CopperFox Metals Inc.

Schaft Creek Project

British Columbia, Canada

Schaft Creek Tahltan (Country) Foods Baseline Assessment




Prepared by:

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Vancouver, British Columbia

April 2008

EXECUTIVE SUMMARY

Executive Summary

This report presents the country foods baseline assessment conducted by Rescan Environmental Services Ltd. (Rescan) for the Schaft Creek Project Environmental Assessment (EA) Application.

People who harvest country foods from the Schaft Creek Project (the Project) area include: members of the Tahltan First Nation, other First Nation groups, and non-First Nations. These country foods harvesters were the human receptors evaluated in this study.

The country foods evaluated were moose (*Alces alces*), snowshoe hare (*Lepus americanus*), grouse (*Phasianidae sp*), rainbow trout (*Oncorhynchus mykiss*), blueberry (*Vaccinium ssp*.), and soapberry (*Shepherdia canadensis*). These species are consumed by the country foods harvesters and are located within the Project area.

This assessment evaluated metals in country foods. Metals were the focus of this assessment because the Project is a base metals mine and base metals also occur naturally in environmental media (*i.e.,* soil, water, and plant and animal tissue). The following twelve metals were evaluated: aluminum, antimony, arsenic, chromium, copper, lead, mercury, molybdenum, nickel, selenium, vanadium, and zinc.

The results of this assessment indicate no unacceptable risks to human receptors (toddlers or adults) from the consumption of moose, grouse, snowshoe hare, rainbow trout, blueberry, and soapberry. Based on the measured and predicted levels of metals in these foods, the amounts currently consumed by country foods harvesters are within the recommended maximum weekly intakes (RMWIs). Thus, people may safely continue to eat these foods.

This baseline assessment will be used to predict potential effects of the Project on country foods as part of the EA Application. The concentration of metals in country foods are directly related to concentrations in the surrounding environment (*i.e.,* soil, water and vegetation). Therefore, the country foods effects assessment will evaluate the potential for mine related increases of metals concentrations in soil, water and vegetation and the potential for subsequent increases in country foods. The EA will also evaluate how the potential changes in tissue concentrations (if any) may affect the recommended weekly intakes presented in this baseline report.

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Kelli Bergh (MET, B.Sc.) of Rescan wrote this report. Kirsten Mackenzie (M.Sc.), Susan Ames (Ph.D.) and Tania Perzoff (M.Sc.) of Rescan provided environmental baseline data. Curtis Rattray of the Tahltan Central Council provided the country foods consumption data. ALS Laboratory Group (Environmental Division) in Burnaby, BC conducted the tissue analysis. Soren Jensen (M.Sc.) of Rescan reviewed the report. Soren Jensen (M.Sc.) provided project coordination and logistical support in collaboration with Shane Uren (M.Sc.) of Copper Fox Metals Inc.

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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

BAF	bioaccumulation factor
BCEAA	*British Columbia Environmental Assessment Act*
BTF	biotransfer factor
BW	body weight
CCME	Canadian Council of Ministers of the Environment
CEAA	*Canadian Environmental Assessment Act*
COPC	contaminant of potential concern
Copper Fox	Copper Fox Metals Inc.
EA	environmental assessment
EDI	estimated daily intake
ER	exposure ratio
EVM	Expert Group on Vitamins and Minerals
FAO	Food and Agriculture Organization
Fd	fraction of daily consumption
ILCR	incremental lifetime cancer risk
IR	ingestion rate
INAC	Indian and Northern Affairs Canada
IRIS	Integrated Risk Information System
JECFA	Joint FAO/WHO Expert Committee on Food Additives and Contaminants
LRMP	Land Resource Management Plan
LOAEL	lowest observable adverse effects level
MDL	method detection limit
MVUE	minimum variance unbiased estimate
NOAEL	no observable adverse effect level
NCP	Northern Contaminants Program
POP	persistent organic pollutant
the Project	the Schaft Creek Project
PTWI	provisional tolerable weekly intake

QA/QC	quality assurance and quality control
Rescan	Rescan Environmental Services Ltd.
RfD	reference dose
RMWI	recommended maximum weekly intake
TDI	tolerable daily intake
TRV	toxicity reference value
US EPA	United States Environmental Protection Agency
UCLM	upper confidence limit of the mean
USL	upper safety level
WHO	World Health Organization

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1. Introduction

1.1 Overview

Copper Fox Metals Inc. (Copper Fox) is proposing to develop the Schaft Creek Project (the Project), which includes the development of a copper-gold-molybdenum-silver mine. The Project is located in the Liard District of northwestern British Columbia, 80 kilometers southwest of Telegraph Creek and approximately 76 km west of the Stewart-Cassiar highway (Highway 37) (Figure 1.1-1). The Project is also located adjacent to the Mount Edziza Provincial Park, at the southwest corner of the park.

The mineral claims of interest are situated near the headwaters of Schaft Creek, a tributary of Mess Creek, which flows into the Stikine River downstream of the community of Telegraph Creek. The mineral claims are within the Cassiar Iskut-Stikine Land and Resource Management area. The Project area is part of the Telegraph Creek Community Watershed identified in the Cassiar Iskut-Stikine Land and Resource Management Plan (LRMP).

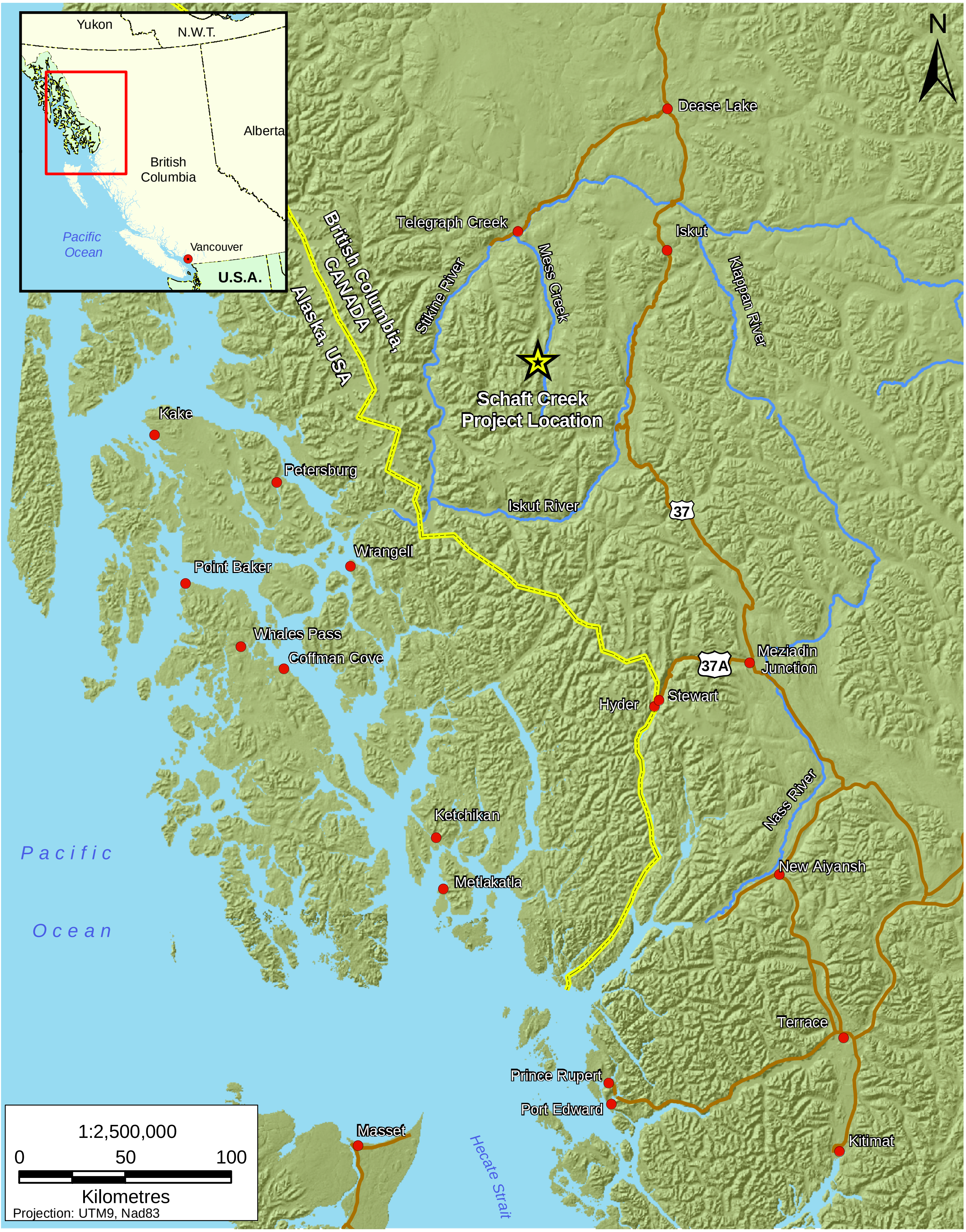
The Project and associated potential access corridors is located within the traditional territory of the Tahltan Nation.

Copper Fox plans to submit an environmental assessment (EA) Application in 2008. It is anticipated that the Project will be reviewed under the *British Columbia Environmental Assessment Act*, S.B.C. 2002, c.43 (BCEAA) and the *Canadian Environmental Assessment Act*, SC 1992, c.37 (CEAA). As part of the EA for the Project, Health Canada may require an assessment of the potential for country food impacts associated with the development of the mine. Country foods are animals, plants and fungi used by humans for medicinal or nutritional purposes that are harvested through hunting, gathering or fishing.

1.2 Objectives

This document presents the country foods baseline assessment, which evaluated current levels of metals in country foods and estimated baseline health risks from consumption of the foods. It also presents the baseline recommended weekly intakes of the country foods, following Health Canada's Guidance on Health Impact Assessments (Health Canada, 2004a).

This baseline assessment will be used to predict potential effects of the Project on country foods as part of the EA Application. The concentration of metals in country foods are directly related to concentrations in the surrounding environment (*i.e.*, soil, water and vegetation). Therefore, the country foods effects assessment will evaluate the potential for mine related increases of metals concentrations in soil, water and vegetation and the potential for subsequent increases of metals in country foods. The EA Application will also evaluate how the potential changes in tissue concentrations (if any) may affect the recommended weekly intakes presented in this baseline report.



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Location Map for Schaft Creek Project

FIGURE 1.1-1

RTEC Rescan

1.3 Background

Concern over the quality of country foods has increased in the past 15 years. This concern is primarily due to studies showing concentrations of persistent organic pollutants (POPs), heavy metals, and radionuclides in tissues of wildlife in undeveloped areas across northern Canada and the Arctic. POPs are human-generated chemicals, whereas radionuclides and metals are natural chemicals in the environment. Regardless of the chemical's source, there is concern that humans who harvest country foods may be exposed to contaminant concentrations that are not safe. In response to these concerns, in 1991, Indian and Northern Affairs Canada (INAC) developed the Northern Contaminants Program (NCP). Since 1991, the federal government agencies (*i.e.*, INAC and Health Canada) have been funding NCP studies to determine the levels, geographic extent and source of contaminants in the north. More recently, research has included evaluating the health benefits and risks of consuming country foods. One of the main objectives of these studies is to provide information to assists individuals and communities in making informed decisions about their food use (INAC, 2006).

