0.192	0.184	0.162	0.050	8408878
Total Phosphorus (P)	mg/kg	1150	1150	993	689	1120	1010	10	8408878
Total Potassium (K)	mg/kg	4150	4480	3660	2940	4790	3570	10	8408878
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408878
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8408878
Total Strontium (Sr)	mg/kg	5.10	5.94	6.05	4.46	13.9	12.4	0.10	8408878
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0030	<0.0020	0.0078	0.0124	0.0020	8408878
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	1.0	8408878
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Zinc (Zn)	mg/kg	18.6	17.5	30.9	13.4	24.3	24.4	0.20	8408878
RDL = Reportable Detection Limit									

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0463	PJ0475	PJ0476	PJ0477	PJ0478	PJ0479		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/20	2016/08/20		
COC Number		08426724	08426725	08426725	08426725	08426725	08426725		
	UNITS	**CCTMAC-626**	**CCTMAC-627**	**CCTMAC-628**	**CCTMBC-629**	**CCTMBC-630**	**CCTMAC-631**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	136	135	111	84.9	107	85.4	1.0	8408878
Total Antimony (Sb)	mg/kg	0.0202	0.0121	0.0096	0.0079	0.125	0.0182	0.0050	8408878
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Barium (Ba)	mg/kg	87.5	96.8	94.8	86.9	95.2	90.0	0.10	8408878
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Boron (B)	mg/kg	7.0	9.4	3.5	10.1	5.5	4.4	2.0	8408878
Total Cadmium (Cd)	mg/kg	<0.010	0.010	<0.010	0.055	<0.010	0.012	0.010	8408878
Total Calcium (Ca)	mg/kg	7930	6380	4990	6380	6430	5380	10	8408878
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Cobalt (Co)	mg/kg	0.028	0.024	0.038	<0.020	0.060	0.029	0.020	8408878
Total Copper (Cu)	mg/kg	2.81	3.95	3.28	2.43	3.13	4.13	0.050	8408878
Total Iron (Fe)	mg/kg	41	41	44	39	40	33	10	8408878
Total Lead (Pb)	mg/kg	0.039	0.020	0.022	0.017	0.028	0.034	0.010	8408878
Total Magnesium (Mg)	mg/kg	1310	1120	1250	866	1260	1380	10	8408878
Total Manganese (Mn)	mg/kg	2830	2140	1540	1140	1600	1540	0.10	8408878
Total Mercury (Hg)	mg/kg	0.017	0.016	0.012	0.012	0.013	0.011	0.010	8408878
Total Molybdenum (Mo)	mg/kg	0.072	<0.050	0.109	0.238	0.116	0.063	0.050	8408878
Total Nickel (Ni)	mg/kg	0.173	0.248	0.275	0.152	0.269	0.432	0.050	8408878
Total Phosphorus (P)	mg/kg	649	768	1150	890	869	884	10	8408878
Total Potassium (K)	mg/kg	2780	3350	4750	3440	3530	3210	10	8408878
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408878
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8408878
Total Strontium (Sr)	mg/kg	6.63	6.15	5.76	9.71	11.6	8.88	0.10	8408878
Total Thallium (Tl)	mg/kg	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Titanium (Ti)	mg/kg	1.1	1.0	1.2	<1.0	<1.0	<1.0	1.0	8408878
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Zinc (Zn)	mg/kg	20.7	25.1	20.1	20.2	14.6	20.4	0.20	8408878
RDL = Reportable Detection Limit									

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0480	PJ0481	PJ0482	PJ0483	PJ0484		
Sampling Date		2016/08/20	2016/08/20	2016/08/20	2016/08/21	2016/08/21		
COC Number		08426725	08426725	08426725	08426725	08426725		
	UNITS	**CCTMAC-632**	**CCTMBC-633**	**CCTMBC-634**	**CCTMRC-635**	**CCTMRC-636**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	119	48.6	33.4	45.5	83.8	1.0	8408878
Total Antimony (Sb)	mg/kg	0.0111	0.0138	0.0115	0.0068	0.0239	0.0050	8408878
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Barium (Ba)	mg/kg	111	61.7	96.9	75.0	65.3	0.10	8408878
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Boron (B)	mg/kg	6.5	8.8	14.1	7.2	13.4	2.0	8408878
Total Cadmium (Cd)	mg/kg	0.022	0.021	0.027	<0.010	0.027	0.010	8408878
Total Calcium (Ca)	mg/kg	6760	6990	8950	5350	6690	10	8408878
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Cobalt (Co)	mg/kg	0.021	<0.020	0.049	0.032	<0.020	0.020	8408878
Total Copper (Cu)	mg/kg	3.40	4.42	4.72	4.47	3.35	0.050	8408878
Total Iron (Fe)	mg/kg	35	36	63	26	33	10	8408878
Total Lead (Pb)	mg/kg	0.014	0.014	0.033	0.012	0.020	0.010	8408878
Total Magnesium (Mg)	mg/kg	1150	895	979	916	861	10	8408878
Total Manganese (Mn)	mg/kg	2310	2190	555	1630	2640	0.10	8408878
Total Mercury (Hg)	mg/kg	0.013	0.014	0.032	0.010	0.012	0.010	8408878
Total Molybdenum (Mo)	mg/kg	0.093	0.156	0.358	<0.050	<0.050	0.050	8408878
Total Nickel (Ni)	mg/kg	0.205	0.127	0.195	0.902	0.194	0.050	8408878
Total Phosphorus (P)	mg/kg	1280	920	749	1180	904	10	8408878
Total Potassium (K)	mg/kg	4950	4300	4110	5090	4190	10	8408878
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8408878
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8408878
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	10	8408878
Total Strontium (Sr)	mg/kg	7.49	8.45	21.7	3.98	6.08	0.10	8408878
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8408878
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.3	<1.0	<1.0	1.0	8408878
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8408878
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8408878
Total Zinc (Zn)	mg/kg	31.0	32.8	15.8	24.3	26.6	0.20	8408878
RDL = Reportable Detection Limit								

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0491	PJ0492	PJ0493	PJ0494		PJ0518		
Sampling Date		2016/08/21	2016/08/21	2016/08/21	2016/08/21		2016/07/05		
COC Number		08426726	08426726	08426726	08426726		08426727		
	UNITS	**CCTMRC-637**	**CCTMRC-638**	**CCTMRC-639**	**CCTMRC-639-R**	**QC Batch**	**CCTMAW-600**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	84.8	81.2	106	89.6	8408888	28.6	1.0	8407097
Total Antimony (Sb)	mg/kg	0.0143	0.0223	0.0067	0.0075	8408888	0.0193	0.0050	8407097
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	8408888	<0.050	0.050	8407097
Total Barium (Ba)	mg/kg	84.8	77.5	97.6	106	8408888	37.9	0.10	8407097
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	8408888	<0.10	0.10	8407097
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	8408888	<0.10	0.10	8407097
Total Boron (B)	mg/kg	10.0	6.8	8.5	7.0	8408888	4.3	2.0	8407097
Total Cadmium (Cd)	mg/kg	0.016	<0.010	0.015	<0.010	8408888	1.03	0.010	8407097
Total Calcium (Ca)	mg/kg	7000	6280	5810	6950	8408888	7890	10	8407097
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	8408888	<0.20	0.20	8407097
Total Cobalt (Co)	mg/kg	<0.020	0.021	0.058	0.033	8408888	0.895	0.020	8407097
Total Copper (Cu)	mg/kg	3.59	4.21	4.83	4.70	8408888	3.63	0.050	8407097
Total Iron (Fe)	mg/kg	37	31	36	33	8408888	68	10	8407097
Total Lead (Pb)	mg/kg	0.018	0.013	0.019	0.014	8408888	0.031	0.010	8407097
Total Magnesium (Mg)	mg/kg	971	921	910	939	8408888	2840	10	8407097
Total Manganese (Mn)	mg/kg	2190	2500	2140	2430	8408888	586	0.10	8407097
Total Mercury (Hg)	mg/kg	0.015	0.010	0.011	0.014	8408888	<0.010	0.010	8407097
Total Molybdenum (Mo)	mg/kg	<0.050	<0.050	<0.050	<0.050	8408888	0.121	0.050	8407097
Total Nickel (Ni)	mg/kg	0.157	0.248	0.267	0.264	8408888	3.58	0.050	8407097
Total Phosphorus (P)	mg/kg	1180	1110	1140	1200	8408888	2380	10	8407097
Total Potassium (K)	mg/kg	4060	4140	4200	4430	8408888	9880	10	8407097
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	8408888	<0.050	0.050	8407097
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	8408888	<0.020	0.020	8407097
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	8408888	<10	10	8407097
Total Strontium (Sr)	mg/kg	5.38	4.13	5.78	5.60	8408888	46.4	0.10	8407097
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	8408888	0.0023	0.0020	8407097
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	8408888	<0.10	0.10	8407097
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	8408888	<1.0	1.0	8407097
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	8408888	<0.0020	0.0020	8407097
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	8408888	<0.20	0.20	8407097
Total Zinc (Zn)	mg/kg	29.1	26.6	31.6	30.8	8408888	123	0.20	8407097
RDL = Reportable Detection Limit									

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0519	PJ0520	PJ0521	PJ0522	PJ0523	PJ0524		
Sampling Date		2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/06		
COC Number		08426727	08426727	08426727	08426727	08426727	08426727		
	UNITS	**CCTMAW-601**	**CCTMBW-602**	**CCTMBW-603**	**CCTMCW-604**	**CCTMCW-605**	**CCTMCW-606**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	19.5	20.3	25.6	16.6	22.7	16.1	1.0	8407097
Total Antimony (Sb)	mg/kg	0.0137	0.0102	0.0168	0.0086	0.0142	<0.0050	0.0050	8407097
Total Arsenic (As)	mg/kg	<0.050	<0.050	0.126	<0.050	<0.050	<0.050	0.050	8407097
Total Barium (Ba)	mg/kg	22.8	12.8	15.2	11.1	22.5	53.6	0.10	8407097
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Boron (B)	mg/kg	7.0	3.4	4.2	5.6	5.9	14.7	2.0	8407097
Total Cadmium (Cd)	mg/kg	0.305	0.363	0.224	1.65	2.93	1.08	0.010	8407097
Total Calcium (Ca)	mg/kg	6450	4480	5540	2720	7540	12600	10	8407097
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407097
Total Cobalt (Co)	mg/kg	0.275	0.919	0.427	0.851	0.333	0.245	0.020	8407097
Total Copper (Cu)	mg/kg	3.80	3.43	3.75	4.04	5.48	4.38	0.050	8407097
Total Iron (Fe)	mg/kg	72	79	68	84	58	66	10	8407097
Total Lead (Pb)	mg/kg	0.014	0.012	0.025	0.024	0.025	0.021	0.010	8407097
Total Magnesium (Mg)	mg/kg	2720	1550	2820	1430	2540	3040	10	8407097
Total Manganese (Mn)	mg/kg	317	1050	224	464	212	50.1	0.10	8407097
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8407097
Total Molybdenum (Mo)	mg/kg	0.086	0.086	0.084	0.506	0.058	0.712	0.050	8407097
Total Nickel (Ni)	mg/kg	3.73	1.35	2.17	2.05	2.75	1.26	0.050	8407097
Total Phosphorus (P)	mg/kg	2260	1830	1740	1710	1340	1980	10	8407097
Total Potassium (K)	mg/kg	9900	8360	10900	13000	10800	12800	10	8407097
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.342	0.050	8407097
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407097
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8407097
Total Strontium (Sr)	mg/kg	38.6	30.8	30.2	15.9	19.8	46.5	0.10	8407097
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0038	<0.0020	<0.0020	<0.0020	0.0020	8407097
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407097
Total Titanium (Ti)	mg/kg	<1.0	<1.0	1.1	<1.0	1.2	<1.0	1.0	8407097
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407097
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407097
Total Zinc (Zn)	mg/kg	85.9	83.2	61.3	121	154	93.0	0.20	8407097
RDL = Reportable Detection Limit									

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0525	PJ0526		PJ0527	PJ0602	PJ0603		
Sampling Date		2016/07/06	2016/07/06		2016/07/06	2016/07/06	2016/08/18		
COC Number		08426727	08426727		08426727	08426728	08426728		
	UNITS	**CCTMCW-607**	**CCTMCW-608**	**QC Batch**	**CCTMCW-609**	**CCTMCW-610**	**CCTMCW-612**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9.9	13.5	8407097	13.5	32.7	71.7	1.0	8407099
Total Antimony (Sb)	mg/kg	<0.0050	0.0055	8407097	<0.0050	0.0099	0.0223	0.0050	8407099
Total Arsenic (As)	mg/kg	<0.050	<0.050	8407097	<0.050	<0.050	<0.050	0.050	8407099
Total Barium (Ba)	mg/kg	23.2	8.38	8407097	26.3	82.5	43.4	0.10	8407099
Total Beryllium (Be)	mg/kg	<0.10	<0.10	8407097	<0.10	<0.10	<0.10	0.10	8407099
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	8407097	<0.10	<0.10	<0.10	0.10	8407099
Total Boron (B)	mg/kg	9.9	2.2	8407097	7.6	3.7	5.8	2.0	8407099
Total Cadmium (Cd)	mg/kg	1.16	0.573	8407097	1.35	14.1	0.910	0.010	8407099
Total Calcium (Ca)	mg/kg	12400	4530	8407097	5830	10100	11100	10	8407099
Total Chromium (Cr)	mg/kg	<0.20	<0.20	8407097	<0.20	<0.20	<0.20	0.20	8407099
Total Cobalt (Co)	mg/kg	0.557	0.656	8407097	0.143	1.18	1.21	0.020	8407099
Total Copper (Cu)	mg/kg	4.37	3.08	8407097	3.18	3.26	4.52	0.050	8407099
Total Iron (Fe)	mg/kg	82	59	8407097	44	59	53	10	8407099
Total Lead (Pb)	mg/kg	<0.010	0.015	8407097	0.022	0.025	0.030	0.010	8407099
Total Magnesium (Mg)	mg/kg	3510	1810	8407097	2250	3690	4460	10	8407099
Total Manganese (Mn)	mg/kg	245	434	8407097	761	108	281	0.10	8407099
Total Mercury (Hg)	mg/kg	<0.010	<0.010	8407097	<0.010	<0.010	<0.010	0.010	8407099
Total Molybdenum (Mo)	mg/kg	3.03	0.097	8407097	0.075	0.118	0.082	0.050	8407099
Total Nickel (Ni)	mg/kg	1.17	0.519	8407097	1.30	4.99	4.01	0.050	8407099
Total Phosphorus (P)	mg/kg	2470	1240	8407097	1270	2400	2600	10	8407099
Total Potassium (K)	mg/kg	9320	6850	8407097	9790	10700	10900	10	8407099
Total Selenium (Se)	mg/kg	<0.050	<0.050	8407097	<0.050	0.094	<0.050	0.050	8407099
Total Silver (Ag)	mg/kg	<0.020	<0.020	8407097	<0.020	<0.020	<0.020	0.020	8407099
Total Sodium (Na)	mg/kg	<10	<10	8407097	15	<10	<10	10	8407099
Total Strontium (Sr)	mg/kg	39.0	19.5	8407097	37.1	50.0	56.5	0.10	8407099
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	8407097	<0.0020	0.0033	0.0032	0.0020	8407099
Total Tin (Sn)	mg/kg	<0.10	<0.10	8407097	<0.10	<0.10	<0.10	0.10	8407099
Total Titanium (Ti)	mg/kg	<1.0	<1.0	8407097	<1.0	1.2	1.1	1.0	8407099
Total Uranium (U)	mg/kg	<0.0020	<0.0020	8407097	<0.0020	<0.0020	<0.0020	0.0020	8407099
Total Vanadium (V)	mg/kg	<0.20	<0.20	8407097	<0.20	<0.20	<0.20	0.20	8407099
Total Zinc (Zn)	mg/kg	112	71.3	8407097	157	99.4	81.3	0.20	8407099
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0604	PJ0605	PJ0606	PJ0607	PJ0608	PJ0609		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426728	08426728	08426728	08426728	08426728	08426728		
	UNITS	**CCTMCW-613**	**CCTMCW-613-R**	**CCTMRW-614**	**CCTMRW-615**	**CCTMRW-616**	**CCTMRW-617**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	232	118	25.0	19.7	55.1	47.6	1.0	8407099
Total Antimony (Sb)	mg/kg	0.0260	0.0085	0.0053	0.0110	0.0113	0.0275	0.0050	8407099
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407099
Total Barium (Ba)	mg/kg	65.6	59.2	19.2	43.9	99.2	102	0.10	8407099
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Boron (B)	mg/kg	3.4	3.3	6.7	5.4	4.9	2.5	2.0	8407099
Total Cadmium (Cd)	mg/kg	0.894	0.783	10.3	2.78	0.669	0.793	0.010	8407099
Total Calcium (Ca)	mg/kg	12400	10100	4830	8290	12500	11400	10	8407099
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407099
Total Cobalt (Co)	mg/kg	3.28	1.49	1.69	0.329	1.25	3.07	0.020	8407099
Total Copper (Cu)	mg/kg	3.69	3.81	3.63	4.10	3.12	3.44	0.050	8407099
Total Iron (Fe)	mg/kg	74	180	45	52	113	66	10	8407099
Total Lead (Pb)	mg/kg	0.046	0.027	0.018	0.029	0.022	0.020	0.010	8407099
Total Magnesium (Mg)	mg/kg	4880	5120	1280	2090	4450	4630	10	8407099
Total Manganese (Mn)	mg/kg	242	277	1150	400	310	240	0.10	8407099
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8407099
Total Molybdenum (Mo)	mg/kg	0.107	0.168	0.089	0.127	0.355	0.242	0.050	8407099
Total Nickel (Ni)	mg/kg	7.89	6.55	4.23	3.33	3.31	16.5	0.050	8407099
Total Phosphorus (P)	mg/kg	2110	2200	980	1190	1750	2020	10	8407099
Total Potassium (K)	mg/kg	9430	9340	7000	11500	9400	11200	10	8407099
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407099
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407099
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8407099
Total Strontium (Sr)	mg/kg	91.2	72.1	24.6	35.5	73.1	75.6	0.10	8407099
Total Thallium (Tl)	mg/kg	<0.0020	0.0036	<0.0020	0.0027	<0.0020	0.0066	0.0020	8407099
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8407099
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407099
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407099
Total Zinc (Zn)	mg/kg	30.7	39.8	293	201	116	74.7	0.20	8407099
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0610	PJ0611	PJ0632	PJ0633	PJ0634	PJ0635		
Sampling Date		2016/08/18	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426728	08426728	08426729	08426729	08426729	08426729		
	UNITS	**CCTMRW-618**	**CCTMAW-619**	**CCTMBW-620**	**CCTMAW-622**	**CCTMAW-622-R**	**CCTMAW-623**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	38.6	12.8	68.2	22.0	20.9	35.5	1.0	8407099
Total Antimony (Sb)	mg/kg	0.0148	0.0308	0.0150	0.0147	0.0639	0.0303	0.0050	8407099
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407099
Total Barium (Ba)	mg/kg	62.5	22.3	11.0	136	104	45.8	0.10	8407099
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Boron (B)	mg/kg	2.9	6.9	8.8	3.6	3.3	3.0	2.0	8407099
Total Cadmium (Cd)	mg/kg	2.78	0.323	0.470	0.799	0.644	1.03	0.010	8407099
Total Calcium (Ca)	mg/kg	10100	22000	4230	26700	19500	11600	10	8407099
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407099
Total Cobalt (Co)	mg/kg	3.03	0.351	2.54	0.862	1.55	1.31	0.020	8407099
Total Copper (Cu)	mg/kg	3.40	4.00	3.47	4.70	4.55	3.18	0.050	8407099
Total Iron (Fe)	mg/kg	74	69	97	64	56	71	10	8407099
Total Lead (Pb)	mg/kg	0.037	0.030	0.022	0.019	0.027	0.025	0.010	8407099
Total Magnesium (Mg)	mg/kg	3390	2280	1790	2880	3290	3750	10	8407099
Total Manganese (Mn)	mg/kg	184	77.1	1040	198	242	260	0.10	8407099
Total Mercury (Hg)	mg/kg	<0.010	0.011	<0.010	0.011	<0.010	<0.010	0.010	8407099
Total Molybdenum (Mo)	mg/kg	0.265	0.303	0.094	0.096	0.120	0.174	0.050	8407099
Total Nickel (Ni)	mg/kg	9.41	0.478	2.74	1.56	5.04	2.77	0.050	8407099
Total Phosphorus (P)	mg/kg	1510	1090	1060	1850	2160	1510	10	8407099
Total Potassium (K)	mg/kg	10500	9180	7020	11200	16600	11100	10	8407099
Total Selenium (Se)	mg/kg	0.123	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407099
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407099
Total Sodium (Na)	mg/kg	<10	<10	30	<10	<10	<10	10	8407099
Total Strontium (Sr)	mg/kg	45.7	73.0	22.7	92.6	76.7	59.5	0.10	8407099
Total Thallium (Tl)	mg/kg	0.0058	<0.0020	0.0024	0.0033	0.0120	<0.0020	0.0020	8407099
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Titanium (Ti)	mg/kg	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8407099
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407099
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407099
Total Zinc (Zn)	mg/kg	103	118	118	83.3	54.2	78.7	0.20	8407099
RDL = Reportable Detection Limit									