Like many First Nations communities across Canada, the Tahltan Band Council and Iskut First Nations are concerned about the quality of country foods. These two groups are particularly concerned because of mining exploration and proposed developments within their traditional harvesting areas. In 2004, the Tahltan and Iskut First Nations developed a "Tahltan Environmental Contaminants Project" funded by Health Canada (Jackson, 2006 *unpublished data*). Part of the project involved a traditional foods survey to determine the amounts and frequencies of country foods consumed by the Tahltan. Dr. Andrew Jin (MD, MHSc) was contracted to work with the Tahltan Band Council to design the study and interpret its results. The overall conclusion of the report prepared by Dr. Jin was that "the Tahltan people still consume a wide variety of locally obtained wild animals and plants, that consumption is highly prevalent in the population and the amounts consumed are significant" (Jin, 2006 *unpublished*). The most frequently consumed country food identified in the survey was moose.

Populations of moose in the Yukon, Northwest Territories, Ontario, Quebec, Newfoundland and British Columbia have been shown to have naturally occurring elevated levels of metals (particularly cadmium and selenium) in their livers and kidneys (Gamberg *et al*., 2005). There are liver and kidney consumption advisories in most of these areas. The advisories limit consumption or recommend not consuming the organs at all (Gamberg, 2006 *unpublished*; Yukon Environment, 2005; Addison, 2001; Jin and Joseph-Quinn, 2003).

Because metals are present in plant and animal tissue and may be elevated even in undeveloped areas, it is important to identify what the levels are prior to project development. This is particularly important for the Project as it is a base metals mine, and therefore, the primary contaminants of potential concern will be metals. In addition, many of the country foods listed in the traditional foods survey are likely harvested from the Project area.

1.4 Study Area and Land Use

The study area for the country foods baseline assessment includes the proposed mine site and the proposed haul route south along Mess Creek and east to Highway 37. This study area falls within the Cassiar Iskut-Stikine LRMP. The study area is also the asserted traditional territory of the Tahltan. Figure 1.3-1 presents the study area. The closest communities to the study area are Telegraph Creek, Iskut, and Dease Lake. There is one year-round resident within the Project area, with a residence on the southeast shore of Mess Lake.

Current land use activities within the study area include:

- wilderness-based tourism and recreation;
- hunting, fishing, trapping and guide-outfitting; and
- mineral exploration.

1.5 Country Foods Harvesters

People that harvest country foods from study area include:

- local residents (*i.e.*, people living in Telegraph Creek, Iskut, Dease Lake), including both First Nations and non-First Nations; and
- residents from other communities in BC who travel to the study area during hunting season (*i.e.*, people residing in Kitimat, Smithers, *etc*.).

Guide outfitting clients are primarily from the United States and some from Europe (Germany, Austria, and Switzerland).

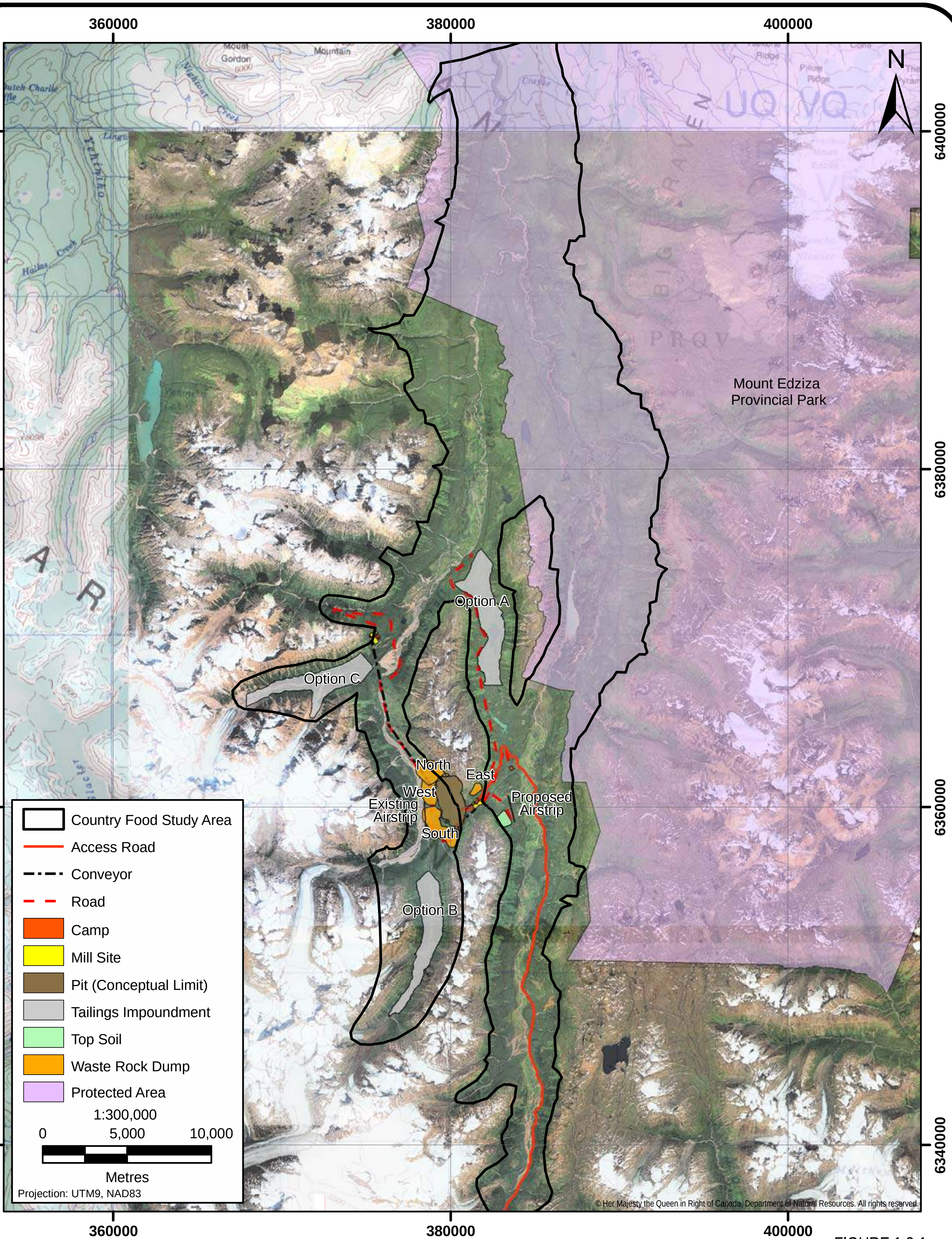

FIGURE 1.3-1

Schaft Creek Project
Country Foods Study Area

2. METHODOLOGY

2. Methodology

This country foods baseline assessment will likely be a Health Canada requirement for the EA Application. As such, the methodology for the assessment was based on Health Canada's *Canadian Handbook on Health Impact Assessment*, Chapter 8: Food Issues in Environment Impact Assessment (Health Canada, 2004a).

The country foods assessment was divided into the following five stages:

1. **Problem Formulation:** The conceptual model for conducting the country foods assessment was developed. This included the identification of the country foods, contaminants of potential concern (COPCs) and human receptors.
2. **Exposure Assessment:** The extent to which human receptors might be exposed to the COPCs was assessed. This included identifying the receptor specific characteristics (*i.e.*, consumption amounts and consumption frequencies) and calculating the estimated daily intakes (EDI).
3. **Toxicity Assessment:** The tolerable daily intakes (TDIs)—levels of daily exposure that can be taken into the body without appreciable health risk—were identified.
4. **Risk Characterization:** The exposure and effects assessments were integrated to produce quantitative risk estimates and Recommended Maximum Weekly Intake (RMWIs).
5. **Uncertainty Analysis:** The assumptions made throughout the assessment and their effects on the conclusions were evaluated.

The baseline assessment will be used to predict potential effects of the Project as part of the EA Application and to identify the need (if any) for future monitoring programs.

3. PROBLEM FORMULATION

3. Problem Formulation

3.1 Introduction

The purpose of the problem formulation stage was to create a conceptual model for the country foods assessment. This entailed identifying the country foods, COPCs, and human receptors to evaluate.

3.2 Country Foods Selected for Evaluation

3.2.1 Country Foods Interviews

The primary objectives of country foods interviews are to identify:

- who collects the country foods in the Project area;
- which country foods are currently collected in the Project area (*i.e.*, road route and mine site);
- how the country foods are used (*i.e.*, food, medicine, or both);
- what part of the country food is used;
- what quantities of the country foods are used; and
- how frequently the country foods are consumed.

Based on previous interviews conducted by Rescan personnel and trained sub-contractors, it is extremely difficult for country foods harvesters to identify the amount of country foods that they consume from a specific location. Rather, consumption patterns from foods collected from within an entire harvesting area are reported. In Rescan's experience, a harvesting area is much larger than a project area. Subsequently, country foods interviews specific to the Project area were not conducted. Consumption patterns were based on previous interviews completed by Rescan (2006, *unpublished data*) and Jin (2006, *unpublished data*).

Dr. Jin was contracted by the Tahltan Central Council to develop, implement and analyse the data of a traditional food and medicine survey of the Tahltan people in Dease Lake, Telegraph Creek and Iskut. Names of eligible persons to interview were randomly selected from the Band membership lists. Participation was voluntary. Persons who refused to participate were replaced by randomly selecting another person from the list. The number of people interviewed from Dease Lake, Telegraph Creek and Iskut were 40, 40, and 68 respectively. In total, 22% of the Tahltan population residing in the three communities were interviewed. Non-local individuals conducted the interviews in Telegraph Creek and Dease Lake in 2005 and two local individuals conducted the interviews in Iskut in 2006. Dr. Jin's analysis of the traditional food survey was submitted to the Tahltan Central Council in July, 2006. The Tahltan Central Council forwarded the report to Rescan in August, 2006 for incorporation into the country foods study.

Although the harvest and consumption patterns used in this assessment were based on the Tahltan traditional food survey, it is recognized that other First Nations and non-First Nations groups harvest food from the Project area. For this reason, the focus of this assessment will be on country foods harvesters in general, rather than focusing on a particular ethnic group. Although patterns of harvest and consumption were based on the Jin study, these patterns are likely conservative with respect to consumption from all country harvesters in the area, whether they are First Nations or non-First Nations harvesters.

The following three sections present a summary of the species currently collected by country foods harvesters. In addition, the amounts and frequencies of consumption of the most frequently consumed country foods are presented.

3.2.1.1 Wildlife Species

Nine mammal species and three bird genera are consumed by the country foods harvesters (Table 3.2-1). The muscle tissue is the most frequently consumed part of the animals. Liver and kidney of moose are also consumed on an infrequent basis. Moose are the most frequently consumed mammal with an average serving size of 213 g at a frequency of 364 times per year (95% upper confidence limit of the mean). The most frequently consumed small mammal is snowshoe hair, with an average serving size of 348 g at a maximum frequency of 18 times per year. Grouse are the most frequently consumed bird species, with an average serving size of 299 g at a maximum frequency of 40 times per year.

Table 3.2-1
Wildlife Species Consumed by the Country Foods Harvesters

			Muscle Tissue	
Latin Name	**Common Name**	**Purpose**	**Mean Serving Size (grams)**	**Maximum Consumption Frequency (times per year)**
Alces alces	Moose	Food	213	364
Rangifer tarandus caribou	Caribou	Food	235	52
Oreamnos americanus	Goat	Food	22	8
Castor canadensis	Beaver	Food	241	10
Ursus americanus	Black bear	Food	160	6
Marmota caligata	Hoary marmot/Groundhog	Food	265	5
Ovis stonei	Sheep	Food	234	13
Erethizon dorsatum	Porcupine	Food	214	1
Spermophilus parryii	Gopher (Arctic ground squirrel)	Food	265	5
Lepus americanus	Snowshoe hare	Food	348	18
Branta canadensis	Goose	Food	147	1
Phasianidae sp.	Ruffed, Spruce and Blue grouse	Food	299	40

3.2.1.2 Aquatic Species

Five types of fish are harvested by the country foods harvesters (Table 3.2-2). Salmon are the most frequently consumed, with an average serving size of 263 g at a maximum frequency of 364 times per year. However, salmon are not found within the Project area. Therefore, salmon were not selected for evaluation.

Rainbow trout (*Oncorhynchus mykiss*) was selected for evaluation because it is frequently consumed (up to 48 times per year) and is found within the waterbodies of the Project area.

Table 3.2-2
Fish Consumed by the Country Foods Harvesters

Latin Name	Common Name	Purpose	Muscle Tissue: Mean Serving Size (grams)	Muscle Tissue: Maximum Consumption Frequency (times per year)
Salmonidae sp.	Salmon	Food	263	364
Oncorhynchus mykiss/ Salvelinus malma malma	Trout (rainbow/Dolly Varden)	Food	279	48
Thymallus arcticus	Arctic grayling	Food	332	2
Lota lota	Burbot	Food	330	5
Oncorhynchus mykiss	Steelhead	Food	236	30

3.2.1.3 Plant Species

Twenty-three plant species are harvested and used for medicinal or food purposes (Table 3.2-3). The most frequently consumed plant species are blueberries, soapberries, Aleutian mugwort/caribou weed, balsam bark, Lodgepole pine and juniper. During the baseline ecosystem mapping field studies, the botanists found blueberries and soapberries within the Project area. The blueberry and soapberry plants were found producing berries in late summer, and were selected for evaluation. The average serving size of blueberry is 219 g at a frequency of 104 times per year. The average serving size of soapberry is 280 g at a frequency of 156 times per year.

3.2.2 Country Foods Selected for Evaluation

It would be unreasonable to evaluate all country foods that are harvested by the country foods harvesters. The amount of metals exposure is largely dependent on a person’s consumption patterns, Therefore, the most frequently consumed wildlife species were selected for evaluation. It is likely that these species represent the highest levels of metal intake from wildlife country foods. It is assumed that if these animals are safe for consumption, all other animals that are consumed less frequently would also be safe. Plant species were selected for evaluation based on plants that are frequently consumed by the country foods harvesters and were found and collected by the Project botanists during the baseline field studies in the Project area. Other, vegetation species may be consumed more frequently, however, they were not found in the Project area. Table 3.2-4 lists the country foods selected for evaluation.

3.3 Contaminants of Potential Concern (COPCs) Selected for Evaluation

The COPCs selected for this assessment were metals. Metals were the focus of this assessment because the Project is a base metals mine and base metals naturally occur in environmental media (*i.e.,* soil, water and plant and animal tissue). Other contaminants (*i.e.,* persistent organic pollutants and radionuclides) have been measured in environmental media under baseline conditions in various areas of the north. These contaminants are not associated with base metal mining operations. Therefore, the Project will have no effect on existing baseline concentrations of such substances and thus were not selected a COPCs for the baseline assessment.

Table 3.2-3
Plants Consumed by the Country Foods Harvesters

Latin Name	Common Name	Purpose
Artemesia	Aleutian mugwort/Caribou weed	Medicine/Food
Pinus contorta	Lodgepole pine	Medicine
Abies lasiocarpa	Sub-alpine fir	Medicine
Vaccinium sp.	Blueberry/Huckleberry	Food
Heracleum lanatum	Cowparsnip	Medicine/Food
Shepherdia Canadensis	Soopallallie	Medicine/Food
Oploplanax horridus	Devil's club	Medicine
Picea glauca	White spruce	Medicine
Fragaria virginiana	Wild strawberry	Food
Viburnum edule	Highbush cranberry	Food
Oxycoccus oxycoccus	Bog cranberry	Food
Rubus idaeus	Red raspberry	Food
Rosa acicularis	Prickly Rose	Food
Empetrum nigrum	Crowberry/Mossberry	Food
Ledum groenlandicum	Labrador tea	Food
Achilea millefolium	Yarrow	Medicine
Alnus incana	Mountain alder	Medicine
Sorbus sp.	Sitka mountain ash	Medicine
Populus tremuloides	Trembling aspen	Medicine
Prunus virginiana	Chokecherry	Food
Juniperus communis *Juniperus scopulorum*	Common juniper Creeping juniper	Medicine
Ribes hudsonianum	Northern black currant	Medicine
Amelanchier alnifolia	Stinging nettle	Food/Medicine

Table 3.2-4
Country Foods Selected for Evaluation

Category	Country Food	Part Consumed
Wildlife	Moose	muscle, kidney and liver
	Snowshoe hare	muscle
	Grouse	muscle
Fish	Rainbow trout	muscle
Plants	Blueberry	berry
	Soapberry	berry

Specific metals were selected as COPCs if they met one or more of the following criteria:

1. The maximum metal concentration in soil measured during the 2007 baseline studies exceeded the Canadian Council of Ministers of the Environment (CCME) guidelines for

residential and park land (CCME, 2006; Rescan, 2008a *(in press)* Shaft Creek Project Surficial Geology and Soils Baseline Report); and

2. The maximum metal concentration in surface water measured during the 2007 baseline studies exceeded the CCME guidelines for aquatic life (CCME, 2006; Rescan, 2008b *(in press*) Schaft Creek 2007 Aquatic Resources Baseline Report. Prepared for Copper Fox Metals Inc.).

Although chemicals were selected based on the maximum concentrations measured in soil and water, both the maximum and 95% upper confidence limit of the means (UCLMs) were used in the country foods baseline assessment. Maximum values are representative of outlier concentrations and do not reflect the actual concentrations to which receptors are generally exposed, while 95% UCLMs are a more realistic representation of area-wide values.

The 95% UCLMs for soil and water were calculated using the approach and software (ProUCL 3.1) recommended by the United States Environmental Protection Agency (US EPA) (US EPA, 2004). No 95% UCLMs were calculated for metals where over 50% of the samples had concentrations below the analytical method detection limits (MDL). In the summary statistics calculations, MDLs were replaced with half the MDL. The distribution of the data was then tested. This included tests for parametric and non-parametric distributions using Lilliefors, Anderson-Darling and Kolmogorov-Smirnov test statistics. The 95% UCLM for normally distributed data was calculated using the Student's t-test. For log-normally distributed data, the 95% UCLM was calculated using the H-test (H-UCL). For data with a gamma distribution, the 95% UCLM was calculated using the approximate gamma UCLM test.

For all other data (considered non-parametric) the Chebyshev minimum variance unbiased estimate (MVUE), the Chebyshev (mean, standard deviation) UCL or the modified Students t-test (adjusted for skewness) were used to calculate the UCLMs. The use of these tests was dependent on the variation in the data set, following US EPA guidance.

The maximum and 95% UCLM concentrations for soil and surface water are summarized in Appendix A (Tables A-1 and A-2). Table 3.3-1 presents a list of the metals selected for evaluation and associated rational for inclusion.

3.4 Human Receptors Evaluated

All food consumed is comprised of a mixture of chemicals. Chemicals that occur naturally in food include essential nutrients, vitamins, and minerals that people need to stay healthy. Although these chemicals occur naturally and are required for people to stay healthy, all chemical substances will exhibit toxic effects at specific doses. Essential elements will also exhibit toxic effects at low doses (*i.e.*, deficiency). Toxic effects from chemicals are generally divided into two categories: threshold (*i.e.*, non-carcinogenic) and non-threshold (*i.e.*, carcinogenic) response chemicals. These two types of chemicals are evaluated differently (Section 6.2 and 6.3). Therefore, when selecting the human receptors to evaluate, the types of chemicals that the people may be exposed to must also be considered.

Table 3.3-1
Metals Evaluated and Rationale for Inclusion

Chemical Evaluated	Rationale for Inclusion			
	Maximum Background Soil Concentrations Exceeds CCME	95% UCLM of Background Soil Exceeds CCME	Maximum Background Water Concentrations Exceeds CCME	95% UCLM of Background Water Exceeds CCME
Aluminum	No Guideline	No Guideline	Yes	Yes
Antimony	Yes	No	No Guideline	No Guideline
Arsenic	Yes	Yes	Yes	No
Chromium	Yes	Yes	Yes	Yes
Copper	Yes	Yes	Yes	Yes
Lead	No	No	Yes	No
Mercury	No	No	Yes	No
Molybdenum	Yes	No	No	No
Nickel	Yes	Yes	No	No
Selenium	Yes	No	Yes	No
Vanadium	Yes	No	No Guideline	No Guideline
Zinc	Yes	No	Yes	No

For threshold response metals, human health was evaluated for a toddler (six months to four years of age) and an adult (greater than 19 years of age). Toddlers are most susceptible to threshold response metals due to their ratio of body size to ingestion rates relative to other life-stages (Health Canada, 2004b). If the assessment finds acceptable levels of threshold metals for the toddler life-stage, all other life-stages would also be considered safe. For non-threshold response metals, an adult receptor was evaluated as per Health Canada guidance.

3.5 Human Exposure Pathways Selected

The purpose of the exposure pathway screening process is to determine the ways (*i.e.*, eating, breathing, and skin contact) that people in the Project area may come into contact with metals. The human exposure pathway that was selected is ingestion of:

- plants that have taken up metals from the soil and water;
- fish that have taken up metals from the water and food within the water; and
- wildlife that has taken up metals through ingestion of soil, vegetation and surface water.

Although other exposure pathways are possible (such as incidental ingestion of soil and dermal contact with water), these exposure pathways were not evaluated, because the focus of this assessment is country foods.

The exposure pathways are shown in Figure 3.5-1. This figure details the source of the metal, residency media (*i.e.*, plants and animals), exposure routes and receptors. The conceptual model for this assessment is presented in Figure 3.5-2.