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0636	PJ0637	PJ0638	PJ0639	PJ0640		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426729	08426729	08426729	08426729	08426729		
	UNITS	**CCTMBW-625**	**CCTMBW-625-R**	**CCTMAW-626**	**CCTMAW-627**	**CCTMAW-628**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	44.1	45.2	46.0	38.9	73.7	1.0	8407099
Total Antimony (Sb)	mg/kg	0.0260	0.0263	0.0131	0.0523	0.0192	0.0050	8407099
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.084	<0.050	0.050	8407099
Total Barium (Ba)	mg/kg	103	106	16.4	67.1	79.8	0.10	8407099
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Boron (B)	mg/kg	21.0	17.4	6.6	7.3	2.8	2.0	8407099
Total Cadmium (Cd)	mg/kg	1.48	1.48	0.654	0.973	0.914	0.010	8407099
Total Calcium (Ca)	mg/kg	13000	11300	6070	12600	12800	10	8407099
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	0.30	0.20	8407099
Total Cobalt (Co)	mg/kg	2.03	2.25	4.09	0.698	1.32	0.020	8407099
Total Copper (Cu)	mg/kg	4.80	5.00	2.61	2.71	3.95	0.050	8407099
Total Iron (Fe)	mg/kg	44	43	96	90	112	10	8407099
Total Lead (Pb)	mg/kg	0.031	0.038	0.017	0.039	0.052	0.010	8407099
Total Magnesium (Mg)	mg/kg	2650	2390	2240	3620	5150	10	8407099
Total Manganese (Mn)	mg/kg	851	817	1220	357	250	0.10	8407099
Total Mercury (Hg)	mg/kg	0.011	0.011	<0.010	0.011	<0.010	0.010	8407099
Total Molybdenum (Mo)	mg/kg	0.314	0.252	0.241	0.158	0.111	0.050	8407099
Total Nickel (Ni)	mg/kg	6.90	7.81	1.90	1.99	7.97	0.050	8407099
Total Phosphorus (P)	mg/kg	3170	3180	902	1020	3170	10	8407099
Total Potassium (K)	mg/kg	15800	16700	6790	12300	11100	10	8407099
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407099
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407099
Total Sodium (Na)	mg/kg	<10	<10	30	<10	<10	10	8407099
Total Strontium (Sr)	mg/kg	94.4	93.5	22.6	46.3	73.4	0.10	8407099
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	0.0040	0.0020	8407099
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407099
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	1.5	3.3	1.0	8407099
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	0.0021	0.0036	0.0020	8407099
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407099
Total Zinc (Zn)	mg/kg	93.5	90.2	108	72.5	80.8	0.20	8407099
RDL = Reportable Detection Limit								

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0641	PJ0643	PJ0644	PJ0645	PJ0646	PJ0647		
Sampling Date		2016/08/19	2016/08/20	2016/08/20	2016/08/20	2016/08/20	2016/08/21		
COC Number		08426729	08426730	08426730	08426730	08426730	08426730		
	UNITS	**CCTMBW-629**	**CCTMAW-631**	**CCTMAW-632**	**CCTMBW-633**	**CCTMBW-634**	**CCTMRW-635**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	26.0	26.3	20.4	15.3	11.0	10.2	1.0	8407124
Total Antimony (Sb)	mg/kg	0.0220	0.0240	0.0194	0.0145	0.0267	0.0171	0.0050	8407124
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407124
Total Barium (Ba)	mg/kg	64.5	209	47.9	30.1	37.6	12.9	0.10	8407124
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Boron (B)	mg/kg	20.2	5.3	3.4	9.1	6.9	3.5	2.0	8407124
Total Cadmium (Cd)	mg/kg	2.26	1.31	2.40	0.962	0.648	0.959	0.010	8407124
Total Calcium (Ca)	mg/kg	14300	14200	13800	11500	17700	2680	10	8407124
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407124
Total Cobalt (Co)	mg/kg	1.08	0.680	0.987	0.156	0.335	1.52	0.020	8407124
Total Copper (Cu)	mg/kg	4.41	3.49	3.40	3.07	6.87	3.64	0.050	8407124
Total Iron (Fe)	mg/kg	43	43	44	53	49	40	10	8407124
Total Lead (Pb)	mg/kg	0.033	0.056	0.031	0.025	0.034	0.017	0.010	8407124
Total Magnesium (Mg)	mg/kg	1760	2020	3470	2030	1310	2090	10	8407124
Total Manganese (Mn)	mg/kg	272	107	179	136	52.1	385	0.10	8407124
Total Mercury (Hg)	mg/kg	0.012	0.012	<0.010	<0.010	0.011	<0.010	0.010	8407124
Total Molybdenum (Mo)	mg/kg	0.269	<0.050	0.086	0.530	0.277	0.093	0.050	8407124
Total Nickel (Ni)	mg/kg	1.82	2.07	2.13	0.402	2.22	9.38	0.050	8407124
Total Phosphorus (P)	mg/kg	2730	2110	2780	869	935	1350	10	8407124
Total Potassium (K)	mg/kg	10500	14600	11700	10500	8600	8410	10	8407124
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407124
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407124
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8407124
Total Strontium (Sr)	mg/kg	72.0	87.1	71.3	63.4	91.3	6.91	0.10	8407124
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0042	<0.0020	<0.0020	<0.0020	0.0020	8407124
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8407124
Total Uranium (U)	mg/kg	<0.0020	0.0111	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407124
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407124
Total Zinc (Zn)	mg/kg	68.7	72.8	118	240	21.7	61.6	0.20	8407124
RDL = Reportable Detection Limit									

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0648	PJ0649	PJ0650	PJ0651	PJ0652	PJ0664		
Sampling Date		2016/08/21	2016/08/21	2016/08/21	2016/08/21	2016/08/21	2016/07/05		
COC Number		08426730	08426730	08426730	08426730	08426730	08426731		
	UNITS	**CCTMRW-636**	**CCTMRW-637**	**CCTMRW-638**	**CCTMRW-639**	**CCTMRW-639-R**	**CCTMCH-604**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9.1	17.4	52.5	57.4	70.4	99.7	1.0	8407124
Total Antimony (Sb)	mg/kg	0.0395	0.0164	0.0519	0.0397	0.0469	0.0087	0.0050	8407124
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407124
Total Barium (Ba)	mg/kg	43.5	51.1	60.9	80.3	55.0	104	0.10	8407124
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Boron (B)	mg/kg	8.5	6.5	4.2	4.2	4.4	13.0	2.0	8407124
Total Cadmium (Cd)	mg/kg	3.20	0.974	0.562	1.37	1.07	0.432	0.010	8407124
Total Calcium (Ca)	mg/kg	9930	10900	8940	11600	8050	7020	10	8407124
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407124
Total Cobalt (Co)	mg/kg	0.396	0.637	1.99	3.17	3.15	2.07	0.020	8407124
Total Copper (Cu)	mg/kg	3.89	2.66	3.51	3.38	3.08	3.84	0.050	8407124
Total Iron (Fe)	mg/kg	37	46	103	125	127	170	10	8407124
Total Lead (Pb)	mg/kg	0.043	0.017	0.026	0.224	0.099	0.036	0.010	8407124
Total Magnesium (Mg)	mg/kg	2230	2760	3010	3710	3930	3050	10	8407124
Total Manganese (Mn)	mg/kg	483	261	274	308	660	234	0.10	8407124
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8407124
Total Molybdenum (Mo)	mg/kg	0.055	0.158	0.207	0.061	0.058	0.705	0.050	8407124
Total Nickel (Ni)	mg/kg	3.51	0.700	2.66	3.34	2.93	3.69	0.050	8407124
Total Phosphorus (P)	mg/kg	950	1120	1380	1510	1990	1570	10	8407124
Total Potassium (K)	mg/kg	7810	9330	11100	10900	10900	26100	10	8407124
Total Selenium (Se)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8407124
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407124
Total Sodium (Na)	mg/kg	<10	<10	<10	<10	<10	<10	10	8407124
Total Strontium (Sr)	mg/kg	39.2	40.4	39.1	49.6	34.0	48.8	0.10	8407124
Total Thallium (Tl)	mg/kg	0.0042	<0.0020	<0.0020	<0.0020	0.0025	0.0258	0.0020	8407124
Total Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8407124
Total Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8407124
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407124
Total Zinc (Zn)	mg/kg	298	137	48.1	81.9	68.7	70.7	0.20	8407124
RDL = Reportable Detection Limit									

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		PJ0665	PJ0666	PJ0667	PJ0668	PJ0669	PJ0670		
Sampling Date		2016/07/06	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/20		
COC Number		08426731	08426731	08426731	08426731	08426731	08426731		
	UNITS	**CCTMCH-609**	**CCTMAH-619**	**CCTMBH-625**	**CCTMBH-625-R**	**CCTMAH-627**	**CCTMBH-630**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	24.1	4.8	71.7	50.0	74.3	60.1	1.0	8407124
Total Antimony (Sb)	mg/kg	0.0179	0.0406	0.0155	0.0182	0.0166	0.124	0.0050	8407124
Total Arsenic (As)	mg/kg	<0.050	<0.050	<0.050	0.063	0.108	<0.050	0.050	8407124
Total Barium (Ba)	mg/kg	123	30.9	346	310	295	203	0.10	8407124
Total Beryllium (Be)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8407124
Total Boron (B)	mg/kg	8.8	22.9	28.7	25.8	14.7	11.5	2.0	8407124
Total Cadmium (Cd)	mg/kg	0.141	0.051	0.085	0.107	0.061	0.070	0.010	8407124
Total Calcium (Ca)	mg/kg	9700	35300	28400	27300	28000	16600	10	8407124
Total Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	0.28	<0.20	0.21	0.20	8407124
Total Cobalt (Co)	mg/kg	0.413	0.544	0.608	0.441	0.625	0.834	0.020	8407124
Total Copper (Cu)	mg/kg	4.45	2.17	2.23	2.24	2.52	4.04	0.050	8407124
Total Iron (Fe)	mg/kg	45	40	24	23	105	85	10	8407124
Total Lead (Pb)	mg/kg	0.027	0.014	0.052	0.053	0.037	0.056	0.010	8407124
Total Magnesium (Mg)	mg/kg	3590	2280	1760	2040	1350	3840	10	8407124
Total Manganese (Mn)	mg/kg	285	82.5	136	122	202	181	0.10	8407124
Total Mercury (Hg)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8407124
Total Molybdenum (Mo)	mg/kg	0.182	0.127	0.117	0.198	0.304	0.383	0.050	8407124
Total Nickel (Ni)	mg/kg	0.813	0.198	3.09	2.76	1.27	1.73	0.050	8407124
Total Phosphorus (P)	mg/kg	2210	945	899	959	748	1070	10	8407124
Total Potassium (K)	mg/kg	26800	28400	9150	10600	14000	26900	10	8407124
Total Selenium (Se)	mg/kg	<0.050	<0.050	0.307	0.511	<0.050	<0.050	0.050	8407124
Total Silver (Ag)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8407124
Total Sodium (Na)	mg/kg	<10	48	<10	<10	<10	<10	10	8407124
Total Strontium (Sr)	mg/kg	72.3	99.4	163	153	113	106	0.10	8407124
Total Thallium (Tl)	mg/kg	<0.0020	<0.0020	0.0025	0.0021	0.0031	<0.0020	0.0020	8407124
Total Tin (Sn)	mg/kg	<0.10	<0.10	0.64	<0.10	<0.10	<0.10	0.10	8407124
Total Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8407124
Total Uranium (U)	mg/kg	0.0034	<0.0020	0.0061	0.0046	0.0023	<0.0020	0.0020	8407124
Total Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8407124
Total Zinc (Zn)	mg/kg	39.8	27.9	34.0	41.8	22.1	46.9	0.20	8407124
RDL = Reportable Detection Limit									

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PHYSICAL TESTING (TISSUE)

Maxxam ID		PJ0261	PJ0262	PJ0263	PJ0264	PJ0265	PJ0266		
Sampling Date		2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05		
COC Number		08426717	08426717	08426717	08426717	08426717	08426717		
	UNITS	**CCTMAL-600**	**CCTMAL-601**	**CCTMBL-602**	**CCTMBL-603**	**CCTMCL-604**	**CCTMCL-605**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	58	64	59	64	53	64	0.30	8408031
RDL = Reportable Detection Limit									

Maxxam ID		PJ0267	PJ0268	PJ0269	PJ0270		PJ0290		
Sampling Date		2016/07/06	2016/07/06	2016/07/06	2016/07/06		2016/07/06		
COC Number		08426717	08426717	08426717	08426717		08426718		
	UNITS	**CCTMCL-606**	**CCTMCL-607**	**CCTMCL-608**	**CCTMCL-609**	**QC Batch**	**CCTMCL-610**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	32	56	66	70	8408031	63	0.30	8409719
RDL = Reportable Detection Limit									

Maxxam ID		PJ0291		PJ0292	PJ0293	PJ0294	PJ0295	PJ0296		
Sampling Date		2016/08/18		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426718		08426718	08426718	08426718	08426718	08426718		
	UNITS	**CCTMCL-611**	**QC Batch**	**CCTMCL-612**	**CCTMCL-613**	**CCTMCL-613R**	**CCTMRL-614**	**CCTMRL-615**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	32	8413052	50	26	21	22	29	0.30	8409719
RDL = Reportable Detection Limit										

Maxxam ID		PJ0297	PJ0298	PJ0299	PJ0326	PJ0327	PJ0328		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426718	08426718	08426718	08426719	08426719	08426719		
	UNITS	**CCTMRL-616**	**CCTMRL-617**	**CCTMRL-618**	**CCTMAL-619**	**CCTMBL-620**	**CCTMBL-621**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	26	29	35	62	61	61	0.30	8409719
RDL = Reportable Detection Limit									

Maxxam ID		PJ0329	PJ0330	PJ0331	PJ0332	PJ0333	PJ0334		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426719	08426719	08426719	08426719	08426719	08426719		
	UNITS	**CCTMAL-622**	**CCTMAL-622-R**	**CCTMAL-623**	**CCTMBL-624**	**CCTMAL-626**	**CCTMAL-627**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	61	61	59	68	59	52	0.30	8409719
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
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PHYSICAL TESTING (TISSUE)

Maxxam ID		PJ0335	PJ0369		PJ0370	PJ0371	PJ0372	PJ0373		
Sampling Date		2016/08/19	2016/08/20		2016/08/20	2016/08/20	2016/08/20	2016/08/20		
COC Number		08426719	08426720		08426720	08426720	08426720	08426720		
	UNITS	CCTMAL-628	CCTMBL-630	QC Batch	CCTMAL-631	CCTMAL-632	CCTMBL-633	CCTMBL-634	RDL	QC Batch
Physical Properties										
Moisture	%	49	70	8409719	65	63	56	55	0.30	8409718
RDL = Reportable Detection Limit										

Maxxam ID		PJ0374	PJ0375	PJ0376	PJ0377	PJ0391	PJ0392		
Sampling Date		2016/08/21	2016/08/21	2016/08/21	2016/08/21	2016/08/21	2016/08/21		
COC Number		08426720	08426720	08426720	08426720	08426721	08426721		
	UNITS	CCTMRL-635	CCTMRL-636	CCTMRL-637	CCTMRL-638	CCTMRL-639	CCTMRL-639-R	RDL	QC Batch
Physical Properties									
Moisture	%	25	16	16	29	28	29	0.30	8409718
RDL = Reportable Detection Limit									

Maxxam ID		PJ0411	PJ0412	PJ0413	PJ0414	PJ0415	PJ0416		
Sampling Date		2016/08/21	2016/07/05	2016/07/05	2016/07/05	2016/07/05	2016/07/05		
COC Number		08426722	08426722	08426722	08426722	08426722	08426722		
	UNITS	CCTMAC-600	CCTMAC-601	CCTMBC-602	CCTMBC-603	CCTMCC-604	CCTMCC-605	RDL	QC Batch
Physical Properties									
Moisture	%	51	52	55	51	51	59	0.30	8409718
RDL = Reportable Detection Limit									

Maxxam ID		PJ0417	PJ0418	PJ0419	PJ0420		PJ0433	PJ0434		
Sampling Date		2016/07/06	2016/07/06	2016/07/06	2016/07/06		2016/07/06	2016/08/18		
COC Number		08426722	08426722	08426722	08426722		08426723	08426723		
	UNITS	CCTMCC-606	CCTMCC-607	CCTMCC-608	CCTMCC-609	QC Batch	CCTMCC-610	CCTMCC-611	RDL	QC Batch
Physical Properties										
Moisture	%	56	53	55	52	8409718	57	50	0.30	8411681
RDL = Reportable Detection Limit										

Maxxam ID		PJ0435	PJ0436	PJ0437	PJ0438	PJ0439	PJ0440		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426723	08426723	08426723	08426723	08426723	08426723		
	UNITS	CCTMCC-612	CCTMCC-613	CCTMCC-613-R	CCTMRC-614	CCTMRC-615	CCTMRC-616	RDL	QC Batch
Physical Properties									
Moisture	%	54	54	53	54	50	56	0.30	8411681
RDL = Reportable Detection Limit									

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PHYSICAL TESTING (TISSUE)

Maxxam ID		PJ0441	PJ0442	PJ0454	PJ0455	PJ0456	PJ0457		
Sampling Date		2016/08/18	2016/08/18	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426723	08426723	08426724	08426724	08426724	08426724		
	UNITS	**CCTMRC-617**	**CCTMRC-618**	**CCTMAC-619**	**CCTMBC-620**	**CCTMBC-621**	**CCTMAC-622**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	55	55	61	54	51	62	0.30	8411681

RDL = Reportable Detection Limit

Maxxam ID		PJ0458	PJ0459	PJ0460	PJ0461	PJ0462	PJ0463		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426724	08426724	08426724	08426724	08426724	08426724		
	UNITS	**CCTMAC-622-R**	**CCTMAC-623**	**CCTMBC-624**	**CCTMBC-625**	**CCTMBC-625-R**	**CCTMAC-626**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	60	51	54	54	56	51	0.30	8411681

RDL = Reportable Detection Limit

Maxxam ID		PJ0475	PJ0476	PJ0477	PJ0478	PJ0479	PJ0480		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/20	2016/08/20	2016/08/20		
COC Number		08426725	08426725	08426725	08426725	08426725	08426725		
	UNITS	**CCTMAC-627**	**CCTMAC-628**	**CCTMBC-629**	**CCTMBC-630**	**CCTMAC-631**	**CCTMAC-632**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	55	52	55	58	57	56	0.30	8411700

RDL = Reportable Detection Limit

Maxxam ID		PJ0481	PJ0482	PJ0483	PJ0484	PJ0491	PJ0492		
Sampling Date		2016/08/20	2016/08/20	2016/08/21	2016/08/21	2016/08/21	2016/08/21		
COC Number		08426725	08426725	08426725	08426725	08426726	08426726		
	UNITS	**CCTMBC-633**	**CCTMBC-634**	**CCTMRC-635**	**CCTMRC-636**	**CCTMRC-637**	**CCTMRC-638**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	54	53	55	52	53	50	0.30	8411700

RDL = Reportable Detection Limit

Maxxam ID		PJ0493	PJ0494	PJ0518	PJ0519	PJ0520	PJ0521		
Sampling Date		2016/08/21	2016/08/21	2016/07/05	2016/07/05	2016/07/05	2016/07/05		
COC Number		08426726	08426726	08426727	08426727	08426727	08426727		
	UNITS	**CCTMRC-639**	**CCTMRC-639-R**	**CCTMAW-600**	**CCTMAW-601**	**CCTMBW-602**	**CCTMBW-603**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	53	54	62	65	59	62	0.30	8411700

RDL = Reportable Detection Limit

Success Through Science®

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PHYSICAL TESTING (TISSUE)

Maxxam ID		PJ0522	PJ0523		PJ0524		PJ0525	PJ0526		
Sampling Date		2016/07/05	2016/07/05		2016/07/06		2016/07/06	2016/07/06		
COC Number		08426727	08426727		08426727		08426727	08426727		
	UNITS	**CCTMCW-604**	**CCTMCW-605**	**QC Batch**	**CCTMCW-606**	**QC Batch**	**CCTMCW-607**	**CCTMCW-608**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	67	64	8411700	62	8413067	67	64	0.30	8413052

RDL = Reportable Detection Limit

Maxxam ID		PJ0527	PJ0602	PJ0603	PJ0604	PJ0605	PJ0606		
Sampling Date		2016/07/06	2016/07/06	2016/08/18	2016/08/18	2016/08/18	2016/08/18		
COC Number		08426727	08426728	08426728	08426728	08426728	08426728		
	UNITS	**CCTMCW-609**	**CCTMCW-610**	**CCTMCW-612**	**CCTMCW-613**	**CCTMCW-613-R**	**CCTMRW-614**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	63	66	63	64	60	57	0.30	8413052

RDL = Reportable Detection Limit

Maxxam ID		PJ0607	PJ0608	PJ0609	PJ0610	PJ0611	PJ0632		
Sampling Date		2016/08/18	2016/08/18	2016/08/18	2016/08/18	2016/08/19	2016/08/19		
COC Number		08426728	08426728	08426728	08426728	08426728	08426729		
	UNITS	**CCTMRW-615**	**CCTMRW-616**	**CCTMRW-617**	**CCTMRW-618**	**CCTMAW-619**	**CCTMBW-620**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	58	59	59	60	59	58	0.30	8413052

RDL = Reportable Detection Limit

Maxxam ID		PJ0633	PJ0634	PJ0635	PJ0636	PJ0637		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426729	08426729	08426729	08426729	08426729		
	UNITS	**CCTMAW-622**	**CCTMAW-622-R**	**CCTMAW-623**	**CCTMBW-625**	**CCTMBW-625-R**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	62	62	61	61	61	0.30	8413052

RDL = Reportable Detection Limit

Maxxam ID		PJ0638	PJ0639	PJ0640	PJ0641	PJ0643	PJ0644		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/20	2016/08/20		
COC Number		08426729	08426729	08426729	08426729	08426730	08426730		
	UNITS	**CCTMAW-626**	**CCTMAW-627**	**CCTMAW-628**	**CCTMBW-629**	**CCTMAW-631**	**CCTMAW-632**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	58	60	62	59	65	62	0.30	8413067

RDL = Reportable Detection Limit

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PHYSICAL TESTING (TISSUE)

Maxxam ID		PJ0645	PJ0646	PJ0647	PJ0648	PJ0649	PJ0650		
Sampling Date		2016/08/20	2016/08/20	2016/08/21	2016/08/21	2016/08/21	2016/08/21		
COC Number		08426730	08426730	08426730	08426730	08426730	08426730		
	UNITS	CCTMBW-633	CCTMBW-634	CCTMRW-635	CCTMRW-636	CCTMRW-637	CCTMRW-638	RDL	QC Batch
Physical Properties									
Moisture	%	60	60	58	58	60	60	0.30	8413067

RDL = Reportable Detection Limit

Maxxam ID		PJ0651	PJ0652	PJ0664	PJ0665	PJ0666	PJ0667		
Sampling Date		2016/08/21	2016/08/21	2016/07/05	2016/07/06	2016/08/19	2016/08/19		
COC Number		08426730	08426730	08426731	08426731	08426731	08426731		
	UNITS	CCTMRW-639	CCTMRW-639-R	CCTMCH-604	CCTMCH-609	CCTMAH-619	CCTMBH-625	RDL	QC Batch
Physical Properties									
Moisture	%	58	60	74	78	78	69	0.30	8413067

RDL = Reportable Detection Limit

Maxxam ID		PJ0668	PJ0669		PJ0670		
Sampling Date		2016/08/19	2016/08/19		2016/08/20		
COC Number		08426731	08426731		08426731		
	UNITS	CCTMBH-625-R	CCTMAH-627	QC Batch	CCTMBH-630	RDL	QC Batch
Physical Properties							
Moisture	%	67	75	8413067	78	0.30	8413052

RDL = Reportable Detection Limit

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CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0116		PJ0117	PJ0118	PJ0119		PJ0120		
Sampling Date		2016/07/05		2016/07/05	2016/07/05	2016/07/05		2016/07/05		
COC Number		08426712		08426712	08426712	08426712		08426712		
	UNITS	**CCTMAS-600**	**QC Batch**	**CCTMAS-601**	**CCTMBS-602**	**CCTMBS-603**	**QC Batch**	**CCTMCS-604**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.80	8381592	4.98	4.19	7.10 (1)	8381597	4.69	N/A	8382278
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	17500	8381589	18000	3180	41000	8381594	12200	100	8382276
Total Antimony (Sb)	mg/kg	0.62	8381589	0.37	<0.10	1.73	8381594	1.87	0.10	8382276
Total Arsenic (As)	mg/kg	53.1	8381589	8.18	0.90	520	8381594	16.1	0.50	8382276
Total Barium (Ba)	mg/kg	122	8381589	99.8	18.4	300	8381594	158	0.10	8382276
Total Beryllium (Be)	mg/kg	<0.40	8381589	<0.40	<0.40	1.08	8381594	<0.40	0.40	8382276
Total Bismuth (Bi)	mg/kg	<0.10	8381589	0.31	<0.10	0.23	8381594	0.25	0.10	8382276
Total Cadmium (Cd)	mg/kg	0.227	8381589	0.253	<0.050	0.750	8381594	0.796	0.050	8382276
Total Calcium (Ca)	mg/kg	3000	8381589	2780	578	6240	8381594	2820	100	8382276
Total Chromium (Cr)	mg/kg	27.7	8381589	26.7	6.2	49.7	8381594	26.1	1.0	8382276
Total Cobalt (Co)	mg/kg	6.98	8381589	6.52	0.70	9.18	8381594	5.59	0.30	8382276
Total Copper (Cu)	mg/kg	17.8	8381589	12.0	3.23	31.6	8381594	18.2	0.50	8382276
Total Iron (Fe)	mg/kg	23400	8381589	24900	4890	38300	8381594	18000	100	8382276
Total Lead (Pb)	mg/kg	8.54	8381589	12.0	2.10	14.2	8381594	42.2	0.10	8382276
Total Lithium (Li)	mg/kg	10.9	8381589	14.6	<5.0	14.6	8381594	6.2	5.0	8382276
Total Magnesium (Mg)	mg/kg	4300	8381589	3830	298	3850	8381594	3060	100	8382276
Total Manganese (Mn)	mg/kg	294	8381589	520	17.6	670	8381594	177	0.20	8382276
Total Mercury (Hg)	mg/kg	<0.050	8381589	<0.050	<0.050	0.261	8381594	0.071	0.050	8382276
Total Molybdenum (Mo)	mg/kg	0.47	8381589	0.73	0.31	2.17	8381594	1.86	0.10	8382276
Total Nickel (Ni)	mg/kg	16.2	8381589	13.1	1.61	27.6	8381594	13.8	0.80	8382276
Total Phosphorus (P)	mg/kg	489	8381589	351	259	1240	8381594	642	10	8382276
Total Potassium (K)	mg/kg	643	8381589	1020	222	1350	8381594	671	100	8382276
Total Selenium (Se)	mg/kg	<0.50	8381589	<0.50	<0.50	0.55	8381594	0.53	0.50	8382276
Total Silver (Ag)	mg/kg	0.066	8381589	0.089	<0.050	0.491	8381594	0.681	0.050	8382276
Total Sodium (Na)	mg/kg	<100	8381589	108	194	107	8381594	168	100	8382276
Total Strontium (Sr)	mg/kg	21.3	8381589	21.4	7.58	49.5	8381594	24.9	0.10	8382276
Total Thallium (Tl)	mg/kg	0.167	8381589	0.262	<0.050	0.316	8381594	0.325	0.050	8382276
Total Tin (Sn)	mg/kg	0.56	8381589	1.16	0.15	0.72	8381594	0.44	0.10	8382276
Total Titanium (Ti)	mg/kg	881	8381589	1030	84.2	451	8381594	657	1.0	8382276
Total Uranium (U)	mg/kg	1.76	8381589	3.66	0.234	26.8	8381594	5.21	0.050	8382276
Total Vanadium (V)	mg/kg	53.7	8381589	53.2	11.1	60.3	8381594	40.2	2.0	8382276

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 3:1.

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0116		PJ0117	PJ0118	PJ0119		PJ0120		
Sampling Date		2016/07/05		2016/07/05	2016/07/05	2016/07/05		2016/07/05		
COC Number		08426712		08426712	08426712	08426712		08426712		
	UNITS	**CCTMAS-600**	**QC Batch**	**CCTMAS-601**	**CCTMBS-602**	**CCTMBS-603**	**QC Batch**	**CCTMCS-604**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	47.0	8381589	57.6	6.6	76.2	8381594	67.9	1.0	8382276
Total Zirconium (Zr)	mg/kg	4.00	8381589	2.83	<0.50	4.65	8381594	6.00	0.50	8382276
RDL = Reportable Detection Limit										

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0121	PJ0123		PJ0124	PJ0125	PJ0148	PJ0149		
Sampling Date		2016/07/05	2016/07/06		2016/07/06	2016/07/06	2016/07/06	2016/08/18		
COC Number		08426712	08426712		08426712	08426712	08426713	08426713		
	UNITS	**CCTMCS-605**	**CCTMCS-607**	**QC Batch**	**CCTMCS-608**	**CCTMCS-609**	**CCTMCS-610**	**CCTMCS-611**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	6.12	5.04	8381597	4.77	5.30 (1)	4.82	4.73	N/A	8382278
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	24000	11300	8381594	14900	10400	10900	13000	100	8382276
Total Antimony (Sb)	mg/kg	0.44	0.30	8381594	0.40	0.57	0.58	0.50	0.10	8382276
Total Arsenic (As)	mg/kg	7.65	4.91	8381594	4.51	9.90	6.35	11.7	0.50	8382276
Total Barium (Ba)	mg/kg	138	131	8381594	138	312	91.8	80.6	0.10	8382276
Total Beryllium (Be)	mg/kg	<0.40	<0.40	8381594	<0.40	0.43	<0.40	<0.40	0.40	8382276
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	8381594	0.17	<0.10	0.21	0.25	0.10	8382276
Total Cadmium (Cd)	mg/kg	0.378	0.218	8381594	0.196	0.772	0.317	0.181	0.050	8382276
Total Calcium (Ca)	mg/kg	5120	10400	8381594	3480	7620	1160	2300	100	8382276
Total Chromium (Cr)	mg/kg	44.7	21.1	8381594	28.0	12.4	20.0	24.4	1.0	8382276
Total Cobalt (Co)	mg/kg	16.7	6.39	8381594	8.10	21.5	4.30	3.59	0.30	8382276
Total Copper (Cu)	mg/kg	28.9	12.2	8381594	11.5	15.8	15.3	9.29	0.50	8382276
Total Iron (Fe)	mg/kg	36600	18300	8381594	18400	11200	23500	21000	100	8382276
Total Lead (Pb)	mg/kg	6.95	4.88	8381594	11.8	4.91	9.32	14.9	0.10	8382276
Total Lithium (Li)	mg/kg	10.2	8.4	8381594	8.6	<5.0	5.9	6.6	5.0	8382276
Total Magnesium (Mg)	mg/kg	15400	3410	8381594	4120	1670	2100	3030	100	8382276
Total Manganese (Mn)	mg/kg	574	224	8381594	265	3150	153	102	0.20	8382276
Total Mercury (Hg)	mg/kg	<0.050	<0.050	8381594	<0.050	0.157	<0.050	<0.050	0.050	8382276
Total Molybdenum (Mo)	mg/kg	0.68	0.37	8381594	0.84	0.93	1.56	0.58	0.10	8382276
Total Nickel (Ni)	mg/kg	29.2	13.7	8381594	16.4	11.7	10.7	10.2	0.80	8382276
Total Phosphorus (P)	mg/kg	644	584	8381594	530	1040	267	351	10	8382276
Total Potassium (K)	mg/kg	1430	733	8381594	663	517	354	464	100	8382276
Total Selenium (Se)	mg/kg	<0.50	<0.50	8381594	<0.50	<0.50	<0.50	<0.50	0.50	8382276
Total Silver (Ag)	mg/kg	0.103	0.057	8381594	0.108	0.269	0.227	0.119	0.050	8382276
Total Sodium (Na)	mg/kg	127	196	8381594	209	<100	142	140	100	8382276
Total Strontium (Sr)	mg/kg	34.9	38.8	8381594	27.0	71.0	13.3	17.7	0.10	8382276
Total Thallium (Tl)	mg/kg	0.125	0.069	8381594	0.139	0.134	0.117	0.105	0.050	8382276
Total Tin (Sn)	mg/kg	0.26	0.31	8381594	0.67	0.20	0.53	0.38	0.10	8382276
Total Titanium (Ti)	mg/kg	1140	686	8381594	796	198	657	682	1.0	8382276
Total Uranium (U)	mg/kg	0.419	0.867	8381594	1.17	11.1	0.397	3.60	0.050	8382276
Total Vanadium (V)	mg/kg	80.8	42.1	8381594	53.5	19.1	68.3	56.9	2.0	8382276

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 6:1.