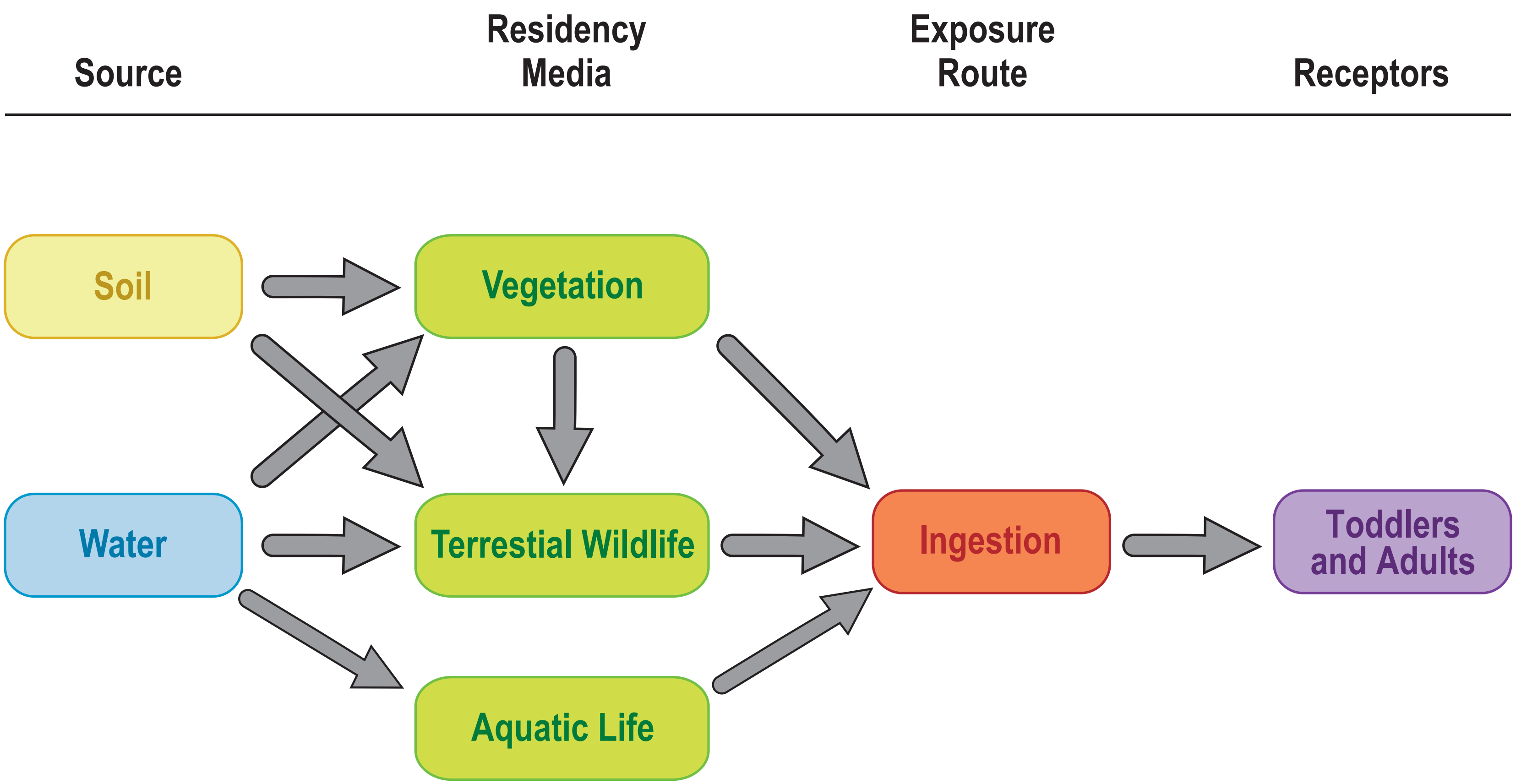

Figure 3.5-1

Human Exposure Pathways

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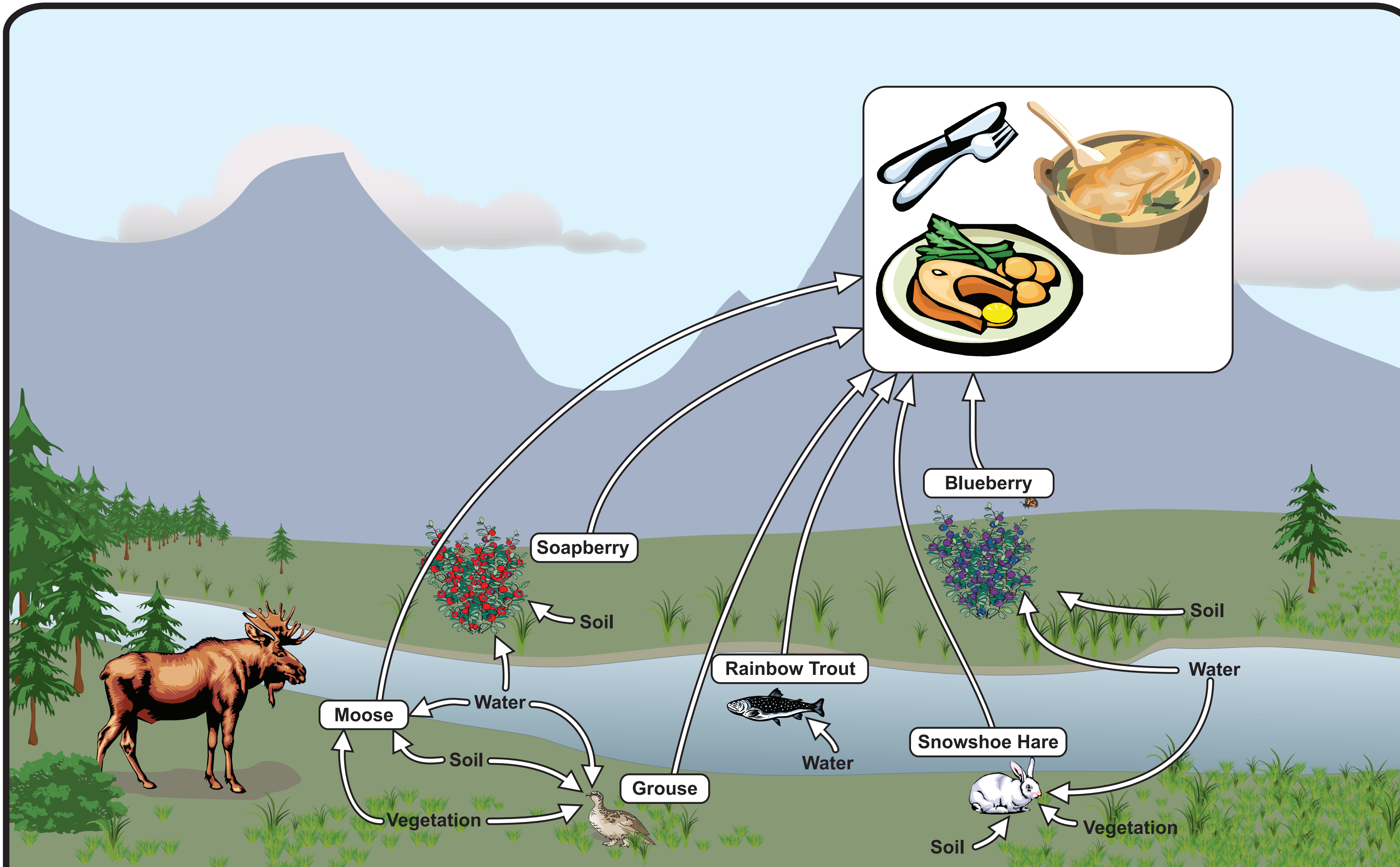

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Figure 3.5-2 Country Foods Conceptual Model

Figure 3.5-2

RTEC Keepers of the Land

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4. EXPOSURE ASSESSMENT

4. Exposure Assessment

4.1 Introduction

The amount of metals that people would be exposed to from the selected country foods was determined for the ingestion pathway. The amount of exposure depends on:

- the concentration of metals in terrestrial wildlife (moose, snowshoe hare and grouse tissue) from their ingestion of environmental media (vegetation, water and soil);
- concentration of metals in fish (rainbow trout) resulting from their uptake of metals in the water and diet;
- the concentration of metals in plants (blueberry and soapberry) resulting from their uptake of metals in soil and water; and
- human receptor characteristics (*i.e.*, consumption amount and frequency).

These parameters are included in exposure estimate equations to determine the EDI of each metal through the consumption of the selected country food. EDIs are based on the current concentrations in country foods.

4.2 Terrestrial Wildlife Tissue Concentrations

For moose, tissue concentrations from samples collected within the entire Tahltan asserted territory were used. These samples were primarily collected in conjunction with the Tahltan Wildlife Guardians and other mining proponents (Western Keltic Mines Inc. and Fortune Coal Limited). The samples included muscle, liver and kidney tissues. The tissues were analysed for metals concentrations. The raw metals data are included in Appendix B (Table B-1). The maximum concentrations of the metals of potential concern in moose tissue are presented in Table 4.2-1. No grouse or snowshoe samples were collected as the focus of the sampling program was on the most frequently consumed wildlife, which is moose. Ken Cottrell, a local trapper who lives within the Project area, verbally confirmed that if he shot grouse or trapped snowshoe hare, he would provide Rescan with samples. He noted a low abundance of snowshoe hare in the area, which he attributed to birds of prey.

Although the tissue data are indicative of the concentrations found in moose within the Tahltan asserted territory, only one sample was collected within the Project study area. Rick McLean of the Tahltan Wildlife Guardians has committed to collecting tissues from resident and non-resident hunters who harvest moose from the Project area. As of January 2008, no samples had been provided. However, it is anticipated that samples will be submitted sometime in 2008. If samples are submitted to Rescan, they will be analyzed for metals concentrations. Any additional data will be incorporated into the baseline report.

Table 4.2-1
Maximum Measured Moose Tissue Concentrations (mg/kg wet weight)

Chemical	Moose		
	Muscle (n=16)	Liver (n=7)	Kidney (n=8)
Aluminum	15.60	3.30	2.8
Antimony	0.02	0.06	0.072
Arsenic	0.03	0.15	0.029
Chromium	1.02	0.13	0.1
Copper	2.32	149.0	217
Lead	0.115	0.047	0.047
Mercury	0.0048	0.0025	0.0173
Molybdenum	0.06	1.37	1.08
Nickel	0.71	0.66	0.14
Selenium	0.10	2.23	5.17
Vanadium	0.05	0.05	0.05
Zinc	71.3	31.8	66.5

Metals concentrations in snowshoe hare and grouse were predicted using a food chain model. The model methodology and results are presented in Appendix C. Table 4.2-2 summarizers the predicted concentrations in these two animals.

Table 4.2-2
Predicted Snowshoe Hare and Grouse Tissue Concentrations (mg/kg wet weight)

Chemical	Snowshoe Hare		Grouse	
	Max	95% UCLM	Max	95% UCLM
Aluminum	1.76E+00	8.10E-01	6.82E+00	3.13E+00
Antimony	5.04E-05	5.76E-06	3.27E-03	3.70E-04
Arsenic	5.70E-03	1.79E-03	1.03E+00	3.22E-01
Chromium	1.01E-01	2.99E-02	9.60E-01	2.85E-01
Copper	3.40E+00	6.10E-01	8.19E+01	1.46E+01
Lead	1.92E-04	1.50E-04	1.49E-01	1.26E-01
Mercury	4.41E-04	9.79E-05	5.47E-04	1.12E-04
Molybdenum	2.95E-02	2.65E-03	1.49E+00	1.37E-01
Nickel	5.14E-02	1.70E-02	3.77E-03	1.23E-03
Selenium	1.38E-01	1.79E-02	4.36E-01	5.94E-02
Vanadium	1.09E-02	7.33E-03	3.72E-01	2.53E-01
Zinc	1.98E+00	9.94E-01	5.70E-02	2.72E-02

4.3 Fish Tissue Concentrations

During the 2007 field season, 46 samples of rainbow trout were collected and analysed for metals concentrations (14 from Tailings Option C Creek (alias: Jackson Creek), 9 from Skeeter Creek, 6 from Schaft Creek and 16 from Walkout Creek). The raw rainbow trout tissue concentrations are included in Appendix B (Table B-2). The maximum and 95% UCLM concentrations of the metals of potential concern are presented in Table 4.3-1.

Table 4.3-1
Rainbow Trout Tissue Concentrations (mg/kg wet weight)

Parameter	Maximum	95% UCLM
Aluminum	84.2	12.3
Antimony	0.014	0.005[1]
Arsenic	0.081	0.033
Chromium	2.76	0.56
Copper	0.85	0.60
Lead	0.042	0.012[1]
Mercury	0.244	0.063
Molybdenum	0.187	0.016[1]
Nickel	1.9	0.14[1]
Selenium	1.52	0.42[1]
Vanadium	0.55	0.07[1]
Zinc	7.83	5.46

[1]Average concentration presented. 95% UCLM was not calculated due to more than 50% of the data points being below the laboratory method detection limit.

4.4 Plant Tissue Concentrations

The raw metals data for plant tissues are included in Appendix B (Table B-3). Due to the small sample size, only the maximum concentrations were used in the exposure assessment. The maximum concentrations of the metals of potential concern, in the plants selected for evaluation, are presented in Table 4.4-1.

4.5 Human Receptor Characteristics

Receptor characteristics were based on guidance provided by Health Canada (2004b), previous country foods interviews conducted by Rescan (2006, *unpublished data*) and Jin (2006, unpublished data). The meal frequency and serving size of each country food was assumed to accurately represent the consumption pattern of people who consume the most of each country food. Data from the country foods interviews were based on adult serving size and consumption frequency. It was assumed that a toddler would eat the country foods at the same frequency as adults. The assumed toddler serving sizes were calculated as 43% of the adult serving size as per Richardson (1997). It is anticipated that this assumption overestimates the actual toddler serving sizes. The receptor characteristics assumed are presented in Table 4.5-1.

Table 4.4-1
Plant Tissue Concentrations (mg/kg wet weight)

Parameter	Maximum Blueberry (n=4)	Maximum Soapberry (n=4)
Aluminum	6.20	6.00
Antimony	0.005	0.005
Arsenic	0.005	0.005
Chromium	0.05	0.05
Copper	1.16	0.02
Lead	0.010	0.025
Mercury	0.005	0.005
Molybdenum	0.54	0.35
Nickel	0.14	0.89
Selenium	0.10	0.10
Vanadium	0.050	0.050
Zinc	1.93	3.25

Table 4.5-1
Human Receptor Characteristics

Parameter	Toddler (0.5 to 4 years old)	Adult (over 18 years old)	Data Source
Body weight (kg)	16.5	70.7	Health Canada, 2004b
Serving size (kg)	0.092	0.213	
Moose meat (muscle)	0.092	0.213	Jin, 2006
Moose meat (liver)	0.077	0.178	Jin, 2006
Moose meat kidney	0.062	0.144	Jin, 2006
Snowshoe hare (muscle)	0.150	0.348	Jin, 2006
Grouse meat (muscle)	0.129	0.299	Jin, 2006
Rainbow trout (muscle)	0.120	0.279	Jin, 2006
Blueberry (berry)	0.094	0.219	Jin, 2006
Soapberry (berry)	0.120	0.280	Jin, 2006
Frequency of consumption (days per year)			
Moose meat (muscle)	364	364	Rescan, 2006
Moose meat (liver)	7	7	Jin, 2006
Moose meat kidney	20	20	Jin, 2006
Snowshoe hare (muscle)	18	18	Jin, 2006
Grouse meat (muscle)	40	40	Jin, 2006
Rainbow trout (muscle)	48	48	Jin, 2006
Blueberry (berry)	104	104	Jin, 2006
Soapberry (berry)	156	156	Jin, 2006

As discussed in the problem formulation, the consumption patterns used in the exposure assessment are not reflective of consumption patterns from foods harvested only from the Project area, thus have been overestimated rather than underestimated.

4.6 Estimated Daily Intake

The following equation was used to estimate the exposure from country foods ingestion:

$$EDI_{food} = \frac{IR \times C_{food} \times Fd}{BW}$$

Where:
EDI_{food} = estimated daily intake of country food (in mg metal/kg body weight/day)
IR = the ingestion rate (in kg/day)
C_{food} = metal concentrations in food (in mg/kg)
Fd = fraction of daily consumption (unitless)
BW = receptor body weight (in kg)

The EDI of each metal for adult and toddler receptors are presented in Tables 4.6-1. Appendix D provides a sample calculation of the EDI of aluminum for toddlers consuming moose meat.

For this assessment, it was conservatively assumed that 100% of the country foods consumed are collected from the Project area, and that each of the metals evaluated are 100% bioavailable.

Table 4.6-1
Estimated Daily Intake of Each COPC by Human Receptors (µg/kg body weight/day)

	EDI Moose Muscle				EDI Moose Liver				EDI Moose Kidney				EDI Snowshoe Hare Muscle			
	Toddler		Adult		Toddler		Adult		Toddler		Adult		Toddler		Adult	
Parameter	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	95% UCLM EDI	Max EDI	95% UCLM EDI
Aluminum	8.64E+01	2.55E+01	4.69E+01	1.38E+01	2.94E-01	1.46E-01	1.59E-01	7.93E-02	5.76E-01	2.98E-01	3.12E-01	1.62E-01	7.89E-01	3.62E-01	4.28E-01	1.97E-01
Antimony	1.27E-01	3.98E-02	6.91E-02	2.16E-02	5.60E-03	1.25E-03	3.04E-03	6.76E-04	1.48E-02	2.98E-03	8.04E-03	1.62E-03	2.25E-05	2.58E-06	1.22E-05	1.40E-06
Arsenic	1.44E-03	3.49E-04	7.81E-04	1.90E-04	1.33E-04	2.59E-05	7.24E-05	1.41E-05	5.96E-05	1.65E-05	3.24E-05	8.93E-06	2.55E-05	8.00E-06	1.38E-05	4.34E-06
Chromium	5.65E+00	7.37E-01	3.06E+00	4.00E-01	1.16E-02	6.86E-03	6.28E-03	3.72E-03	2.06E-02	1.16E-02	1.12E-02	6.28E-03	4.51E-02	1.34E-02	2.45E-02	7.26E-03
Copper	1.28E+01	8.34E+00	6.97E+00	4.53E+00	1.33E+01	8.81E+00	7.19E+00	4.78E+00	4.46E+01	6.25E+00	2.42E+01	3.39E+00	1.52E+00	2.73E-01	8.26E-01	1.48E-01
Lead	6.37E-01	1.37E-01	3.46E-01	7.42E-02	4.18E-03	1.36E-03	2.27E-03	7.38E-04	9.66E-03	3.01E-03	5.25E-03	1.63E-03	8.58E-05	6.70E-05	4.66E-05	3.64E-05
Mercury	2.66E-02	1.31E-02	1.44E-02	7.14E-03	2.22E-04	2.17E-04	1.21E-04	1.18E-04	3.56E-03	2.19E-03	1.93E-03	1.19E-03	1.97E-04	4.38E-05	1.07E-04	2.38E-05
Molybdenum	3.04E-01	5.78E-02	1.65E-01	3.14E-02	1.22E-01	9.72E-02	6.61E-02	5.28E-02	2.22E-01	8.12E-02	1.21E-01	4.41E-02	1.32E-02	1.19E-03	7.16E-03	6.43E-04
Nickel	3.93E+00	5.05E-01	2.13E+00	2.74E-01	5.87E-02	1.22E-02	3.19E-02	6.62E-03	2.88E-02	1.62E-02	1.56E-02	8.79E-03	2.30E-02	7.60E-03	1.25E-02	4.13E-03
Selenium	5.54E-01	5.54E-01	3.00E-01	3.00E-01	1.98E-01	8.03E-02	1.08E-01	4.36E-02	1.06E+00	2.98E-01	5.77E-01	1.62E-01	6.17E-02	8.02E-03	3.35E-02	4.35E-03
Vanadium	2.77E-01	2.77E-01	1.50E-01	1.50E-01	4.45E-03	4.45E-03	2.41E-03	2.41E-03	1.03E-02	1.03E-02	5.58E-03	5.58E-03	4.87E-03	3.28E-03	2.64E-03	1.78E-03
Zinc	3.95E+02	2.93E+02	2.14E+02	1.59E+02	2.83E+00	2.21E+00	1.54E+00	1.20E+00	1.37E+01	7.94E+00	7.42E+00	4.31E+00	8.85E-01	4.45E-01	4.81E-01	2.41E-01

	EDI Grouse Muscle				EDI Rainbow Trout Muscle				EDI Blueberry		EDI Soapberry	
	Toddler		Adult		Toddler		Adult		Toddler	Adult	Toddler	Adult
Parameter	Max EDI	95% UCLM EDI	Max EDI	95% UCLM EDI	Max EDI	Average EDI	Max EDI	Average EDI	Max EDI	Max EDI	Max EDI	Max EDI
Aluminum	5.82E+00	2.67E+00	3.16E+00	1.45E+00	8.05E+01	1.18E+01	4.37E+01	6.38E+00	1.01E+01	5.47E+00	1.87E+01	1.02E+01
Antimony	2.79E-03	3.16E-04	1.52E-03	1.71E-04	1.34E-02	4.78E-03	7.27E-03	2.59E-03	8.13E-03	4.41E-03	1.56E-02	8.46E-03
Arsenic	8.76E-03	2.75E-03	4.75E-03	1.49E-03	7.75E-02	3.16E-02	4.20E-02	1.71E-02	8.13E-05	4.41E-05	1.56E-04	8.46E-05
Chromium	8.20E-01	2.43E-01	4.45E-01	1.32E-01	2.64E+00	5.36E-01	1.43E+00	2.91E-01	8.13E-02	4.41E-02	1.56E-01	8.46E-02
Copper	7.00E+01	1.25E+01	3.80E+01	6.76E+00	8.13E-01	5.74E-01	4.41E-01	3.11E-01	1.89E+00	1.02E+00	7.48E-02	4.06E-02
Lead	1.27E-01	1.08E-01	6.91E-02	5.86E-02	4.02E-02	1.15E-02	2.18E-02	6.23E-03	1.63E-02	8.83E-03	7.80E-02	4.23E-02
Mercury	4.67E-04	9.60E-05	2.54E-04	5.21E-05	2.33E-01	6.03E-02	1.27E-01	3.27E-02	8.13E-03	4.41E-03	1.56E-02	8.46E-03
Molybdenum	1.28E+00	1.17E-01	6.92E-01	6.34E-02	1.79E-01	1.53E-02	9.70E-02	8.30E-03	8.78E-01	4.77E-01	1.08E+00	5.86E-01
Nickel	3.22E-03	1.05E-03	1.75E-03	5.72E-04	1.82E+00	1.34E-01	9.86E-01	7.27E-02	2.28E-01	1.24E-01	2.78E+00	1.51E+00
Selenium	3.72E-01	5.07E-02	2.02E-01	2.75E-02	1.45E+00	4.02E-01	7.89E-01	2.18E-01	1.63E-01	8.83E-02	3.12E-01	1.69E-01
Vanadium	3.18E-01	2.16E-01	1.72E-01	1.17E-01	5.26E-01	6.69E-02	2.85E-01	3.63E-02	8.13E-02	4.41E-02	1.56E-01	8.46E-02
Zinc	4.86E-02	2.32E-02	2.64E-02	1.26E-02	7.49E+00	5.22E+00	4.06E+00	2.83E+00	3.14E+00	1.70E+00	1.01E+01	5.50E+00

5. TOXICITY ASSESSMENT

5. Toxicity Assessment

5.1 Introduction

The toxicity assessment involved identification of the potentially toxic effects of the COPCs and determination of the amount of COPCs that can be taken into the body without experiencing adverse health effects to humans.

5.2 Toxicity Reference Values

Toxicity reference values (TRVs) are safe levels below which there is minimal risk of adverse health effects. The TRVs used in the country foods assessment were obtained from Health Canada (2006 and 2004c). The TRVs were derived by Health Canada's Bureau of Chemical Safety, Chemical Health Hazard Division or were adopted by Health Canada from various other regulatory agencies such as the US EPA's Integrated Risk Information Service Database (IRIS), and the Joint Food and Agriculture Organization (FAO)/World Health Organization (WHO) Expert Committee on Food Additives and Contaminants (JECFA).