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0121	PJ0123		PJ0124	PJ0125	PJ0148	PJ0149		
Sampling Date		2016/07/05	2016/07/06		2016/07/06	2016/07/06	2016/07/06	2016/08/18		
COC Number		08426712	08426712		08426712	08426712	08426713	08426713		
	UNITS	CCTMCS-605	CCTMCS-607	QC Batch	CCTMCS-608	CCTMCS-609	CCTMCS-610	CCTMCS-611	RDL	QC Batch
Total Zinc (Zn)	mg/kg	75.6	40.4	8381594	53.6	29.5	37.6	40.6	1.0	8382276
Total Zirconium (Zr)	mg/kg	2.29	1.88	8381594	1.88	2.06	1.44	3.47	0.50	8382276
RDL = Reportable Detection Limit										

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0150		PJ0151		PJ0152	PJ0153		
Sampling Date		2016/08/18		2016/08/18		2016/08/18	2016/08/18		
COC Number		08426713		08426713		08426713	08426713		
	UNITS	**CCTMCS-612**	**QC Batch**	**CCTMCS-613**	**QC Batch**	**CCTMCS-613-R**	**CCTMRS-614**	**RDL**	**QC Batch**
Physical Properties									
Soluble (2:1) pH	pH	5.04	8381592	4.40	8382278	4.69	4.96 (1)	N/A	8381597
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	12100	8381589	13500	8382276	14900	9790	100	8381594
Total Antimony (Sb)	mg/kg	0.64	8381589	0.52	8382276	0.55	0.28	0.10	8381594
Total Arsenic (As)	mg/kg	4.90	8381589	7.97	8382276	8.38	2.79	0.50	8381594
Total Barium (Ba)	mg/kg	54.1	8381589	74.4	8382276	56.9	193	0.10	8381594
Total Beryllium (Be)	mg/kg	<0.40	8381589	<0.40	8382276	<0.40	<0.40	0.40	8381594
Total Bismuth (Bi)	mg/kg	0.46	8381589	0.18	8382276	0.16	0.10	0.10	8381594
Total Cadmium (Cd)	mg/kg	0.136	8381589	0.148	8382276	0.150	0.897	0.050	8381594
Total Calcium (Ca)	mg/kg	732	8381589	1210	8382276	1400	4300	100	8381594
Total Chromium (Cr)	mg/kg	19.2	8381589	27.0	8382276	24.9	19.3	1.0	8381594
Total Cobalt (Co)	mg/kg	3.63	8381589	4.90	8382276	5.30	17.6	0.30	8381594
Total Copper (Cu)	mg/kg	11.1	8381589	16.7	8382276	12.8	40.6	0.50	8381594
Total Iron (Fe)	mg/kg	25900	8381589	27600	8382276	33200	14000	100	8381594
Total Lead (Pb)	mg/kg	25.4	8381589	9.75	8382276	8.60	5.29	0.10	8381594
Total Lithium (Li)	mg/kg	5.8	8381589	7.6	8382276	7.8	<5.0	5.0	8381594
Total Magnesium (Mg)	mg/kg	1470	8381589	2900	8382276	2970	1830	100	8381594
Total Manganese (Mn)	mg/kg	438	8381589	171	8382276	201	858	0.20	8381594
Total Mercury (Hg)	mg/kg	0.090	8381589	<0.050	8382276	<0.050	0.105	0.050	8381594
Total Molybdenum (Mo)	mg/kg	2.32	8381589	1.55	8382276	1.11	1.40	0.10	8381594
Total Nickel (Ni)	mg/kg	6.59	8381589	11.1	8382276	13.5	16.0	0.80	8381594
Total Phosphorus (P)	mg/kg	209	8381589	337	8382276	237	1220	10	8381594
Total Potassium (K)	mg/kg	790	8381589	362	8382276	427	410	100	8381594
Total Selenium (Se)	mg/kg	<0.50	8381589	<0.50	8382276	<0.50	<0.50	0.50	8381594
Total Silver (Ag)	mg/kg	<0.050	8381589	<0.050	8382276	<0.050	0.790	0.050	8381594
Total Sodium (Na)	mg/kg	<100	8381589	<100	8382276	<100	143	100	8381594
Total Strontium (Sr)	mg/kg	9.34	8381589	14.1	8382276	11.8	31.5	0.10	8381594
Total Thallium (Tl)	mg/kg	0.299	8381589	0.153	8382276	0.138	0.109	0.050	8381594
Total Tin (Sn)	mg/kg	1.51	8381589	0.62	8382276	0.66	0.14	0.10	8381594
Total Titanium (Ti)	mg/kg	973	8381589	670	8382276	962	157	1.0	8381594
Total Uranium (U)	mg/kg	2.16	8381589	0.735	8382276	0.691	1.84	0.050	8381594
Total Vanadium (V)	mg/kg	59.7	8381589	75.0	8382276	72.0	26.5	2.0	8381594

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 4:1.

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0150		PJ0151		PJ0152	PJ0153		
Sampling Date		2016/08/18		2016/08/18		2016/08/18	2016/08/18		
COC Number		08426713		08426713		08426713	08426713		
	UNITS	**CCTMCS-612**	**QC Batch**	**CCTMCS-613**	**QC Batch**	**CCTMCS-613-R**	**CCTMRS-614**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	45.2	8381589	33.4	8382276	34.9	27.9	1.0	8381594
Total Zirconium (Zr)	mg/kg	2.76	8381589	1.20	8382276	1.51	0.54	0.50	8381594

RDL = Reportable Detection Limit

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0154	PJ0155		PJ0156	PJ0157		PJ0186		
Sampling Date		2016/08/18	2016/08/18		2016/08/18	2016/08/19		2016/08/19		
COC Number		08426713	08426713		08426713	08426713		08426714		
	UNITS	**CCTMRS-615**	**CCTMRS-616**	**QC Batch**	**CCTMRS-617**	**CCTMRS-618**	**QC Batch**	**CCTMAS-619**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.46	5.46	8381592	4.67	5.38	8381597	7.42	N/A	8382278
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	25500	27700	8381589	10300	28600	8381594	12800	100	8382276
Total Antimony (Sb)	mg/kg	0.24	0.31	8381589	0.29	0.24	8381594	0.42	0.10	8382276
Total Arsenic (As)	mg/kg	3.61	9.29	8381589	6.73	6.96	8381594	7.47	0.50	8382276
Total Barium (Ba)	mg/kg	401	260	8381589	65.7	341	8381594	165	0.10	8382276
Total Beryllium (Be)	mg/kg	<0.40	<0.40	8381589	<0.40	<0.40	8381594	<0.40	0.40	8382276
Total Bismuth (Bi)	mg/kg	<0.10	0.15	8381589	0.12	0.13	8381594	0.12	0.10	8382276
Total Cadmium (Cd)	mg/kg	0.277	0.251	8381589	0.114	0.328	8381594	0.313	0.050	8382276
Total Calcium (Ca)	mg/kg	5220	3880	8381589	1130	4420	8381594	27000	100	8382276
Total Chromium (Cr)	mg/kg	109	64.5	8381589	70.4	87.0	8381594	34.7	1.0	8382276
Total Cobalt (Co)	mg/kg	14.4	16.2	8381589	5.55	23.3	8381594	9.05	0.30	8382276
Total Copper (Cu)	mg/kg	27.4	42.1	8381589	10.9	50.7	8381594	26.5	0.50	8382276
Total Iron (Fe)	mg/kg	28600	36200	8381589	15000	41100	8381594	21300	100	8382276
Total Lead (Pb)	mg/kg	6.23	5.21	8381589	4.19	24.8	8381594	8.59	0.10	8382276
Total Lithium (Li)	mg/kg	10.6	22.5	8381589	<5.0	30.2	8381594	8.4	5.0	8382276
Total Magnesium (Mg)	mg/kg	17300	10700	8381589	4550	13600	8381594	7200	100	8382276
Total Manganese (Mn)	mg/kg	382	458	8381589	110	379	8381594	423	0.20	8382276
Total Mercury (Hg)	mg/kg	<0.050	<0.050	8381589	<0.050	<0.050	8381594	0.056	0.050	8382276
Total Molybdenum (Mo)	mg/kg	0.64	0.70	8381589	0.84	0.98	8381594	0.53	0.10	8382276
Total Nickel (Ni)	mg/kg	45.0	40.6	8381589	67.9	56.7	8381594	21.8	0.80	8382276
Total Phosphorus (P)	mg/kg	493	688	8381589	284	560	8381594	500	10	8382276
Total Potassium (K)	mg/kg	6640	4670	8381589	518	3950	8381594	2190	100	8382276
Total Selenium (Se)	mg/kg	<0.50	<0.50	8381589	<0.50	<0.50	8381594	<0.50	0.50	8382276
Total Silver (Ag)	mg/kg	0.158	0.067	8381589	0.057	0.243	8381594	0.100	0.050	8382276
Total Sodium (Na)	mg/kg	125	211	8381589	113	189	8381594	246	100	8382276
Total Strontium (Sr)	mg/kg	35.6	21.1	8381589	11.0	22.2	8381594	107	0.10	8382276
Total Thallium (Tl)	mg/kg	0.238	0.279	8381589	0.058	0.374	8381594	0.197	0.050	8382276
Total Tin (Sn)	mg/kg	0.33	0.59	8381589	0.36	0.45	8381594	0.38	0.10	8382276
Total Titanium (Ti)	mg/kg	1540	1910	8381589	705	2140	8381594	724	1.0	8382276
Total Uranium (U)	mg/kg	0.518	0.823	8381589	0.309	0.728	8381594	2.91	0.050	8382276
Total Vanadium (V)	mg/kg	77.1	99.0	8381589	46.9	112	8381594	41.9	2.0	8382276

RDL = Reportable Detection Limit
N/A = Not Applicable

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0154	PJ0155		PJ0156	PJ0157		PJ0186		
Sampling Date		2016/08/18	2016/08/18		2016/08/18	2016/08/19		2016/08/19		
COC Number		08426713	08426713		08426713	08426713		08426714		
	UNITS	**CCTMRS-615**	**CCTMRS-616**	**QC Batch**	**CCTMRS-617**	**CCTMRS-618**	**QC Batch**	**CCTMAS-619**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	62.4	64.2	8381589	20.3	97.7	8381594	62.6	1.0	8382276
Total Zirconium (Zr)	mg/kg	2.83	3.44	8381589	0.64	3.27	8381594	3.65	0.50	8382276
RDL = Reportable Detection Limit										

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0187		PJ0188	PJ0189		PJ0190		
Sampling Date		2016/08/19		2016/08/19	2016/08/19		2016/08/19		
COC Number		08426714		08426714	08426714		08426714		
	UNITS	**CCTMBS-620**	**QC Batch**	**CCTMBS-621**	**CCTMAS-622**	**QC Batch**	**CCTMAS-622-R**	**RDL**	**QC Batch**
Physical Properties									
Soluble (2:1) pH	pH	4.78	8382278	4.32 (1)	5.09	8381597	4.71	N/A	8381592
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	13100	8382276	11000	15600	8381594	17000	100	8381589
Total Antimony (Sb)	mg/kg	0.32	8382276	0.13	0.29	8381594	0.28	0.10	8381589
Total Arsenic (As)	mg/kg	6.42	8382276	2.65	7.75	8381594	9.71	0.50	8381589
Total Barium (Ba)	mg/kg	96.3	8382276	82.9	171	8381594	186	0.10	8381589
Total Beryllium (Be)	mg/kg	<0.40	8382276	<0.40	<0.40	8381594	<0.40	0.40	8381589
Total Bismuth (Bi)	mg/kg	0.14	8382276	0.12	0.14	8381594	0.18	0.10	8381589
Total Cadmium (Cd)	mg/kg	0.168	8382276	0.131	0.101	8381594	0.155	0.050	8381589
Total Calcium (Ca)	mg/kg	2780	8382276	2760	2860	8381594	2740	100	8381589
Total Chromium (Cr)	mg/kg	23.4	8382276	34.4	26.8	8381594	33.8	1.0	8381589
Total Cobalt (Co)	mg/kg	4.67	8382276	4.70	8.55	8381594	10.2	0.30	8381589
Total Copper (Cu)	mg/kg	8.26	8382276	10.6	11.3	8381594	11.6	0.50	8381589
Total Iron (Fe)	mg/kg	18300	8382276	14700	24300	8381594	25900	100	8381589
Total Lead (Pb)	mg/kg	10.0	8382276	6.38	6.53	8381594	8.16	0.10	8381589
Total Lithium (Li)	mg/kg	7.8	8382276	<5.0	8.9	8381594	10.3	5.0	8381589
Total Magnesium (Mg)	mg/kg	3660	8382276	4130	4420	8381594	5120	100	8381589
Total Manganese (Mn)	mg/kg	175	8382276	127	274	8381594	426	0.20	8381589
Total Mercury (Hg)	mg/kg	0.066	8382276	0.061	<0.050	8381594	<0.050	0.050	8381589
Total Molybdenum (Mo)	mg/kg	0.63	8382276	0.56	0.85	8381594	1.36	0.10	8381589
Total Nickel (Ni)	mg/kg	12.5	8382276	10.9	14.6	8381594	16.2	0.80	8381589
Total Phosphorus (P)	mg/kg	560	8382276	500	283	8381594	356	10	8381589
Total Potassium (K)	mg/kg	514	8382276	1090	610	8381594	736	100	8381589
Total Selenium (Se)	mg/kg	<0.50	8382276	<0.50	<0.50	8381594	<0.50	0.50	8381589
Total Silver (Ag)	mg/kg	0.101	8382276	0.068	0.055	8381594	0.072	0.050	8381589
Total Sodium (Na)	mg/kg	173	8382276	110	153	8381594	122	100	8381589
Total Strontium (Sr)	mg/kg	20.9	8382276	21.2	20.1	8381594	22.8	0.10	8381589
Total Thallium (Tl)	mg/kg	0.131	8382276	0.110	0.125	8381594	0.189	0.050	8381589
Total Tin (Sn)	mg/kg	0.48	8382276	0.41	0.43	8381594	0.58	0.10	8381589
Total Titanium (Ti)	mg/kg	714	8382276	702	819	8381594	1110	1.0	8381589
Total Uranium (U)	mg/kg	2.44	8382276	1.17	0.490	8381594	0.526	0.050	8381589
Total Vanadium (V)	mg/kg	43.6	8382276	25.8	52.4	8381594	71.2	2.0	8381589

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 4:1.

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0187		PJ0188	PJ0189		PJ0190		
Sampling Date		2016/08/19		2016/08/19	2016/08/19		2016/08/19		
COC Number		08426714		08426714	08426714		08426714		
	UNITS	**CCTMBS-620**	**QC Batch**	**CCTMBS-621**	**CCTMAS-622**	**QC Batch**	**CCTMAS-622-R**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	47.1	8382276	29.2	29.7	8381594	34.3	1.0	8381589
Total Zirconium (Zr)	mg/kg	1.68	8382276	1.58	1.02	8381594	1.33	0.50	8381589
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0191	PJ0192	PJ0193	PJ0194	PJ0195		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426714	08426714	08426714	08426714	08426714		
	UNITS	**CCTMAS-623**	**CCTMBS-624**	**CCTMBS-625**	**CCTMBS-625-R**	**CCTMAS-626**	**RDL**	**QC Batch**
Physical Properties								
Soluble (2:1) pH	pH	4.39	4.64	4.46	4.73	4.48 (1)	N/A	8381597
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	10200	13400	10900	9270	8130	100	8381594
Total Antimony (Sb)	mg/kg	1.20	11.2	0.66	0.41	0.22	0.10	8381594
Total Arsenic (As)	mg/kg	20.9	16.9	11.8	5.85	1.92	0.50	8381594
Total Barium (Ba)	mg/kg	73.0	131	42.6	38.1	80.3	0.10	8381594
Total Beryllium (Be)	mg/kg	<0.40	0.47	<0.40	<0.40	<0.40	0.40	8381594
Total Bismuth (Bi)	mg/kg	0.11	0.16	0.14	0.12	<0.10	0.10	8381594
Total Cadmium (Cd)	mg/kg	0.246	0.243	0.178	0.212	0.261	0.050	8381594
Total Calcium (Ca)	mg/kg	1840	3590	1170	686	1930	100	8381594
Total Chromium (Cr)	mg/kg	21.0	28.1	16.5	11.4	18.3	1.0	8381594
Total Cobalt (Co)	mg/kg	5.03	12.0	3.47	3.08	2.99	0.30	8381594
Total Copper (Cu)	mg/kg	10.9	9.88	7.82	8.65	10.4	0.50	8381594
Total Iron (Fe)	mg/kg	16600	28100	16200	13600	9770	100	8381594
Total Lead (Pb)	mg/kg	5.92	10.3	8.69	6.08	3.55	0.10	8381594
Total Lithium (Li)	mg/kg	<5.0	5.8	5.3	<5.0	<5.0	5.0	8381594
Total Magnesium (Mg)	mg/kg	2380	6280	2050	812	2300	100	8381594
Total Manganese (Mn)	mg/kg	132	602	149	340	62.3	0.20	8381594
Total Mercury (Hg)	mg/kg	0.086	<0.050	<0.050	<0.050	0.053	0.050	8381594
Total Molybdenum (Mo)	mg/kg	1.20	0.90	0.82	0.83	0.64	0.10	8381594
Total Nickel (Ni)	mg/kg	10.6	10.6	6.84	3.64	7.75	0.80	8381594
Total Phosphorus (P)	mg/kg	460	393	264	214	491	10	8381594
Total Potassium (K)	mg/kg	559	2480	582	393	533	100	8381594
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	8381594
Total Silver (Ag)	mg/kg	0.082	0.082	0.053	0.073	0.096	0.050	8381594
Total Sodium (Na)	mg/kg	106	<100	128	137	152	100	8381594
Total Strontium (Sr)	mg/kg	14.5	19.5	9.74	7.77	15.5	0.10	8381594
Total Thallium (Tl)	mg/kg	0.101	0.161	0.106	0.080	0.116	0.050	8381594
Total Tin (Sn)	mg/kg	0.34	0.94	0.40	0.34	0.37	0.10	8381594
Total Titanium (Ti)	mg/kg	581	656	592	480	434	1.0	8381594
Total Uranium (U)	mg/kg	1.43	0.893	0.545	0.676	0.985	0.050	8381594
Total Vanadium (V)	mg/kg	44.2	65.6	34.6	30.5	21.3	2.0	8381594

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 3:1.

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0191	PJ0192	PJ0193	PJ0194	PJ0195		
Sampling Date		2016/08/19	2016/08/19	2016/08/19	2016/08/19	2016/08/19		
COC Number		08426714	08426714	08426714	08426714	08426714		
	UNITS	**CCTMAS-623**	**CCTMBS-624**	**CCTMBS-625**	**CCTMBS-625-R**	**CCTMAS-626**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	23.4	48.4	24.4	15.7	17.8	1.0	8381594
Total Zirconium (Zr)	mg/kg	1.00	0.97	0.86	0.80	0.59	0.50	8381594
RDL = Reportable Detection Limit								

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0216	PJ0217	PJ0218		PJ0219	PJ0220		
Sampling Date		2016/08/19	2016/08/19	2016/08/19		2016/08/20	2016/08/20		
COC Number		08426715	08426715	08426715		08426715	08426715		
	UNITS	**CCTMAS-627**	**CCTMAS-628**	**CCTMBS-629**	**QC Batch**	**CCTMBS-630**	**CCTMAS-631**	**RDL**	**QC Batch**
Physical Properties									
Soluble (2:1) pH	pH	4.06 (1)	4.17	4.92	8382278	4.76	4.31	N/A	8381597
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	3000	10900	25400	8382276	15300	12100	100	8381594
Total Antimony (Sb)	mg/kg	0.23	0.34	0.41	8382276	0.28	3.31	0.10	8381594
Total Arsenic (As)	mg/kg	2.36	6.53	8.80	8382276	6.06	22.9	0.50	8381594
Total Barium (Ba)	mg/kg	39.3	85.8	146	8382276	110	66.6	0.10	8381594
Total Beryllium (Be)	mg/kg	<0.40	<0.40	0.40	8382276	0.42	<0.40	0.40	8381594
Total Bismuth (Bi)	mg/kg	<0.10	0.13	0.25	8382276	0.14	0.32	0.10	8381594
Total Cadmium (Cd)	mg/kg	0.250	0.179	0.235	8382276	0.164	0.178	0.050	8381594
Total Calcium (Ca)	mg/kg	958	1420	2670	8382276	2910	1250	100	8381594
Total Chromium (Cr)	mg/kg	8.3	21.4	41.0	8382276	23.4	27.9	1.0	8381594
Total Cobalt (Co)	mg/kg	1.37	5.89	9.11	8382276	7.64	6.36	0.30	8381594
Total Copper (Cu)	mg/kg	9.12	11.7	11.9	8382276	10.9	11.2	0.50	8381594
Total Iron (Fe)	mg/kg	6460	18700	33600	8382276	20200	21800	100	8381594
Total Lead (Pb)	mg/kg	2.27	7.93	12.4	8382276	5.34	20.0	0.10	8381594
Total Lithium (Li)	mg/kg	<5.0	<5.0	18.6	8382276	6.2	5.3	5.0	8381594
Total Magnesium (Mg)	mg/kg	426	3570	6390	8382276	4700	3330	100	8381594
Total Manganese (Mn)	mg/kg	38.7	218	250	8382276	143	392	0.20	8381594
Total Mercury (Hg)	mg/kg	0.062	<0.050	<0.050	8382276	<0.050	0.095	0.050	8381594
Total Molybdenum (Mo)	mg/kg	0.64	0.74	1.34	8382276	0.53	1.19	0.10	8381594
Total Nickel (Ni)	mg/kg	3.57	11.0	22.1	8382276	13.4	13.2	0.80	8381594
Total Phosphorus (P)	mg/kg	643	390	234	8382276	390	421	10	8381594
Total Potassium (K)	mg/kg	340	590	1170	8382276	1310	686	100	8381594
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	8382276	<0.50	<0.50	0.50	8381594
Total Silver (Ag)	mg/kg	0.112	0.064	0.077	8382276	0.101	0.111	0.050	8381594
Total Sodium (Na)	mg/kg	144	103	<100	8382276	<100	<100	100	8381594
Total Strontium (Sr)	mg/kg	8.90	13.1	19.9	8382276	19.2	10.7	0.10	8381594
Total Thallium (Tl)	mg/kg	<0.050	0.120	0.206	8382276	0.133	0.114	0.050	8381594
Total Tin (Sn)	mg/kg	0.15	0.38	0.84	8382276	0.64	0.61	0.10	8381594
Total Titanium (Ti)	mg/kg	125	636	854	8382276	808	672	1.0	8381594
Total Uranium (U)	mg/kg	0.369	0.507	0.612	8382276	1.88	1.30	0.050	8381594
Total Vanadium (V)	mg/kg	17.5	55.3	79.8	8382276	41.0	50.6	2.0	8381594

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 3:1.

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0216	PJ0217	PJ0218		PJ0219	PJ0220		
Sampling Date		2016/08/19	2016/08/19	2016/08/19		2016/08/20	2016/08/20		
COC Number		08426715	08426715	08426715		08426715	08426715		
	UNITS	**CCTMAS-627**	**CCTMAS-628**	**CCTMBS-629**	**QC Batch**	**CCTMBS-630**	**CCTMAS-631**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	17.6	34.7	67.3	8382276	27.5	33.2	1.0	8381594
Total Zirconium (Zr)	mg/kg	0.66	1.40	3.98	8382276	1.54	0.88	0.50	8381594
RDL = Reportable Detection Limit									

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0221		PJ0222		PJ0223		PJ0224		
Sampling Date		2016/08/20		2016/08/20		2016/08/20		2016/08/21		
COC Number		08426715		08426715		08426715		08426715		
	UNITS	**CCTMAS-632**	**QC Batch**	**CCTMBS-633**	**QC Batch**	**CCTMBS-634**	**QC Batch**	**CCTMRS-635**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.14	8382278	6.20	8381597	6.85	8382278	6.72	N/A	8381592
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	21300	8382276	23100	8381594	11400	8382276	7670	100	8381589
Total Antimony (Sb)	mg/kg	0.36	8382276	0.22	8381594	0.56	8382276	0.28	0.10	8381589
Total Arsenic (As)	mg/kg	9.61	8382276	5.71	8381594	10.0	8382276	5.93	0.50	8381589
Total Barium (Ba)	mg/kg	149	8382276	222	8381594	335	8382276	197	0.10	8381589
Total Beryllium (Be)	mg/kg	1.00	8382276	<0.40	8381594	0.41	8382276	<0.40	0.40	8381589
Total Bismuth (Bi)	mg/kg	0.27	8382276	0.15	8381594	0.14	8382276	<0.10	0.10	8381589
Total Cadmium (Cd)	mg/kg	0.517	8382276	0.107	8381594	0.251	8382276	0.415	0.050	8381589
Total Calcium (Ca)	mg/kg	4200	8382276	7090	8381594	22100	8382276	6870	100	8381589
Total Chromium (Cr)	mg/kg	34.8	8382276	95.0	8381594	32.4	8382276	291	1.0	8381589
Total Cobalt (Co)	mg/kg	9.15	8382276	14.8	8381594	10.7	8382276	26.5	0.30	8381589
Total Copper (Cu)	mg/kg	21.1	8382276	35.5	8381594	21.4	8382276	58.5	0.50	8381589
Total Iron (Fe)	mg/kg	27200	8382276	20100	8381594	21600	8382276	18500	100	8381589
Total Lead (Pb)	mg/kg	18.3	8382276	3.72	8381594	6.37	8382276	2.54	0.10	8381589
Total Lithium (Li)	mg/kg	11.3	8382276	11.7	8381594	8.5	8382276	<5.0	5.0	8381589
Total Magnesium (Mg)	mg/kg	7160	8382276	11300	8381594	6090	8382276	15300	100	8381589
Total Manganese (Mn)	mg/kg	444	8382276	214	8381594	420	8382276	999	0.20	8381589
Total Mercury (Hg)	mg/kg	<0.050	8382276	<0.050	8381594	0.061	8382276	0.070	0.050	8381589
Total Molybdenum (Mo)	mg/kg	1.57	8382276	0.19	8381594	0.57	8382276	0.56	0.10	8381589
Total Nickel (Ni)	mg/kg	16.8	8382276	53.5	8381594	23.1	8382276	290	0.80	8381589
Total Phosphorus (P)	mg/kg	502	8382276	343	8381594	472	8382276	686	10	8381589
Total Potassium (K)	mg/kg	1500	8382276	915	8381594	2300	8382276	378	100	8381589
Total Selenium (Se)	mg/kg	<0.50	8382276	<0.50	8381594	<0.50	8382276	<0.50	0.50	8381589
Total Silver (Ag)	mg/kg	0.370	8382276	<0.050	8381594	0.098	8382276	0.130	0.050	8381589
Total Sodium (Na)	mg/kg	209	8382276	345	8381594	178	8382276	<100	100	8381589
Total Strontium (Sr)	mg/kg	34.0	8382276	67.1	8381594	173	8382276	25.1	0.10	8381589
Total Thallium (Tl)	mg/kg	0.269	8382276	0.127	8381594	0.173	8382276	0.105	0.050	8381589
Total Tin (Sn)	mg/kg	1.05	8382276	0.32	8381594	0.35	8382276	<0.10	0.10	8381589
Total Titanium (Ti)	mg/kg	1040	8382276	672	8381594	673	8382276	248	1.0	8381589
Total Uranium (U)	mg/kg	3.36	8382276	0.505	8381594	1.90	8382276	0.230	0.050	8381589
Total Vanadium (V)	mg/kg	65.0	8382276	36.2	8381594	37.8	8382276	22.5	2.0	8381589

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0221		PJ0222		PJ0223		PJ0224		
Sampling Date		2016/08/20		2016/08/20		2016/08/20		2016/08/21		
COC Number		08426715		08426715		08426715		08426715		
	UNITS	**CCTMAS-632**	**QC Batch**	**CCTMBS-633**	**QC Batch**	**CCTMBS-634**	**QC Batch**	**CCTMRS-635**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	80.3	8382276	29.3	8381594	39.1	8382276	41.4	1.0	8381589
Total Zirconium (Zr)	mg/kg	3.31	8382276	1.15	8381594	4.00	8382276	0.61	0.50	8381589

RDL = Reportable Detection Limit

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

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0225		PJ0238		PJ0239		PJ0240		
Sampling Date		2016/08/21		2016/08/21		2016/08/21		2016/08/21		
COC Number		08426715		08426716		08426716		08426716		
	UNITS	**CCTMRS-636**	**QC Batch**	**CCTMRS-637**	**QC Batch**	**CCTMRS-638**	**QC Batch**	**CCTMRS-639**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	5.57	8381592	5.18	8381597	4.54	8381592	4.73	N/A	8382278
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	17500	8381589	21800	8381594	6500	8381589	13000	100	8382276
Total Antimony (Sb)	mg/kg	0.51	8381589	0.38	8381594	0.13	8381589	0.35	0.10	8382276
Total Arsenic (As)	mg/kg	7.04	8381589	7.63	8381594	1.42	8381589	6.94	0.50	8382276
Total Barium (Ba)	mg/kg	639	8381589	129	8381594	172	8381589	138	0.10	8382276
Total Beryllium (Be)	mg/kg	0.62	8381589	0.48	8381594	<0.40	8381589	<0.40	0.40	8382276
Total Bismuth (Bi)	mg/kg	0.16	8381589	0.13	8381594	<0.10	8381589	0.33	0.10	8382276
Total Cadmium (Cd)	mg/kg	0.686	8381589	0.172	8381594	0.434	8381589	0.192	0.050	8382276
Total Calcium (Ca)	mg/kg	6310	8381589	3090	8381594	2420	8381589	3300	100	8382276
Total Chromium (Cr)	mg/kg	29.6	8381589	34.1	8381594	9.2	8381589	28.8	1.0	8382276
Total Cobalt (Co)	mg/kg	30.5	8381589	12.1	8381594	2.90	8381589	10.4	0.30	8382276
Total Copper (Cu)	mg/kg	33.8	8381589	24.3	8381594	36.5	8381589	22.7	0.50	8382276
Total Iron (Fe)	mg/kg	27300	8381589	31500	8381594	8230	8381589	25100	100	8382276
Total Lead (Pb)	mg/kg	9.22	8381589	7.62	8381594	5.42	8381589	37.6	0.10	8382276
Total Lithium (Li)	mg/kg	6.5	8381589	12.7	8381594	<5.0	8381589	9.0	5.0	8382276
Total Magnesium (Mg)	mg/kg	2620	8381589	6700	8381594	654	8381589	6540	100	8382276
Total Manganese (Mn)	mg/kg	11600	8381589	357	8381594	41.4	8381589	332	0.20	8382276
Total Mercury (Hg)	mg/kg	0.137	8381589	<0.050	8381594	0.065	8381589	<0.050	0.050	8382276
Total Molybdenum (Mo)	mg/kg	2.66	8381589	0.94	8381594	0.79	8381589	0.93	0.10	8382276
Total Nickel (Ni)	mg/kg	36.4	8381589	23.8	8381594	9.02	8381589	16.9	0.80	8382276
Total Phosphorus (P)	mg/kg	1310	8381589	417	8381594	629	8381589	537	10	8382276
Total Potassium (K)	mg/kg	589	8381589	739	8381594	361	8381589	685	100	8382276
Total Selenium (Se)	mg/kg	0.56	8381589	<0.50	8381594	<0.50	8381589	<0.50	0.50	8382276
Total Silver (Ag)	mg/kg	0.428	8381589	<0.050	8381594	0.203	8381589	0.144	0.050	8382276
Total Sodium (Na)	mg/kg	143	8381589	<100	8381594	143	8381589	123	100	8382276
Total Strontium (Sr)	mg/kg	38.9	8381589	20.1	8381594	20.5	8381589	22.3	0.10	8382276
Total Thallium (Tl)	mg/kg	0.233	8381589	0.088	8381594	<0.050	8381589	0.093	0.050	8382276
Total Tin (Sn)	mg/kg	0.30	8381589	0.51	8381594	0.11	8381589	0.32	0.10	8382276
Total Titanium (Ti)	mg/kg	248	8381589	781	8381594	95.6	8381589	940	1.0	8382276
Total Uranium (U)	mg/kg	1.43	8381589	0.852	8381594	1.50	8381589	0.473	0.050	8382276
Total Vanadium (V)	mg/kg	45.0	8381589	65.8	8381594	13.2	8381589	58.9	2.0	8382276