Toxicity information comes from human studies where exposures to substances (*i.e.*, through the work place, drinking water, food, *etc.*) and associated health effects have been documented.

Toxicity information also comes from animal studies, where animal dose-response information is extrapolated to humans by applying safety factors. In most cases, safety factors of 100 to 1,000 are applied to laboratory derived no observable adverse effect levels (NOAEL; the highest concentration in a toxicity test where no chronic health effects were observed or measured) to account for interspecies extrapolation and protection of the most susceptible portion of the population (*i.e.*, children and the elderly). Therefore, TRVs based on animal studies generally have large margins of safety to ensure that the toxicity or risk of a substance to people is not underestimated. Lowest observable adverse effects levels (LOAEL) from human studies have smaller safety factors because no extrapolation from animal to humans is required.

The TRVs used in this assessment are presented as TDIs. The TDI is defined as the amount of metal per unit body weight that can be taken into the body each day with no risk of adverse health effects. The TDIs used in this baseline assessment are presented in Table 5.2-1. It is noted that the US EPA uses the term reference dose (RfD) rather than TDI. The toxicity studies that the TDIs are based on and the rational for their selection are briefly summarized in the following sections.

5.2.1 Aluminum

Health Canada (2006) provides a TDI of 1000 µg/kg body weight/day for aluminum. This TDI is based on the provisional tolerable weekly intake (PTWI) of 7 mg/kg body weight recommended by the JECFA (2008). The WHO found that aluminum intake ranges from about 2 to 6 mg/day for children and 6 to 14 mg/day for teenagers and adults. However, the low total body burdens of aluminum coupled with urinary excretion suggests that only a small amount of

Table 5.2-1
Toxicity Reference Values for Metals of Potential Concern

Metal	TDI (µg/kg body weight/day)	Slope Factor $(mg/kg\ body\ weight/day)^{-1}$
Aluminum	1,000	N/A
Antimony	3	N/A
Arsenic	1	1.7
Chromium	1,500	N/A
Copper	125	N/A
Lead	3.57	N/A
Mercury	0.71	N/A
Molybdenum	33	N/A
Nickel	25	N/A
Selenium	10	N/A
Vanadium	15	N/A
Zinc	700	N/A

N/A = not applicable.

aluminum is absorbed, despite the high levels of consumption. The aluminum that is absorbed at these concentrations is located primarily in the heart, spleen, and bone but its presence in these sites was without histopathologic lesions (*i.e.*, abnormalities in the tissue).

5.2.2 Antimony

Health Canada (2006) provides a TDI of 3 µg/kg body weight/day for antimony. Health Canada does not provide a rational for the derivation of this TDI.

5.2.3 Arsenic

Health Canada (2006) provides a provisional TDI of 1 µg/kg body weight/day for oral exposures to arsenic. This value is based on recommendations by the JECFA of the WHO. This value was used to estimate non-cancer risks from arsenic.

Arsenic is the only metal in this assessment that is considered carcinogenic via the ingestion pathway. For carcinogens, slope factors are the TRVs used. A slope factor is the upper bound estimate of the probability of a response-per-unit intake of a material of concern over a lifetime. It is used to estimate an upper-bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of arsenic. Health Canada (2004c) provides an oral slope factor of 1.7 mg/kg bw/day for arsenic and was this selected for use in this assessment.

5.2.4 Chromium

Health Canada (2006) provides a TDI of 1500 µg/kg body weight/day for chromium III. This TDI is based on the IRIS RfD, which was derived from a chronic toxicity study conducted by Ivankovic and Preussman (1975; cited in IRIS, 2008). Groups of rats (12 to 19 per group) were exposed to 0, 2 or 5 percent chromic oxide in bread, five days per week for 18 weeks. Food consumption and body weight were monitored. Toxicological endpoints (measures of effect) included serum protein, urine analysis, organ weights and microscopic examination. The only effects observed were reductions (12% to 37%) in liver and spleen weights of animals in the high-dose group. The NOAEL was 1,468 mg/kg body weight/day. An uncertainty factor of 1,000 was applied to the NOAEL; 10 for interspecies extrapolation, 10 for protection of the most susceptible receptor and 10 for a lack of chronic and reproductive toxicity studies (IRIS, 2008). The TDI for chromium III was selected for use because chromium VI is generally not present in animal or plant tissue. After its absorption, hexavalent chromium is rapidly reduced to the trivalent form which is the main form found in biological material (Leonard and Lauwerys, 1980; Kerger *et al*., 1996; and Shrivastava *et al*., 2003).

5.2.5 Copper

Health Canada (2006) provides a TDI of 125 µg/kg body weight/day for copper. Health Canada does not provide a rational for the derivation of this TDI.

5.2.6 Lead

Health Canada (2006) provides a TDI of 3.6 µg/kg body weight/day for lead. This TDI is based on the provisional tolerable weekly intake (PTWI) of 0.025 mg/kg body weight recommended by the JECFA (2008). JECFA concluded that this concentration of lead found in food would have negligible effects on the neurobehavioural development of infants and children.

5.2.7 Mercury

Health Canada (2006) provides a TDI of 0.71 µg/kg body weight/day for mercury. This TDI is based on the provisional tolerable weekly intake (PTWI) of µg/kg body weight recommended by the JECFA (2008).

5.2.8 Molybdenum

Health Canada (2006) provides a TDI of 33 µg/kg body weight/day for molybdenum. This TDI is based on the Institute of Medicine's Tolerable Upper Intake Level of 2000 µg/day (Institute of Medicine, 2000). The TDI was derived by dividing the Tolerable Upper Intake Level 61 kg, which is the body weight assumed by the Institute of Medicine.

5.2.9 Nickel

A TDI of 25 µg/kg body weight/day is recommended by Health Canada (2006). This TDI for total nickel (as soluble salts) was based on a dietary study in rats that found a NOAEL of 5 mg/kg body weight/day for altered organ to body weight ratios. An uncertainty factor of 200 was applied to the NOAEL: 10 for interspecies variation and 10 to protect sensitive populations. A modifying factor of two was also applied to account for the inadequacies of the reproductive studies.

5.2.10 Selenium

Health Canada (2006) provides a TDI of 750 µg/person/day for selenium. If this number is divided by the average adult weight of 70.7 kg, the TDI is 10 µg/kg body weight/day. Health Canada does not provide a rational for the derivation of this TDI.

5.2.11 Vanadium

Health Canada (2006) provides a TDI of 15 µg/kg body weight/day for vanadium. Health Canada does not provide a rational for the derivation of this TDI.

5.2.12 Zinc

Health Canada (2006) provides a TDI of 700 µg/kg body weight/day. This value is based on the Upper Safe Level (USL) established by the Expert Group on Vitamins and Minerals (EVM) (EVM, 2003). The EVM derived the USL based on Yadrick *et al.* (1989), Fischer *et al.* (1984) Black *et al.* (1988) Cunningham *et al.* (1994) and Davis *et al.* (2000) (cited in EVM, 2003). In these studies, a LOAEL of 50 mg/day was found for both men and women exposed to zinc supplements. The primary endpoint was a reduction of copper absorption by zinc, and subsequent reduced activity of the copper-dependent enzyme (erythrocyte superoxide dismutase). The LOAEL was converted to a NOAEL by dividing it by an uncertainty factor of two to give a NOAEL of 25 mg/day, which is 0.42 mg/kg body weight/day in a 60 kg person. Thus, the USL for zinc supplements is 0.42 mg/kg body weight/day. If the maximum zinc intake of 17 mg/day (0.28 mg/kg body weight/day) from food is added to the USL the maximum total intake for zinc is equivalent to 0.7 mg/kg body weight/day.

6. RISK CHARACTERIZATION

6. Risk Characterization

6.1 Introduction

Using the results of the exposure and effects assessments, human health risks from consumption of country foods were quantified. This chapter provides the methods and results of the estimates of human health risks. In addition, the RMWIs were determined for each country food evaluated.

6.2 Estimation of Non-carcinogenic Risks

Human health risk estimates were calculated based on the following formula:

$$\text{Exposure Ratio} = \frac{\text{Estimated Exposure}}{\text{Tolerable Daily Intake}}$$

For non-carcinogenic metals, an exposure ratio (ER) of less than 0.2 represents exposure that does not pose a significant health risk to human receptors (Health Canada, 2004b). Health Canada considers an ER value of 0.2 appropriate because only one exposure pathway is evaluated and it is assumed that people are exposed to COPCs from multiple sources such as: other food groups, soil, air, water and potentially cigarettes (*i.e.,* nickel, zinc, cadmium).

ER values greater than 0.2 do not necessarily indicate that adverse health effects will occur, due to the conservatism employed in their estimation (*e.g.*, the toxicity reference values are conservative and protective of human health). Thus, an ER value of greater than 0.2 is not conclusive evidence that a health risk exists. However, it does suggest potential risk that may require a more detailed evaluation. For instance, when evaluating country foods where the country food comprises the main component of the diet (*i.e.*, moose meat) an ER of 0.2 may be over protective because exposure from other food groups would be minimal. Tables 6.2-1 presents the calculated ERs.

In general, the level of risk associated with the ERs is acceptable under all scenarios evaluated with the following exceptions:

- Based on the maximum and average concentrations for zinc, ERs were above 0.2 for a toddler and adult consuming moose muscle. The ERs ranged from 0.22 to 0.56.
- Based on the maximum concentration for copper, the ER was above 0.2 for a toddler consuming moose kidney. The ER was 0.36.
- Based on the maximum concentration for mercury, the ER was above 0.2 for a toddler consuming rainbow trout. The ER was 0.33.

A detailed evaluation of these potential risks are discussed in the following two sections.

Table 6.2-1
Exposure Ratios for Human Receptors

	ER Moose Muscle				ER Moose Liver				ER Moose Kidney			
	Toddler		Adult		Toddler		Adult		Toddler		Adult	
Parameter	Max ER	Average ER	Max ER	Average ER	Max ER	Average ER	Max ER	Average ER	Max ER	Average ER	Max ER	Average ER
Aluminum	8.64E-02	2.55E-02	4.69E-02	1.38E-02	2.94E-04	1.46E-04	1.59E-04	7.93E-05	5.76E-04	2.98E-04	3.12E-04	1.62E-04
Antimony	4.24E-02	1.33E-02	2.30E-02	7.20E-03	1.87E-03	4.15E-04	1.01E-03	2.25E-04	4.94E-03	9.94E-04	2.68E-03	5.39E-04
Arsenic	1.44E-03	3.49E-04	7.81E-04	1.90E-04	1.33E-04	2.59E-05	7.24E-05	1.41E-05	5.96E-05	1.65E-05	3.24E-05	8.93E-06
Chromium	3.76E-03	4.91E-04	2.04E-03	2.67E-04	7.71E-06	4.58E-06	4.18E-06	2.48E-06	1.37E-05	7.71E-06	7.44E-06	4.19E-06
Copper	1.03E-01	6.67E-02	5.58E-02	3.62E-02	1.06E-01	7.05E-02	5.76E-02	3.82E-02	3.57E-01	5.00E-02	1.94E-01	2.71E-02
Lead	1.78E-01	3.83E-02	9.68E-02	2.08E-02	1.17E-03	3.81E-04	6.36E-04	2.07E-04	2.71E-03	8.42E-04	1.47E-03	4.57E-04
Mercury	3.74E-02	1.85E-02	2.03E-02	1.01E-02	3.13E-04	3.06E-04	1.70E-04	1.66E-04	5.01E-03	3.08E-03	2.72E-03	1.67E-03
Molybdenum	9.23E-03	1.75E-03	5.01E-03	9.50E-04	3.69E-03	2.95E-03	2.00E-03	1.60E-03	6.73E-03	2.46E-03	3.65E-03	1.34E-03
Nickel	1.19E-01	1.53E-02	6.46E-02	8.31E-03	1.78E-03	3.70E-04	9.66E-04	2.01E-04	8.72E-04	4.91E-04	4.73E-04	2.66E-04
Selenium	5.54E-02	5.54E-02	3.00E-02	3.00E-02	1.98E-02	8.03E-03	1.08E-02	4.36E-03	1.06E-01	2.98E-02	5.77E-02	1.62E-02
Vanadium	1.85E-02	1.85E-02	1.00E-02	1.00E-02	2.97E-04	2.97E-04	1.61E-04	1.61E-04	6.85E-04	6.85E-04	3.72E-04	3.72E-04
Zinc	5.64E-01	4.19E-01	3.06E-01	2.27E-01	4.04E-03	3.15E-03	2.19E-03	1.71E-03	1.95E-02	1.13E-02	1.06E-02	6.16E-03

	ER Rainbow Trout Muscle				ER Blueberry		ER Soapberry	
	Toddler		Adult		Toddler	Adult	Toddler	Adult
Parameter	Max ER	Average ER	Max ER	Average ER	Max EDI	Max EDI	Max EDI	Max EDI
Aluminum	8.05E-02	1.18E-02	4.37E-02	6.38E-03	1.01E-02	5.47E-03	1.87E-02	1.02E-02
Antimony	4.46E-03	1.59E-03	2.42E-03	8.65E-04	2.71E-03	1.47E-03	5.20E-03	2.82E-03
Arsenic	7.75E-02	3.16E-02	4.20E-02	1.71E-02	8.13E-05	4.41E-05	1.56E-04	8.46E-05
Chromium	1.76E-03	3.57E-04	9.55E-04	1.94E-04	5.42E-05	2.94E-05	1.04E-04	5.64E-05
Copper	6.50E-03	4.59E-03	3.53E-03	2.49E-03	1.51E-02	8.19E-03	5.99E-04	3.25E-04
Lead	1.13E-02	3.21E-03	6.11E-03	1.74E-03	4.56E-03	2.47E-03	2.18E-02	1.19E-02
Mercury	3.29E-01	8.49E-02	1.78E-01	4.60E-02	1.15E-02	6.22E-03	2.20E-02	1.19E-02
Molybdenum	5.42E-03	4.64E-04	2.94E-03	2.52E-04	2.66E-02	1.44E-02	3.27E-02	1.77E-02
Nickel	7.27E-02	5.36E-03	3.94E-02	2.91E-03	6.90E-03	3.74E-03	8.41E-02	4.57E-02
Selenium	1.45E-01	4.02E-02	7.89E-02	2.18E-02	1.63E-02	8.83E-03	3.12E-02	1.69E-02
Vanadium	3.51E-02	4.46E-03	1.90E-02	2.42E-03	5.42E-03	2.94E-03	1.04E-02	5.64E-03
Zinc	1.07E-02	7.46E-03	5.80E-03	4.05E-03	4.48E-03	2.43E-03	1.45E-02	7.86E-03

6.2.1 Zinc

The moose tissue concentrations for zinc are within the high range of concentrations measured in moose tissue from other regions (Gamberg *et al.*, 2005, Gamberg 2006, *unpublished data*). Because the zinc levels are within the range of baseline concentrations measured in other areas, they are not considered elevated in this data set. The primary reason that ERs were above 0.2 for zinc was due to the moose consumption frequencies, reported in the country foods interviews (*i.e.*, some people eat moose 364 days per year). Red meat is a known source of zinc; therefore, it is not surprising that a person who eats red meat every day is consuming larger amounts of zinc.

This level of zinc intake is not considered a health risk. As discussed previously, Health Canada sets the acceptable ER at 0.2 rather than 1 in order to account for chemical exposures other than those from the site. However, under the current exposure scenario it is assumed that all meat is coming from the site. Under this scenario, (*i.e.*, people eat moose 364 days per year from the site) the main source of zinc is coming from moose rather than from other sources. As such, for the moose consumption scenario, using an ER of 0.2 is likely overly conservative. The maximum ER was 0.56, which is within the acceptable ER limit (<1.0) if the provincial risk assessment guidance was followed.

Furthermore, the maximum adult daily intake of zinc, predicted in the exposure assessment, is slightly higher than that of a multivitamin (17 mg vs. 15 mg). Thus, a person consuming moose everyday is not at risk from elevated exposure to zinc. However, a person eating moose everyday and taking a multivitamin may exhibit signs of copper deficiency as elevated zinc in the diet has been shown to inhibit copper uptake. Thus, people eating moose everyday are getting sufficient amounts of zinc and do not need to take zinc enriched multi-vitamins.

6.2.2 Copper and Mercury

Exposure ratios for a toddler exposed to copper from moose kidney and mercury from rainbow trout muscle were marginally above 0.2, based on the maximum measured tissues concentrations. Exposure estimates based on the maximum measured concentrations provide a conservative and somewhat unrealistic estimate of exposure. This is because maximum tissue concentrations represent outliers in the data set. More realistic estimates of exposure are from the 95% UCLM values and/or average tissue concentrations. Exposure ratios based on the average moose kidney and fish muscle concentrations are an order of magnitude less that 0.2. Therefore, these metals are not likely causing adverse health effects in toddlers that consume moose kidney and rainbow trout.

6.3 Estimation of Cancer Risks

Carcinogenic risks were estimated as incremental lifetime cancer risk (ILCR) estimates according to the following formula:

ILCR = Estimated Lifetime Daily Exposure (mg/kg bw/day) x Cancer Potency Factor (mg/kg bw/day)$^{-1}$

For the Estimated Lifetime Daily Exposure, maximum measured arsenic concentrations in tissue were used where available. Where measured tissue concentrations were not available, the maximum predicted tissue concentrations were used. If the ILCRs are acceptable based on the maximum exposure concentrations, then all other scenarios would also be acceptable. In British Columbia an ILCR estimate that is less than 1 x 10^{-5} is normally considered acceptable. The results of the baseline ILCRs from exposure to arsenic in country foods are presented in Table 6.3-1. The calculated ILCRs are all less than 1 x 10^{-5} by at least an order of magnitude.

Table 6.3-1
Incremental Lifetime Cancer Risk for Human Receptors Exposed to Arsenic in Country Foods

Country Food	Incremental Lifetime Cancer Risk
Moose meat (muscle)	1.33 x 10^{-06}
Moose meat (liver)	1.23 x 10^{-07}
Moose meat (kidney)	5.50 x 10^{-08}
Snowshoe hare (muscle)	2.35 x 10^{-08}
Grouse meat (muscle)	8.08 x 10^{-06}
Rainbow trout (muscle)	7.15 x 10^{-07}
Blueberry (berry)	7.50 x 10^{-08}
Soapberry (berry)	1.44 x 10^{-07}

6.4 Recommended Maximum Weekly Intakes

The RMWIs were calculated as per Health Canada guidance, using the following equation:

$$RMWI = \frac{TRV \times BW \times 7}{C_{food}}$$

Where:

RMWI = recommended maximum weekly intake of food (g/week)
TRV = toxicological reference value (µg/kg body weight per day)
BW = receptor body weight (kg)
7 = days/week
Cfood = 95% UCLM metal concentration in food (µg/g)

This equation was applied to each metal and receptor scenario (Appendix E, Table E-1). The metal that had the lowest RMWI for each receptor was selected as the overall RMWI, because the lowest metal specific RMWI is the driver of potential risks. Table 6.4-2 presents the RMWIs as recommended maximum number of servings per week.

All RMWIs are greater than the current levels of consumption for all country foods evaluated. This means that the predicted levels of the metals evaluated in the foods harvested from the Project area do not pose a health risk to toddlers or adults that consume them and that the country foods harvesters can continue to consume the country foods at rates and frequencies to which they are accustomed.

Table 6.4-2
Recommended Maximum Number of Servings per Week

Country Food	Human Receptor	Recommended Maximum Number of Servings Per Week	Current Number of Servings Per Week
Moose meat (muscle)	Toddler	16.7	7.00
	Adult	30.7	7.00
Moose meat (liver)	Toddler	1.9	0.12
	Adult	3.5	0.12
Moose meat (kidney)	Toddler	7.7	0.38
	Adult	14.1	0.38
Snowshoe hare muscle	Toddler	28.3	0.06
	Adult	52.2	0.06
Grouse muscle	Toddler	0.9	0.12
	Adult	1.6	0.12
Rainbow Trout muscle	Toddler	10.8	0.13
	Adult	20.0	0.15
Blueberry (berry)	Toddler	111.9	1.29
	Adult	205.8	1.29
Soapberry (berry)	Toddler	39.2	0.02
	Adult	72.0	0.02

7. UNCERTAINTY ANALYSIS

7. Uncertainty Analysis

7.1 Introduction

The process of evaluating human health risks from exposure to environmental media involves multiple steps. Inherent in each step of the baseline assessment are uncertainties that ultimately affect the final risk estimates. Uncertainties may exist in numerous areas, including the collection of samples used to identify contaminant concentrations, laboratory analysis of samples, estimation of potential exposures and derivation of toxicity reference values. These uncertainties may result in an over- or underestimation of risk. However, for this assessment, where uncertainties existed, a conservative approach was taken, where appropriate, in order to overestimate rather than underestimate potential risks.

Some of the uncertainties have been mentioned in the preceding report sections. The following uncertainty analysis is a qualitative discussion of the significant sources of uncertainty in this assessment. There may be sources of uncertainty other than those evaluated here; however, their impact on the estimated risks and RMWIs are considered comparatively insignificant.

7.2 Contaminants of Potential Concern

The COPCs selected for this assessment were metals. Metals were the focus of this assessment because the Project is a base metals mine and base metals naturally occur in environmental media (*i.e.,* soil, water and plant and animal tissue). Other contaminants (*i.e.,* persistent organic pollutants and radionuclides) have been measured in environmental media under baseline conditions in various areas of the north. However, these contaminants are not associated with base metal mining operations. Therefore, the Project will have no effect on the levels of these contaminants, even if they currently occur at detectable concentrations within the study area. COPCs other than metals that may be associated mine operations but do not occur under baseline conditions will be evaluated as part of the EA for the Project. Subsequently, it is certain that all baseline COPCs that are relevant to the Project have been evaluated.

7.3 Tissue Concentrations

There are some uncertainties associated with the tissue concentrations used in this assessment. A description of these uncertainties is provided for wildlife and plants.

7.3.1 Moose

Only one moose tissue sample was from the Project area, the remainder of the data set was from samples collected outside of the Project area, but within the Tahltan asserted territory. Rescan has asked guide outfitters, local harvesters and the Tahltan Wildlife Guardians to submit samples from the moose that have been harvested from the Project area. If additional samples are provided to Rescan, the samples will be analysed for metals concentrations and the new data will be incorporated into this baseline report. Additional moose tissue data from the Project area would increase the certainty of this assessment.