RDL = Reportable Detection Limit
N/A = Not Applicable

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

Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0225		PJ0238		PJ0239		PJ0240		
Sampling Date		2016/08/21		2016/08/21		2016/08/21		2016/08/21		
COC Number		08426715		08426716		08426716		08426716		
	UNITS	CCTMRS-636	QC Batch	CCTMRS-637	QC Batch	CCTMRS-638	QC Batch	CCTMRS-639	RDL	QC Batch
Total Zinc (Zn)	mg/kg	72.2	8381589	54.6	8381594	11.7	8381589	53.3	1.0	8382276
Total Zirconium (Zr)	mg/kg	0.61	8381589	1.19	8381594	<0.50	8381589	1.03	0.50	8382276
RDL = Reportable Detection Limit										

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Maxxam Job #: B672722
Report Date: 2016/09/29

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0241	PJ2887		
Sampling Date		2016/08/21	2016/08/19		
COC Number		08426716	08426713		
	UNITS	**CCTMRS-639-R**	**CCTMCS-606**	**RDL**	**QC Batch**
Physical Properties					
Soluble (2:1) pH	pH	4.02 (1)	4.98	N/A	8382278
Total Metals by ICPMS					
Total Aluminum (Al)	mg/kg	7550	14800	100	8382276
Total Antimony (Sb)	mg/kg	0.23	0.45	0.10	8382276
Total Arsenic (As)	mg/kg	4.20	8.22	0.50	8382276
Total Barium (Ba)	mg/kg	57.0	278	0.10	8382276
Total Beryllium (Be)	mg/kg	<0.40	<0.40	0.40	8382276
Total Bismuth (Bi)	mg/kg	0.82	0.12	0.10	8382276
Total Cadmium (Cd)	mg/kg	0.550	0.690	0.050	8382276
Total Calcium (Ca)	mg/kg	1290	4340	100	8382276
Total Chromium (Cr)	mg/kg	20.0	28.0	1.0	8382276
Total Cobalt (Co)	mg/kg	5.70	9.16	0.30	8382276
Total Copper (Cu)	mg/kg	21.6	15.5	0.50	8382276
Total Iron (Fe)	mg/kg	16400	22300	100	8382276
Total Lead (Pb)	mg/kg	26.5	6.72	0.10	8382276
Total Lithium (Li)	mg/kg	<5.0	9.2	5.0	8382276
Total Magnesium (Mg)	mg/kg	3030	4070	100	8382276
Total Manganese (Mn)	mg/kg	163	420	0.20	8382276
Total Mercury (Hg)	mg/kg	0.056	<0.050	0.050	8382276
Total Molybdenum (Mo)	mg/kg	0.74	1.45	0.10	8382276
Total Nickel (Ni)	mg/kg	8.51	19.0	0.80	8382276
Total Phosphorus (P)	mg/kg	613	375	10	8382276
Total Potassium (K)	mg/kg	555	358	100	8382276
Total Selenium (Se)	mg/kg	<0.50	<0.50	0.50	8382276
Total Silver (Ag)	mg/kg	0.229	0.076	0.050	8382276
Total Sodium (Na)	mg/kg	119	192	100	8382276
Total Strontium (Sr)	mg/kg	12.4	29.4	0.10	8382276
Total Thallium (Tl)	mg/kg	<0.050	0.109	0.050	8382276
Total Tin (Sn)	mg/kg	0.22	0.42	0.10	8382276
Total Titanium (Ti)	mg/kg	419	631	1.0	8382276
Total Uranium (U)	mg/kg	0.403	0.569	0.050	8382276

RDL = Reportable Detection Limit

N/A = Not Applicable

(1) Due to high absorbtivity of the sample the water soil extraction ratio has changed from 2:1 to 3:1.

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ0241	PJ2887		
Sampling Date		2016/08/21	2016/08/19		
COC Number		08426716	08426713		
	UNITS	**CCTMRS-639-R**	**CCTMCS-606**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/kg	40.8	61.2	2.0	8382276
Total Zinc (Zn)	mg/kg	30.0	51.1	1.0	8382276
Total Zirconium (Zr)	mg/kg	0.70	2.46	0.50	8382276
RDL = Reportable Detection Limit					

GENERAL COMMENTS

Samples from PJ0116 to PJ0148, PJ0261 to PJ0290, PJ0412 to PJ0433, PJ0519 to PJ0602, were received after holding time expired on mercury.

Sample PJ0116-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0117-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0118-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0119-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0120-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0121-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0123-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0124-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0125-01 : Sample received past method-specified hold time for Total Mercury in soil.

Sample PJ0148-01 : Sample received past method-specified hold time for Total Mercury in soil.

Results relate only to the items tested.

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Maxxam Job #: B672722
Report Date: 2016/09/29

QUALITY ASSURANCE REPORT

EDI ENVIRONMENTAL DYNAMICS INC.
Client Project #: 14Y0306
Site Location: KAMINAK COFFEE CREEK

			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
8378803	Moisture	2016/08/29					<0.30	%	4.0	20		
8378807	Moisture	2016/08/29					<0.30	%	5.0	20		
8378819	Moisture	2016/08/29					<0.30	%	1.5	20		
8381589	Total Aluminum (Al)	2016/08/30					<100	mg/kg	0.75	35	98	70 - 130
8381589	Total Antimony (Sb)	2016/08/30	91	75 - 125	92	75 - 125	<0.10	mg/kg	NC	30	106	70 - 130
8381589	Total Arsenic (As)	2016/08/30	87	75 - 125	90	75 - 125	<0.50	mg/kg	NC	30	84	70 - 130
8381589	Total Barium (Ba)	2016/08/30	NC	75 - 125	97	75 - 125	<0.10	mg/kg	2.7	35	95	70 - 130
8381589	Total Beryllium (Be)	2016/08/30	94	75 - 125	90	75 - 125	<0.40	mg/kg	NC	30	89	70 - 130
8381589	Total Bismuth (Bi)	2016/08/30					<0.10	mg/kg	NC	30		
8381589	Total Cadmium (Cd)	2016/08/30	97	75 - 125	99	75 - 125	<0.050	mg/kg	NC	30	116	70 - 130
8381589	Total Calcium (Ca)	2016/08/30					<100	mg/kg	2.1	30	94	70 - 130
8381589	Total Chromium (Cr)	2016/08/30	91	75 - 125	97	75 - 125	<1.0	mg/kg	0.069	30	101	70 - 130
8381589	Total Cobalt (Co)	2016/08/30	95	75 - 125	98	75 - 125	<0.30	mg/kg	0.39	30	93	70 - 130
8381589	Total Copper (Cu)	2016/08/30	NC	75 - 125	99	75 - 125	<0.50	mg/kg	4.8	30	102	70 - 130
8381589	Total Iron (Fe)	2016/08/30					<100	mg/kg	1.4	30	95	70 - 130
8381589	Total Lead (Pb)	2016/08/30	94	75 - 125	97	75 - 125	<0.10	mg/kg	4.1	35	100	70 - 130
8381589	Total Lithium (Li)	2016/08/30	100	75 - 125	95	75 - 125	<5.0	mg/kg	NC	30	96	70 - 130
8381589	Total Magnesium (Mg)	2016/08/30					<100	mg/kg	2.2	30	93	70 - 130
8381589	Total Manganese (Mn)	2016/08/30	NC	75 - 125	97	75 - 125	<0.20	mg/kg	0.44	30	96	70 - 130
8381589	Total Mercury (Hg)	2016/08/30	90	75 - 125	91	75 - 125	<0.050	mg/kg	NC	35	129	70 - 130
8381589	Total Molybdenum (Mo)	2016/08/30	97	75 - 125	97	75 - 125	<0.10	mg/kg	4.4	35	116	70 - 130
8381589	Total Nickel (Ni)	2016/08/30	95	75 - 125	95	75 - 125	<0.80	mg/kg	4.3	30	125	70 - 130
8381589	Total Phosphorus (P)	2016/08/30					<10	mg/kg	0.49	30	87	70 - 130
8381589	Total Potassium (K)	2016/08/30					<100	mg/kg	NC	35	91	70 - 130
8381589	Total Selenium (Se)	2016/08/30	86	75 - 125	88	75 - 125	<0.50	mg/kg	NC	30		
8381589	Total Silver (Ag)	2016/08/30	93	75 - 125	91	75 - 125	<0.050	mg/kg	NC	35	92	70 - 130
8381589	Total Sodium (Na)	2016/08/30					<100	mg/kg	NC	35	77	70 - 130
8381589	Total Strontium (Sr)	2016/08/30	96	75 - 125	96	75 - 125	<0.10	mg/kg	3.4	35	99	70 - 130
8381589	Total Thallium (Tl)	2016/08/30	92	75 - 125	93	75 - 125	<0.050	mg/kg	NC	30	86	70 - 130
8381589	Total Tin (Sn)	2016/08/30	90	75 - 125	90	75 - 125	<0.10	mg/kg	1.5	35	90	70 - 130
8381589	Total Titanium (Ti)	2016/08/30	NC	75 - 125	95	75 - 125	<1.0	mg/kg	0.90	35		

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			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
8381589	Total Uranium (U)	2016/08/30	89	75 - 125	89	75 - 125	<0.050	mg/kg	NC	30	89	70 - 130
8381589	Total Vanadium (V)	2016/08/30	NC	75 - 125	95	75 - 125	<2.0	mg/kg	0.95	30	95	70 - 130
8381589	Total Zinc (Zn)	2016/08/30	NC	75 - 125	90	75 - 125	<1.0	mg/kg	3.4	30	93	70 - 130
8381589	Total Zirconium (Zr)	2016/08/30					<0.50	mg/kg	4.6	30		
8381592	Soluble (2:1) pH	2016/08/30			100	97 - 103			0.17	N/A		
8381594	Total Aluminum (Al)	2016/08/30					<100	mg/kg	12	35	106	70 - 130
8381594	Total Antimony (Sb)	2016/08/30	90	75 - 125	95	75 - 125	<0.10	mg/kg	NC	30	108	70 - 130
8381594	Total Arsenic (As)	2016/08/30	87	75 - 125	94	75 - 125	<0.50	mg/kg	NC	30	87	70 - 130
8381594	Total Barium (Ba)	2016/08/30	89	75 - 125	95	75 - 125	0.12, RDL=0.10	mg/kg	9.3	35	92	70 - 130
8381594	Total Beryllium (Be)	2016/08/30	88	75 - 125	93	75 - 125	<0.40	mg/kg	NC	30	85	70 - 130
8381594	Total Bismuth (Bi)	2016/08/30					<0.10	mg/kg	NC	30		
8381594	Total Cadmium (Cd)	2016/08/30	99	75 - 125	104	75 - 125	<0.050	mg/kg	NC	30	119	70 - 130
8381594	Total Calcium (Ca)	2016/08/30					<100	mg/kg	NC	30	101	70 - 130
8381594	Total Chromium (Cr)	2016/08/30	92	75 - 125	99	75 - 125	<1.0	mg/kg	5.1	30	105	70 - 130
8381594	Total Cobalt (Co)	2016/08/30	96	75 - 125	100	75 - 125	<0.30	mg/kg	NC	30	96	70 - 130
8381594	Total Copper (Cu)	2016/08/30	98	75 - 125	102	75 - 125	<0.50	mg/kg	0.84	30	99	70 - 130
8381594	Total Iron (Fe)	2016/08/30					<100	mg/kg	6.9	30	101	70 - 130
8381594	Total Lead (Pb)	2016/08/30	92	75 - 125	97	75 - 125	<0.10	mg/kg	6.9	35	99	70 - 130
8381594	Total Lithium (Li)	2016/08/30	91	75 - 125	94	75 - 125	<5.0	mg/kg	NC	30	97	70 - 130
8381594	Total Magnesium (Mg)	2016/08/30					<100	mg/kg	NC	30	94	70 - 130
8381594	Total Manganese (Mn)	2016/08/30	90	75 - 125	96	75 - 125	<0.20	mg/kg	6.3	30	98	70 - 130
8381594	Total Mercury (Hg)	2016/08/30	90	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	108	70 - 130
8381594	Total Molybdenum (Mo)	2016/08/30	93	75 - 125	94	75 - 125	<0.10	mg/kg	NC	35	104	70 - 130
8381594	Total Nickel (Ni)	2016/08/30	95	75 - 125	98	75 - 125	<0.80	mg/kg	NC	30	103	70 - 130
8381594	Total Phosphorus (P)	2016/08/30					<10	mg/kg	0.76	30	90	70 - 130
8381594	Total Potassium (K)	2016/08/30					<100	mg/kg	NC	35	102	70 - 130
8381594	Total Selenium (Se)	2016/08/30	87	75 - 125	96	75 - 125	<0.50	mg/kg	NC	30		
8381594	Total Silver (Ag)	2016/08/30	91	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35	84	70 - 130
8381594	Total Sodium (Na)	2016/08/30					<100	mg/kg	NC	35	83	70 - 130
8381594	Total Strontium (Sr)	2016/08/30	96	75 - 125	96	75 - 125	<0.10	mg/kg	12	35	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
8381594	Total Thallium (Tl)	2016/08/30	89	75 - 125	95	75 - 125	<0.050	mg/kg	NC	30	86	70 - 130
8381594	Total Tin (Sn)	2016/08/30	87	75 - 125	88	75 - 125	<0.10	mg/kg	NC	35	87	70 - 130
8381594	Total Titanium (Ti)	2016/08/30	NC	75 - 125	96	75 - 125	<1.0	mg/kg	35	35		
8381594	Total Uranium (U)	2016/08/30	85	75 - 125	91	75 - 125	<0.050	mg/kg	NC	30	98	70 - 130
8381594	Total Vanadium (V)	2016/08/30	91	75 - 125	98	75 - 125	<2.0	mg/kg	3.4	30	98	70 - 130
8381594	Total Zinc (Zn)	2016/08/30	89	75 - 125	101	75 - 125	<1.0	mg/kg	19	30	94	70 - 130
8381594	Total Zirconium (Zr)	2016/08/30					<0.50	mg/kg	NC	30		
8381597	Soluble (2:1) pH	2016/08/30			100	97 - 103			0.48	N/A		
8382276	Total Aluminum (Al)	2016/08/31					<100	mg/kg			97	70 - 130
8382276	Total Antimony (Sb)	2016/08/31	93	75 - 125	96	75 - 125	<0.10	mg/kg			101	70 - 130
8382276	Total Arsenic (As)	2016/08/31	92	75 - 125	95	75 - 125	<0.50	mg/kg			100	70 - 130
8382276	Total Barium (Ba)	2016/08/31	96	75 - 125	100	75 - 125	<0.10	mg/kg			96	70 - 130
8382276	Total Beryllium (Be)	2016/08/31	97	75 - 125	96	75 - 125	<0.40	mg/kg			94	70 - 130
8382276	Total Bismuth (Bi)	2016/08/31					<0.10	mg/kg				
8382276	Total Cadmium (Cd)	2016/08/31	100	75 - 125	107	75 - 125	<0.050	mg/kg			122	70 - 130
8382276	Total Calcium (Ca)	2016/08/31					<100	mg/kg			102	70 - 130
8382276	Total Chromium (Cr)	2016/08/31	NC	75 - 125	100	75 - 125	<1.0	mg/kg			109	70 - 130
8382276	Total Cobalt (Co)	2016/08/31	90	75 - 125	103	75 - 125	<0.30	mg/kg			99	70 - 130
8382276	Total Copper (Cu)	2016/08/31	NC	75 - 125	99	75 - 125	<0.50	mg/kg	5.0	30	99	70 - 130
8382276	Total Iron (Fe)	2016/08/31					<100	mg/kg			99	70 - 130
8382276	Total Lead (Pb)	2016/08/31	96	75 - 125	100	75 - 125	<0.10	mg/kg			100	70 - 130
8382276	Total Lithium (Li)	2016/08/31	95	75 - 125	94	75 - 125	<5.0	mg/kg			100	70 - 130
8382276	Total Magnesium (Mg)	2016/08/31					<100	mg/kg			104	70 - 130
8382276	Total Manganese (Mn)	2016/08/31	NC	75 - 125	101	75 - 125	<0.20	mg/kg			104	70 - 130
8382276	Total Mercury (Hg)	2016/08/31	93	75 - 125	99	75 - 125	<0.050	mg/kg			96	70 - 130
8382276	Total Molybdenum (Mo)	2016/08/31	97	75 - 125	94	75 - 125	<0.10	mg/kg			109	70 - 130
8382276	Total Nickel (Ni)	2016/08/31	NC	75 - 125	97	75 - 125	<0.80	mg/kg			103	70 - 130
8382276	Total Phosphorus (P)	2016/08/31					<10	mg/kg			94	70 - 130
8382276	Total Potassium (K)	2016/08/31					<100	mg/kg			95	70 - 130
8382276	Total Selenium (Se)	2016/08/31	95	75 - 125	100	75 - 125	<0.50	mg/kg				
8382276	Total Silver (Ag)	2016/08/31	92	75 - 125	95	75 - 125	<0.050	mg/kg			116	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
8382276	Total Sodium (Na)	2016/08/31					<100	mg/kg			97	70 - 130
8382276	Total Strontium (Sr)	2016/08/31	NC	75 - 125	95	75 - 125	<0.10	mg/kg			100	70 - 130
8382276	Total Thallium (Tl)	2016/08/31	94	75 - 125	101	75 - 125	<0.050	mg/kg			90	70 - 130
8382276	Total Tin (Sn)	2016/08/31	89	75 - 125	90	75 - 125	<0.10	mg/kg			89	70 - 130
8382276	Total Titanium (Ti)	2016/08/31	NC	75 - 125	97	75 - 125	<1.0	mg/kg				
8382276	Total Uranium (U)	2016/08/31	96	75 - 125	97	75 - 125	<0.050	mg/kg			105	70 - 130
8382276	Total Vanadium (V)	2016/08/31	NC	75 - 125	100	75 - 125	<2.0	mg/kg			105	70 - 130
8382276	Total Zinc (Zn)	2016/08/31	NC	75 - 125	103	75 - 125	<1.0	mg/kg			103	70 - 130
8382276	Total Zirconium (Zr)	2016/08/31					<0.50	mg/kg				
8382278	Soluble (2:1) pH	2016/08/31			100	97 - 103			1.5	N/A		
8405576	Total Aluminum (Al)	2016/09/23					<1.0	mg/kg	NC	35	46	17 - 93
8405576	Total Antimony (Sb)	2016/09/23	105	75 - 125	107	75 - 125	<0.0050	mg/kg	NC	35		
8405576	Total Arsenic (As)	2016/09/23	110	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	104	42 - 199
8405576	Total Barium (Ba)	2016/09/23	NC	75 - 125	115	75 - 125	<0.10	mg/kg	0.22	35		
8405576	Total Beryllium (Be)	2016/09/23	115	75 - 125	106	75 - 125	<0.10	mg/kg	NC	35		
8405576	Total Bismuth (Bi)	2016/09/23					<0.10	mg/kg	NC	35		
8405576	Total Boron (B)	2016/09/23					<2.0	mg/kg	7.9	35	105	75 - 125
8405576	Total Cadmium (Cd)	2016/09/23	NC	75 - 125	106	75 - 125	<0.010	mg/kg	0.50	35	97	75 - 125
8405576	Total Calcium (Ca)	2016/09/23					<10	mg/kg	1.8	35	104	75 - 125
8405576	Total Chromium (Cr)	2016/09/23	110	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
8405576	Total Cobalt (Co)	2016/09/23	107	75 - 125	104	75 - 125	<0.020	mg/kg	5.9	35	88	75 - 125
8405576	Total Copper (Cu)	2016/09/23	NC	75 - 125	103	75 - 125	<0.050	mg/kg	5.2	35	95	75 - 125
8405576	Total Iron (Fe)	2016/09/23					<10	mg/kg	3.9	35		
8405576	Total Lead (Pb)	2016/09/23	98	75 - 125	101	75 - 125	<0.010	mg/kg	10	35		
8405576	Total Magnesium (Mg)	2016/09/23					<10	mg/kg	0.88	35		
8405576	Total Manganese (Mn)	2016/09/23	NC	75 - 125	103	75 - 125	<0.10	mg/kg	4.5	35	95	75 - 125
8405576	Total Mercury (Hg)	2016/09/23	113	75 - 125	111	75 - 125	0.012, RDL=0.010	mg/kg	NC	35	108	75 - 125
8405576	Total Molybdenum (Mo)	2016/09/23	108	75 - 125	98	75 - 125	<0.050	mg/kg	0.85	35		
8405576	Total Nickel (Ni)	2016/09/23	108	75 - 125	105	75 - 125	<0.050	mg/kg	0.64	35	85	75 - 125
8405576	Total Phosphorus (P)	2016/09/23					<10	mg/kg	1.3	35	117	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
8405576	Total Potassium (K)	2016/09/23					<10	mg/kg	3.3	35	101	75 - 125
8405576	Total Selenium (Se)	2016/09/23	110	75 - 125	106	75 - 125	<0.050	mg/kg	6.1	35	120	75 - 125
8405576	Total Silver (Ag)	2016/09/23	95	75 - 125	93	75 - 125	<0.020	mg/kg	NC	35		
8405576	Total Sodium (Na)	2016/09/23					<10	mg/kg	NC	35	101	75 - 125
8405576	Total Strontium (Sr)	2016/09/23	NC	75 - 125	101	75 - 125	<0.10	mg/kg	1.7	35	99	75 - 125
8405576	Total Thallium (Tl)	2016/09/23	106	75 - 125	106	75 - 125	<0.0020	mg/kg	NC	35		
8405576	Total Tin (Sn)	2016/09/23	77	75 - 125	102	75 - 125	<0.10	mg/kg	NC	35		
8405576	Total Titanium (Ti)	2016/09/23	71 (1)	75 - 125	101	75 - 125	<1.0	mg/kg	NC	35		
8405576	Total Uranium (U)	2016/09/23	101	75 - 125	100	75 - 125	<0.0020	mg/kg	4.2	35		
8405576	Total Vanadium (V)	2016/09/23	111	75 - 125	104	75 - 125	<0.20	mg/kg	NC	35		
8405576	Total Zinc (Zn)	2016/09/23	NC	75 - 125	106	75 - 125	<0.20	mg/kg	2.6	35	96	75 - 125
8405594	Total Aluminum (Al)	2016/09/25					<1.0	mg/kg	6.6	35	46	17 - 93
8405594	Total Antimony (Sb)	2016/09/25	106	75 - 125	114	75 - 125	<0.0050	mg/kg	2.5	35		
8405594	Total Arsenic (As)	2016/09/25	107	75 - 125	114	75 - 125	<0.050	mg/kg	NC	35	103	42 - 199
8405594	Total Barium (Ba)	2016/09/25	NC	75 - 125	118	75 - 125	<0.10	mg/kg	7.1	35		
8405594	Total Beryllium (Be)	2016/09/25	108	75 - 125	114	75 - 125	<0.10	mg/kg	NC	35		
8405594	Total Bismuth (Bi)	2016/09/25					<0.10	mg/kg	NC	35		
8405594	Total Boron (B)	2016/09/25					<2.0	mg/kg	NC	35	105	75 - 125
8405594	Total Cadmium (Cd)	2016/09/25	108	75 - 125	113	75 - 125	<0.010	mg/kg	5.5	35	102	75 - 125
8405594	Total Calcium (Ca)	2016/09/25					<10	mg/kg	2.3	35	99	75 - 125
8405594	Total Chromium (Cr)	2016/09/25	105	75 - 125	109	75 - 125	<0.20	mg/kg	NC	35		
8405594	Total Cobalt (Co)	2016/09/25	104	75 - 125	111	75 - 125	<0.020	mg/kg	1.1	35	92	75 - 125
8405594	Total Copper (Cu)	2016/09/25	104	75 - 125	111	75 - 125	<0.050	mg/kg	5.6	35	98	75 - 125
8405594	Total Iron (Fe)	2016/09/25					<10	mg/kg	6.0	35		
8405594	Total Lead (Pb)	2016/09/25	98	75 - 125	108	75 - 125	<0.010	mg/kg	10	35		
8405594	Total Magnesium (Mg)	2016/09/25					<10	mg/kg	0.012	35		
8405594	Total Manganese (Mn)	2016/09/25	NC	75 - 125	112	75 - 125	<0.10	mg/kg	3.8	35	102	75 - 125
8405594	Total Mercury (Hg)	2016/09/25	109	75 - 125	125	75 - 125	0.013, RDL=0.010	mg/kg	NC	35	125	75 - 125
8405594	Total Molybdenum (Mo)	2016/09/25	105	75 - 125	108	75 - 125	<0.050	mg/kg	NC	35		
8405594	Total Nickel (Ni)	2016/09/25	103	75 - 125	114	75 - 125	<0.050	mg/kg	0.66	35	88	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
8405594	Total Phosphorus (P)	2016/09/25					<10	mg/kg	2.8	35	120	75 - 125
8405594	Total Potassium (K)	2016/09/25					<10	mg/kg	3.3	35	107	75 - 125
8405594	Total Selenium (Se)	2016/09/25	118	75 - 125	115	75 - 125	<0.050	mg/kg	NC	35	96	75 - 125
8405594	Total Silver (Ag)	2016/09/25	75	75 - 125	169 (2)	75 - 125	<0.020	mg/kg	NC	35		
8405594	Total Sodium (Na)	2016/09/25					<10	mg/kg	NC	35	113	75 - 125
8405594	Total Strontium (Sr)	2016/09/25	NC	75 - 125	107	75 - 125	<0.10	mg/kg	4.4	35	102	75 - 125
8405594	Total Thallium (Tl)	2016/09/25	101	75 - 125	113	75 - 125	<0.0020	mg/kg	NC	35		
8405594	Total Tin (Sn)	2016/09/25	99	75 - 125	106	75 - 125	<0.10	mg/kg	NC	35		
8405594	Total Titanium (Ti)	2016/09/25	NC	75 - 125	107	75 - 125	<1.0	mg/kg	8.3	35		
8405594	Total Uranium (U)	2016/09/25	99	75 - 125	108	75 - 125	<0.0020	mg/kg	NC	35		
8405594	Total Vanadium (V)	2016/09/25	105	75 - 125	110	75 - 125	<0.20	mg/kg	NC	35		
8405594	Total Zinc (Zn)	2016/09/25	NC	75 - 125	113	75 - 125	<0.20	mg/kg	3.6	35	105	75 - 125
8407097	Total Aluminum (Al)	2016/09/25					<1.0	mg/kg	0.60	35	48	17 - 93
8407097	Total Antimony (Sb)	2016/09/25	110	75 - 125	109	75 - 125	<0.0050	mg/kg	7.8	35		
8407097	Total Arsenic (As)	2016/09/25	104	75 - 125	108	75 - 125	<0.050	mg/kg	NC	35	79	42 - 199
8407097	Total Barium (Ba)	2016/09/25	NC	75 - 125	118	75 - 125	<0.10	mg/kg	5.1	35		
8407097	Total Beryllium (Be)	2016/09/25	114	75 - 125	111	75 - 125	<0.10	mg/kg	NC	35		
8407097	Total Bismuth (Bi)	2016/09/25					<0.10	mg/kg	NC	35		
8407097	Total Boron (B)	2016/09/25					<2.0	mg/kg	NC	35	108	75 - 125
8407097	Total Cadmium (Cd)	2016/09/25	109	75 - 125	109	75 - 125	<0.010	mg/kg	NC	35	98	75 - 125
8407097	Total Calcium (Ca)	2016/09/25					<10	mg/kg	2.9	35	99	75 - 125
8407097	Total Chromium (Cr)	2016/09/25	99	75 - 125	101	75 - 125	<0.20	mg/kg	NC	35		
8407097	Total Cobalt (Co)	2016/09/25	103	75 - 125	106	75 - 125	<0.020	mg/kg	NC	35	91	75 - 125
8407097	Total Copper (Cu)	2016/09/25	101	75 - 125	103	75 - 125	<0.050	mg/kg	1.4	35	99	75 - 125
8407097	Total Iron (Fe)	2016/09/25					<10	mg/kg	1.4	35		
8407097	Total Lead (Pb)	2016/09/25	101	75 - 125	103	75 - 125	<0.010	mg/kg	6.0	35		
8407097	Total Magnesium (Mg)	2016/09/25					<10	mg/kg	8.8	35		
8407097	Total Manganese (Mn)	2016/09/25	NC	75 - 125	107	75 - 125	<0.10	mg/kg	9.4	35	99	75 - 125
8407097	Total Mercury (Hg)	2016/09/25	115	75 - 125	112	75 - 125	<0.010	mg/kg	NC	35	104	75 - 125
8407097	Total Molybdenum (Mo)	2016/09/25	104	75 - 125	105	75 - 125	<0.050	mg/kg	NC	35		
8407097	Total Nickel (Ni)	2016/09/25	102	75 - 125	108	75 - 125	<0.050	mg/kg	NC	35	87	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
8407097	Total Phosphorus (P)	2016/09/25					<10	mg/kg	8.6	35	117	75 - 125
8407097	Total Potassium (K)	2016/09/25					<10	mg/kg	9.5	35	107	75 - 125
8407097	Total Selenium (Se)	2016/09/25	118	75 - 125	113	75 - 125	<0.050	mg/kg	NC	35	84	75 - 125
8407097	Total Silver (Ag)	2016/09/25	76	75 - 125	101	75 - 125	<0.020	mg/kg	NC	35		
8407097	Total Sodium (Na)	2016/09/25					<10	mg/kg	NC	35	112	75 - 125
8407097	Total Strontium (Sr)	2016/09/25	100	75 - 125	102	75 - 125	<0.10	mg/kg	3.7	35	99	75 - 125
8407097	Total Thallium (Tl)	2016/09/25	105	75 - 125	109	75 - 125	<0.0020	mg/kg	NC	35		
8407097	Total Tin (Sn)	2016/09/25	103	75 - 125	104	75 - 125	<0.10	mg/kg	NC	35		
8407097	Total Titanium (Ti)	2016/09/25	104	75 - 125	96	75 - 125	<1.0	mg/kg	NC	35		
8407097	Total Uranium (U)	2016/09/25	103	75 - 125	103	75 - 125	<0.0020	mg/kg	NC	35		
8407097	Total Vanadium (V)	2016/09/25	105	75 - 125	103	75 - 125	<0.20	mg/kg	NC	35		
8407097	Total Zinc (Zn)	2016/09/25	NC	75 - 125	111	75 - 125	<0.20	mg/kg	4.7	35	101	75 - 125
8407099	Total Aluminum (Al)	2016/09/25					<1.0	mg/kg	6.3	35	46	17 - 93
8407099	Total Antimony (Sb)	2016/09/25	114	75 - 125	108	75 - 125	<0.0050	mg/kg	NC	35		
8407099	Total Arsenic (As)	2016/09/25	110	75 - 125	106	75 - 125	<0.050	mg/kg	NC	35	95	42 - 199
8407099	Total Barium (Ba)	2016/09/25	NC	75 - 125	118	75 - 125	<0.10	mg/kg	4.0	35		
8407099	Total Beryllium (Be)	2016/09/25	118	75 - 125	108	75 - 125	<0.10	mg/kg	NC	35		
8407099	Total Bismuth (Bi)	2016/09/25					<0.10	mg/kg	NC	35		
8407099	Total Boron (B)	2016/09/25					<2.0	mg/kg	NC	35	112	75 - 125
8407099	Total Cadmium (Cd)	2016/09/25	116	75 - 125	107	75 - 125	<0.010	mg/kg	2.2	35	103	75 - 125
8407099	Total Calcium (Ca)	2016/09/25					<10	mg/kg	2.5	35	103	75 - 125
8407099	Total Chromium (Cr)	2016/09/25	103	75 - 125	106	75 - 125	<0.20	mg/kg	NC	35		
8407099	Total Cobalt (Co)	2016/09/25	105	75 - 125	107	75 - 125	<0.020	mg/kg	0.91	35	96	75 - 125
8407099	Total Copper (Cu)	2016/09/25	NC	75 - 125	106	75 - 125	<0.050	mg/kg	0.83	35	102	75 - 125
8407099	Total Iron (Fe)	2016/09/25					<10	mg/kg	NC	35		
8407099	Total Lead (Pb)	2016/09/25	99	75 - 125	103	75 - 125	<0.010	mg/kg	NC	35		
8407099	Total Magnesium (Mg)	2016/09/25					<10	mg/kg	1.3	35		
8407099	Total Manganese (Mn)	2016/09/25	NC	75 - 125	108	75 - 125	<0.10	mg/kg	0.91	35	102	75 - 125
8407099	Total Mercury (Hg)	2016/09/25	111	75 - 125	110	75 - 125	<0.010	mg/kg	NC	35	99	75 - 125
8407099	Total Molybdenum (Mo)	2016/09/25	108	75 - 125	105	75 - 125	<0.050	mg/kg	NC	35		
8407099	Total Nickel (Ni)	2016/09/25	108	75 - 125	110	75 - 125	<0.050	mg/kg	0.66	35	92	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
8407099	Total Phosphorus (P)	2016/09/25					<10	mg/kg	0.60	35	119	75 - 125
8407099	Total Potassium (K)	2016/09/25					<10	mg/kg	0.49	35	107	75 - 125
8407099	Total Selenium (Se)	2016/09/25	118	75 - 125	115	75 - 125	<0.050	mg/kg	NC	35	120	75 - 125
8407099	Total Silver (Ag)	2016/09/25	80	75 - 125	87	75 - 125	<0.020	mg/kg	NC	35		
8407099	Total Sodium (Na)	2016/09/25					<10	mg/kg	NC	35	111	75 - 125
8407099	Total Strontium (Sr)	2016/09/25	NC	75 - 125	104	75 - 125	<0.10	mg/kg	0.83	35	102	75 - 125
8407099	Total Thallium (Tl)	2016/09/25	108	75 - 125	107	75 - 125	<0.0020	mg/kg	NC	35		
8407099	Total Tin (Sn)	2016/09/25	104	75 - 125	100	75 - 125	<0.10	mg/kg	NC	35		
8407099	Total Titanium (Ti)	2016/09/25	102	75 - 125	96	75 - 125	<1.0	mg/kg	NC	35		
8407099	Total Uranium (U)	2016/09/25	101	75 - 125	103	75 - 125	<0.0020	mg/kg	NC	35		
8407099	Total Vanadium (V)	2016/09/25	107	75 - 125	104	75 - 125	<0.20	mg/kg	NC	35		
8407099	Total Zinc (Zn)	2016/09/25	NC	75 - 125	110	75 - 125	<0.20	mg/kg	3.6	35	105	75 - 125
8407124	Total Aluminum (Al)	2016/09/27					<1.0	mg/kg	2.6	35	35	17 - 93
8407124	Total Antimony (Sb)	2016/09/27	119	75 - 125	105	75 - 125	<0.0050	mg/kg	NC	35		
8407124	Total Arsenic (As)	2016/09/27	116	75 - 125	106	75 - 125	<0.050	mg/kg	NC	35	95	42 - 199
8407124	Total Barium (Ba)	2016/09/27	NC	75 - 125	126 (3)	75 - 125	<0.10	mg/kg	0.31	35		
8407124	Total Beryllium (Be)	2016/09/27	119	75 - 125	103	75 - 125	<0.10	mg/kg	NC	35		
8407124	Total Bismuth (Bi)	2016/09/27					<0.10	mg/kg	NC	35		
8407124	Total Boron (B)	2016/09/27					<2.0	mg/kg	0.36	35	105	75 - 125
8407124	Total Cadmium (Cd)	2016/09/27	119	75 - 125	103	75 - 125	<0.010	mg/kg	1.9	35	99	75 - 125
8407124	Total Calcium (Ca)	2016/09/27					<10	mg/kg	2.3	35	99	75 - 125
8407124	Total Chromium (Cr)	2016/09/27	111	75 - 125	104	75 - 125	<0.20	mg/kg	NC	35		
8407124	Total Cobalt (Co)	2016/09/27	111	75 - 125	106	75 - 125	<0.020	mg/kg	2.7	35	89	75 - 125
8407124	Total Copper (Cu)	2016/09/27	NC	75 - 125	103	75 - 125	<0.050	mg/kg	8.3	35	95	75 - 125
8407124	Total Iron (Fe)	2016/09/27					<10	mg/kg	NC	35		
8407124	Total Lead (Pb)	2016/09/27	100	75 - 125	96	75 - 125	<0.010	mg/kg	NC	35		
8407124	Total Magnesium (Mg)	2016/09/27					<10	mg/kg	1.1	35		
8407124	Total Manganese (Mn)	2016/09/27	NC	75 - 125	107	75 - 125	<0.10	mg/kg	2.9	35	98	75 - 125
8407124	Total Mercury (Hg)	2016/09/27	117	75 - 125	108	75 - 125	<0.010	mg/kg	NC	35	99	75 - 125
8407124	Total Molybdenum (Mo)	2016/09/27	117	75 - 125	100	75 - 125	<0.050	mg/kg	2.1	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
8407124	Total Nickel (Ni)	2016/09/27	116	75 - 125	107	75 - 125	0.055, RDL=0.050	mg/kg	7.6	35	80	75 - 125
8407124	Total Phosphorus (P)	2016/09/27					<10	mg/kg	5.2	35	116	75 - 125
8407124	Total Potassium (K)	2016/09/27					<10	mg/kg	4.3	35	105	75 - 125
8407124	Total Selenium (Se)	2016/09/27	121	75 - 125	110	75 - 125	<0.050	mg/kg	NC	35	121	75 - 125
8407124	Total Silver (Ag)	2016/09/27	87	75 - 125	83	75 - 125	<0.020	mg/kg	NC	35		
8407124	Total Sodium (Na)	2016/09/27					<10	mg/kg	NC	35	98	75 - 125
8407124	Total Strontium (Sr)	2016/09/27	NC	75 - 125	94	75 - 125	<0.10	mg/kg	0.64	35	99	75 - 125
8407124	Total Thallium (Tl)	2016/09/27	112	75 - 125	105	75 - 125	<0.0020	mg/kg	NC	35		
8407124	Total Tin (Sn)	2016/09/27	109	75 - 125	97	75 - 125	<0.10	mg/kg	NC	35		
8407124	Total Titanium (Ti)	2016/09/27	111	75 - 125	105	75 - 125	<1.0	mg/kg	NC	35		
8407124	Total Uranium (U)	2016/09/27	101	75 - 125	94	75 - 125	0.0030, RDL=0.0020	mg/kg	NC	35		
8407124	Total Vanadium (V)	2016/09/27	115	75 - 125	107	75 - 125	<0.20	mg/kg	NC	35		
8407124	Total Zinc (Zn)	2016/09/27	NC	75 - 125	111	75 - 125	<0.20	mg/kg	8.8	35	98	75 - 125
8408031	Moisture	2016/09/23					<0.30	%	0.15	20		
8408741	Total Aluminum (Al)	2016/09/27					<1.0	mg/kg	4.6	35	38	17 - 93
8408741	Total Antimony (Sb)	2016/09/27	112	75 - 125	110	75 - 125	<0.0050	mg/kg	NC	35		
8408741	Total Arsenic (As)	2016/09/27	116	75 - 125	109	75 - 125	<0.050	mg/kg	NC	35	100	42 - 199
8408741	Total Barium (Ba)	2016/09/27	NC	75 - 125	120	75 - 125	<0.10	mg/kg	13	35		
8408741	Total Beryllium (Be)	2016/09/27	122	75 - 125	105	75 - 125	<0.10	mg/kg	NC	35		
8408741	Total Bismuth (Bi)	2016/09/27					<0.10	mg/kg	NC	35		
8408741	Total Boron (B)	2016/09/27					<2.0	mg/kg	NC	35	96	75 - 125
8408741	Total Cadmium (Cd)	2016/09/27	115	75 - 125	108	75 - 125	<0.010	mg/kg	NC	35	102	75 - 125
8408741	Total Calcium (Ca)	2016/09/27					<10	mg/kg	13	35	104	75 - 125
8408741	Total Chromium (Cr)	2016/09/27	107	75 - 125	100	75 - 125	<0.20	mg/kg	NC	35		
8408741	Total Cobalt (Co)	2016/09/27	108	75 - 125	103	75 - 125	<0.020	mg/kg	NC	35	95	75 - 125
8408741	Total Copper (Cu)	2016/09/27	NC	75 - 125	101	75 - 125	<0.050	mg/kg	58 (1)	35	101	75 - 125
8408741	Total Iron (Fe)	2016/09/27					<10	mg/kg	4.2	35		
8408741	Total Lead (Pb)	2016/09/27	101	75 - 125	95	75 - 125	<0.010	mg/kg	NC	35		
8408741	Total Magnesium (Mg)	2016/09/27					<10	mg/kg	11	35		
8408741	Total Manganese (Mn)	2016/09/27	NC	75 - 125	104	75 - 125	<0.10	mg/kg	11	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
8408741	Total Mercury (Hg)	2016/09/27	121	75 - 125	113	75 - 125	<0.010	mg/kg	NC	35	102	75 - 125
8408741	Total Molybdenum (Mo)	2016/09/27	114	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35		
8408741	Total Nickel (Ni)	2016/09/27	109	75 - 125	103	75 - 125	<0.050	mg/kg	0.80	35	89	75 - 125
8408741	Total Phosphorus (P)	2016/09/27					<10	mg/kg	8.8	35	125	75 - 125
8408741	Total Potassium (K)	2016/09/27					<10	mg/kg	4.0	35	110	75 - 125
8408741	Total Selenium (Se)	2016/09/27	120	75 - 125	111	75 - 125	<0.050	mg/kg	NC	35	102	75 - 125
8408741	Total Silver (Ag)	2016/09/27	83	75 - 125	96	75 - 125	<0.020	mg/kg	NC	35		
8408741	Total Sodium (Na)	2016/09/27					<10	mg/kg	NC	35	109	75 - 125
8408741	Total Strontium (Sr)	2016/09/27	NC	75 - 125	101	75 - 125	<0.10	mg/kg	12	35	109	75 - 125
8408741	Total Thallium (Tl)	2016/09/27	113	75 - 125	106	75 - 125	<0.0020	mg/kg	NC	35		
8408741	Total Tin (Sn)	2016/09/27	106	75 - 125	106	75 - 125	<0.10	mg/kg	NC	35		
8408741	Total Titanium (Ti)	2016/09/27	115	75 - 125	106	75 - 125	<1.0	mg/kg	NC	35		
8408741	Total Uranium (U)	2016/09/27	102	75 - 125	92	75 - 125	<0.0020	mg/kg	NC	35		
8408741	Total Vanadium (V)	2016/09/27	111	75 - 125	106	75 - 125	<0.20	mg/kg	NC	35		
8408741	Total Zinc (Zn)	2016/09/27	NC	75 - 125	106	75 - 125	<0.20	mg/kg	8.8	35	102	75 - 125
8408878	Total Aluminum (Al)	2016/09/28					<1.0	mg/kg	6.9	35	44	17 - 93
8408878	Total Antimony (Sb)	2016/09/28	119	75 - 125	113	75 - 125	<0.0050	mg/kg	NC	35		
8408878	Total Arsenic (As)	2016/09/28	115	75 - 125	108	75 - 125	<0.050	mg/kg	NC	35	103	42 - 199
8408878	Total Barium (Ba)	2016/09/28	NC	75 - 125	118	75 - 125	<0.10	mg/kg	15	35		
8408878	Total Beryllium (Be)	2016/09/28	119	75 - 125	109	75 - 125	<0.10	mg/kg	NC	35		
8408878	Total Bismuth (Bi)	2016/09/28					<0.10	mg/kg	NC	35		
8408878	Total Boron (B)	2016/09/28					<2.0	mg/kg	NC	35	113	75 - 125
8408878	Total Cadmium (Cd)	2016/09/28	119	75 - 125	113	75 - 125	<0.010	mg/kg	NC	35	108	75 - 125
8408878	Total Calcium (Ca)	2016/09/28					<10	mg/kg	13	35	107	75 - 125
8408878	Total Chromium (Cr)	2016/09/28	110	75 - 125	110	75 - 125	<0.20	mg/kg	NC	35		
8408878	Total Cobalt (Co)	2016/09/28	111	75 - 125	107	75 - 125	<0.020	mg/kg	NC	35	92	75 - 125
8408878	Total Copper (Cu)	2016/09/28	NC	75 - 125	107	75 - 125	<0.050	mg/kg	19	35	102	75 - 125
8408878	Total Iron (Fe)	2016/09/28					<10	mg/kg	NC	35		
8408878	Total Lead (Pb)	2016/09/28	103	75 - 125	101	75 - 125	<0.010	mg/kg	NC	35		
8408878	Total Magnesium (Mg)	2016/09/28					<10	mg/kg	5.7	35		
8408878	Total Manganese (Mn)	2016/09/28	NC	75 - 125	110	75 - 125	<0.10	mg/kg	11	35	105	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
8408878	Total Mercury (Hg)	2016/09/28	127 (1)	75 - 125	122	75 - 125	<0.010	mg/kg	NC	35	117	75 - 125
8408878	Total Molybdenum (Mo)	2016/09/28	116	75 - 125	111	75 - 125	<0.050	mg/kg	NC	35		
8408878	Total Nickel (Ni)	2016/09/28	104	75 - 125	109	75 - 125	<0.050	mg/kg	NC	35	89	75 - 125
8408878	Total Phosphorus (P)	2016/09/28					<10	mg/kg	9.0	35	123	75 - 125
8408878	Total Potassium (K)	2016/09/28					<10	mg/kg	8.7	35	109	75 - 125
8408878	Total Selenium (Se)	2016/09/28	119	75 - 125	113	75 - 125	<0.050	mg/kg	NC	35	106	75 - 125
8408878	Total Silver (Ag)	2016/09/28	84	75 - 125	89	75 - 125	<0.020	mg/kg	NC	35		
8408878	Total Sodium (Na)	2016/09/28					<10	mg/kg	NC	35	110	75 - 125
8408878	Total Strontium (Sr)	2016/09/28	NC	75 - 125	104	75 - 125	<0.10	mg/kg	11	35	110	75 - 125
8408878	Total Thallium (Tl)	2016/09/28	112	75 - 125	113	75 - 125	<0.0020	mg/kg	NC	35		
8408878	Total Tin (Sn)	2016/09/28	109	75 - 125	106	75 - 125	<0.10	mg/kg	NC	35		
8408878	Total Titanium (Ti)	2016/09/28	107	75 - 125	112	75 - 125	<1.0	mg/kg	NC	35		
8408878	Total Uranium (U)	2016/09/28	103	75 - 125	100	75 - 125	<0.0020	mg/kg	NC	35		
8408878	Total Vanadium (V)	2016/09/28	113	75 - 125	105	75 - 125	<0.20	mg/kg	NC	35		
8408878	Total Zinc (Zn)	2016/09/28	NC	75 - 125	110	75 - 125	<0.20	mg/kg	9.3	35	105	75 - 125
8408888	Total Aluminum (Al)	2016/09/27					<1.0	mg/kg	1.2	35	38	17 - 93
8408888	Total Antimony (Sb)	2016/09/27	105	75 - 125	116	75 - 125	<0.0050	mg/kg	NC	35		
8408888	Total Arsenic (As)	2016/09/27	107	75 - 125	112	75 - 125	<0.050	mg/kg	NC	35	106	42 - 199
8408888	Total Barium (Ba)	2016/09/27	NC	75 - 125	119	75 - 125	<0.10	mg/kg	4.3	35		
8408888	Total Beryllium (Be)	2016/09/27	107	75 - 125	120	75 - 125	<0.10	mg/kg	NC	35		
8408888	Total Bismuth (Bi)	2016/09/27					<0.10	mg/kg	NC	35		
8408888	Total Boron (B)	2016/09/27					<2.0	mg/kg	4.8	35	93	75 - 125
8408888	Total Cadmium (Cd)	2016/09/27	107	75 - 125	116	75 - 125	<0.010	mg/kg	NC	35	100	75 - 125
8408888	Total Calcium (Ca)	2016/09/27					<10	mg/kg	3.5	35	104	75 - 125
8408888	Total Chromium (Cr)	2016/09/27	95	75 - 125	115	75 - 125	<0.20	mg/kg	NC	35		
8408888	Total Cobalt (Co)	2016/09/27	98	75 - 125	118	75 - 125	<0.020	mg/kg	NC	35	93	75 - 125
8408888	Total Copper (Cu)	2016/09/27	NC	75 - 125	117	75 - 125	<0.050	mg/kg	8.6	35	102	75 - 125
8408888	Total Iron (Fe)	2016/09/27					<10	mg/kg	NC	35		
8408888	Total Lead (Pb)	2016/09/27	94	75 - 125	105	75 - 125	<0.010	mg/kg	NC	35		
8408888	Total Magnesium (Mg)	2016/09/27					<10	mg/kg	1.6	35		
8408888	Total Manganese (Mn)	2016/09/27	NC	75 - 125	121	75 - 125	<0.10	mg/kg	0.73	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
8408888	Total Mercury (Hg)	2016/09/27	110	75 - 125	121	75 - 125	<0.010	mg/kg	NC	35	93	75 - 125
8408888	Total Molybdenum (Mo)	2016/09/27	106	75 - 125	116	75 - 125	<0.050	mg/kg	NC	35		
8408888	Total Nickel (Ni)	2016/09/27	99	75 - 125	121	75 - 125	<0.050	mg/kg	NC	35	88	75 - 125
8408888	Total Phosphorus (P)	2016/09/27					<10	mg/kg	0.83	35	122	75 - 125
8408888	Total Potassium (K)	2016/09/27					<10	mg/kg	1.5	35	108	75 - 125
8408888	Total Selenium (Se)	2016/09/27	107	75 - 125	119	75 - 125	<0.050	mg/kg	NC	35	109	75 - 125
8408888	Total Silver (Ag)	2016/09/27	79	75 - 125	101	75 - 125	<0.020	mg/kg	NC	35		
8408888	Total Sodium (Na)	2016/09/27					<10	mg/kg	NC	35	111	75 - 125
8408888	Total Strontium (Sr)	2016/09/27	NC	75 - 125	112	75 - 125	<0.10	mg/kg	5.4	35	106	75 - 125
8408888	Total Thallium (Tl)	2016/09/27	103	75 - 125	119	75 - 125	<0.0020	mg/kg	NC	35		
8408888	Total Tin (Sn)	2016/09/27	100	75 - 125	108	75 - 125	<0.10	mg/kg	NC	35		
8408888	Total Titanium (Ti)	2016/09/27	99	75 - 125	114	75 - 125	<1.0	mg/kg	NC	35		
8408888	Total Uranium (U)	2016/09/27	92	75 - 125	103	75 - 125	<0.0020	mg/kg	NC	35		
8408888	Total Vanadium (V)	2016/09/27	103	75 - 125	118	75 - 125	<0.20	mg/kg	NC	35		
8408888	Total Zinc (Zn)	2016/09/27	NC	75 - 125	117	75 - 125	<0.20	mg/kg	1.8	35	104	75 - 125
8409718	Moisture	2016/09/24					<0.30	%	4.0	20		
8409719	Moisture	2016/09/24					<0.30	%	2.6	20		
8411681	Moisture	2016/09/27					<0.30	%	2.3	20		
8411700	Moisture	2016/09/27					<0.30	%	1.9	20		
8413052	Moisture	2016/09/28					<0.30	%	0.61	20		

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
8413067	Moisture	2016/09/28					<0.30	%	1.4	20		

N/A = Not Applicable

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

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

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) Blank Spike outside acceptance criteria - re-analysis yields similar results.

(3) Blank Spike outside acceptance criteria (10% of analytes failure allowed).

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VALIDATION SIGNATURE PAGE

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

[signature redacted]

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.