7.3.2 Snowshoe Hare and Grouse

Concentrations in the tissue of snowshoe hare and grouse were predicted using an uptake model (Appendix C). As with all models, this model has some uncertainties associated with it. The main uncertainty was the biotransfer factors (BTFs) and bioaccumulation factors (BAFs) used. For all animal exposure routes, BTFs from soil-to-tissue were used. However, it is unlikely that the BTFs from plant-to-tissue and water-to-tissue are the same as soil-to-tissue. Notwithstanding, this method is the accepted way to model uptake of COPCs into animals when empirical data is not available or samples sizes are too small to make conclusions about population tissue concentrations.

Other uncertainties associated with the predicted animal tissue concentrations include the following:

- tissue concentrations were estimated based on a limited sample size of soil and vegetation, which may not be representative of the overall soil and vegetation concentrations over the Project area;
- diets of snowshoe hare and grouse were assumed to be comprised of the plant species collected, which were primarily leaves and stems, and may not be representative of the actual foods that these animals eat (for instance, grouse diet is comprised of berries, insects, and the needles and buds of conifer trees); and
- maximum and 95% UCLM values were used; however, the animals may not be exposed to the maximum or 95% UCLM of soil, water and vegetation all at once.

The predicted animal tissue concentrations were the largest source of uncertainty in this assessment. The best way to increase this certainty would be to collect grouse and snowshoe hare from country foods harvesters that have harvested these animals for consumption. Ken Cottrell (the local trapper) previously stated that he would provide samples if the opportunity arose. However, this winter he was employed by Copper Fox to look after the Schaft Creek Camp and subsequently he has no need to trap this winter. In addition, there is no road access to the Project area. Thus, it is unlikely that country foods harvesters are harvesting these species from this area. Therefore, it is likely that the uncertainty in the tissue concentrations for snowshoe hare and grouse will remain. The actual consumption rates and frequencies of these species (harvested from the Project area), and thus the exposure, are likely much lower than assumed in this assessment, even if the predicted tissue concentrations are higher that the actual concentrations.

7.3.3 Plants

A limited number of blueberry and soapberry samples were collected and analyzed for metals. Therefore, there is some uncertainty that the levels of metals measured are reflective of the metals concentrations throughout the entire proposed road route and mine site.

In 2007, Rescan botanists identified several soapberry plants near the camp and pit area. However, the botanists were at the site when the plants were not producing berries. Thus, no soapberry samples were collected in these two areas. There is a potential for these areas, to be effected by project activities. Thus, baseline berry data should be obtained for the pit and camp.

In addition, limited vegetation surveys were conducted along the proposed road route. If the Project is approved, the road route would likely be used by country foods harvesters for harvesting country foods. Thus, additional baseline sampling of soapberries and blueberries near the road route should also be conducted.

The sampling effort in 2008 will provide a better understanding of the quality, abundance and distribution of these two species at the mine-site, camp and along the road route. Even with collecting additional data in 2008, there will be uncertainty whether the levels of metals are reflective of those in the entire Project area. This is primarily due to the size of the Project area. Such uncertainties are associated with all environmental media sampling in projects of this size and nature. However, by conducting additional sampling in 2008, it can be shown that a considerable amount effort was given to assess the quality of berries in the project areas that may be impacted and/or may become available for harvest.

7.3.4 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) methodologies were followed during the sampling of the soil, water, and vegetation. A description of these methodologies and results can be found in Rescan, 2008 x, y, and z for soils, for water and vegetation respectively.

All persons collecting the tissue samples were trained on appropriate tissue sampling techniques. This minimized the potential for cross contamination and ensured that the samples sizes were adequate for chemical analyses. Tissue collectors were provided with all of the sterile field supplies and disinfectants required for collecting samples.

All chemistry samples were analysed by ALS Laboratory Group (Environmental Division) in Burnaby, BC. ALS is certified by the Canadian Association of Environmental Analytical Laboratories. Chain of custody forms were completed and transported with all tissue samples sent to ALS.

7.4 Locations of Country Foods Harvested

For most of the country foods assessed, it was assumed that 100% of the food consumed per year came from within the Project area. This is likely an overestimation of actual consumption, as it is improbable that 100% of the moose, grouse, snowshoe hare, rainbow trout, blueberry and soapberry that are harvested come from within the Project area. This is particularly true, given that the site is primarily only accessible by air.

7.5 Country Foods Consumption Amounts and Frequency

The consumption amount and frequency data used in this assessment came from interviews called Food Consumption Frequency Questionnaire interviews. This type of interview often leads to overestimations of actual intake (Institute for Risk Research, 1999). Therefore, it is likely that the consumption amounts and frequencies have been overestimated. Such overestimation provides conservatism in the risk evaluation and RMWIs.

This assessment does not consider seasonal differences in the way that food is prepared (it is based on fresh weight and not dried or preserved weight), nor does it consider variability in a person's diet over time.

7.6 Toxicity Reference Values

There is uncertainty associated with estimating toxicity benchmarks by extrapolating potential effects on humans from animal studies in the laboratory. Thus, for human health risk assessments, it is a standard practice to assume that people are more sensitive to the toxic effects of a substance than laboratory animals. Therefore, the toxicity benchmarks for human health are set at much lower levels than the animal benchmarks (typically 100 to 1,000 times lower). This large margin ensures that doses less than the toxicity benchmarks are safe and that minor exceedances of these benchmarks are extremely unlikely to cause adverse health effects.

The TRVs are derived for individual contaminants. However, it is recognized that within any food, multiple chemicals may be present and interactions between compounds may result in antagonism, additivity or synergism. As the scientific understanding of the effects of multiple contaminants is still in its infancy, interactions were not evaluated in this assessment.

7.7 Definition of Health

This country foods assessment is a science-based approach recommended by Health Canada. It should protect human receptors from adverse health effects from exposure to the selected metals. The country foods assessor recognizes that health is more than just physical health. For instance: social, cultural, nutritional, and economic factors also play a role in a persons overall health status. Thus, this science-based assessment does not take into account all aspects of human health. However, some of these health attributes are assessed in the social and economic baseline study (Rescan, 2008x).

8. CONCLUSIONS

8. Conclusions

This country foods assessment integrated the results of the country foods interviews, literature based country foods consumption and frequency patterns, the environmental media baseline studies and regulatory based toxicity reference values. The quality of country foods has been estimated prior to development of the Project and thus is reflective of baseline levels of metals. It also evaluated current potential health risks associated from the ingestion of baseline metals concentrations in the country foods. This baseline assessment will be used to as a benchmark for predicting potential effects of the Project on country foods as part of the EA Application. Below presents a summary of the findings of the study and presents an overview of how the results of this study will be used to evaluate potential Project related effects on the quality of country foods.

8.1 Baseline Country Foods Quality

People who harvest country foods from the Project area include: members of the Tahltan First Nations, other First Nation groups, and non-First Nations. These country foods harvesters were the human receptors evaluated in this study.

The country foods evaluated were moose (*Alces alces*), snowshoe hare (*Lepus americanus*), grouse (*Phasianidae sp*), rainbow trout (*Oncorhynchus mykiss*), blueberry (*Vaccinium ssp*.), and soapberry (*Shepherdia canadensis*).

Metals were the focus of this assessment because the Project is a base metals mine and base metals also occur in environmental media (*i.e.,* soil, water and plant and animal tissue). Twelve metals were evaluated: aluminum, antimony, arsenic, chromium, copper, lead, mercury, molybdenum, nickel, selenium, vanadium, and zinc. Concentrations of these metals have been measured in moose, rainbow trout, blueberry and soapberry. Concentrations in snowshoe hare and grouse were predicted using a food chain model recommended by Health Canada.

This study predicted no unacceptable risks to people from the consumption of moose, grouse, snowshoe hare, rainbow trout, blueberry and soapberry. Based on the measured and predicted levels of metals in these foods, the amounts currently consumed by the country foods harvesters are within the recommended maximum number of servings per week. Thus, country foods harvesters may continue to eat these country foods at a rate that they are accustomed. In addition, persons eating moose muscle daily do not need to take multi-vitamins enriched with zinc, as they are getting sufficient amounts of zinc from their diet.

8.2 Future Country Foods Quality

This baseline assessment will be used to predict potential effects of the Project on country foods as part of the EA Application. The concentration of COPCs in country foods are directly related to the concentrations in the surrounding environment (*i.e.,* in soil, water and vegetation). Therefore, the country foods effects assessment will evaluate the potential for mine related increases of COPC concentrations (particularly metals) in soil, water and vegetation and the potential for subsequent increases in country foods. The EA will also evaluate how the potential changes in tissue concentrations (if any) may affect the recommended weekly intakes presented in this baseline report.

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APPENDIX A
SOIL AND SURFACE WATER CONCENTRATIONS

Table A-1
Summary of Metals in Soil from Samples Collected in 2007

Metals	Number of Samples	CCME Residential/Parkland Guideline	Maximum Concentration	95% UCLM	% BMDL
Aluminum	53	NG	44800	20488	0
Antimony	53	20	54	6	96
Arsenic	53	12	123	39	38
Barium	53	500	395	130	0
Beryllium	53	4	3	1	40
Bismuth	53	NG	10	10	100
Cadmium	53	10	0.25	0.25	100
Calcium	53	NG	28300	12535	0
Chromium	53	64	468	139	0
Cobalt	53	50	49	24	4
Copper	53	63	16300	2870	0
Iron	53	NG	74300	51244	0
Lead	53	140	15	15	100
Lithium	53	NG	22	12	0
Magnesium	53	NG	44800	21325	0
Manganese	53	NG	4540	1149	0
Mercury	53	6.6	1.67	0.3	4
Molybdenum	53	10	71	10	53
Nickel	53	50	260	82	0
Phosphorus	53	NG	1840	862	0
Potassium	53	NG	1700	882	0
Selenium[1]	53	1	2.5	1	100
Silver	53	40	4	1	96
Strontium	53	NG	210	88	0
Thallium	53	1	0.5	0.5	100
Tin	53	50	2.5	2.5	100
Titanium	53	NS	3270	1354	0
Vanadium	53	130	181	125	0
Zinc	53	200	251	84	0

Shaded values indicate an exceedance of the CCME guideline.

All values expressed in mg/kg.

CCME = Canadian Council of Ministers of the Environment.

UCLM = upper confidence of the mean.

NG = no guidelines.

BMDL = below laboratory method detection limit.

[1] = method detection limit above standard for all samples.

Table A-2
Summary of Metals in Surface Water from Samples Collected in 2006 and 2007

	Number of Samples	CCME Aquatic Life Guideline	Maximum Concentration	95% UCLM or Average	% BMDL
Aluminum	367	0.005 - 0.10 [A]	23	2.76	0
Antimony	367	NG	0.0047	0.0002	63
Arsenic	367	0.005	0.0119	0.0017	5
Barium	367	NG	0.431	0.09	0
Beryllium	367	NG	0.0005	0.0003	100
Bismuth	367	NG	0.0005	0.0003	100
Boron	367	NG	0.085	0.011	64
Cadmium	367	$10^{\{0.86[\log(\text{hardness})] - 3.2\}}$	0.000267	0.000026	61
Calcium	367	NG	55.3	26.5	0
Chromium	367	0.001 [B]	0.027	0.0022	55
Cobalt	367	NG	0.014	0.002	48
Copper	367	0.002-0.004 [C]	0.0829	0.008	1
Iron	367	0.3	24.3	2.515	7
Lead	367	0.001-0.007 [D]	0.0067	0.0004	52
Lithium	367	NG	0.015	0.0029	91
Magnesium	367	NG	56.6	8.76	0
Manganese	367	NG	0.931	0.10	0
Mercury	367	0.000026 [E]	0.00048	0.00001	93
Molybdenum	367	0.073	0.0512	0.004	1
Nickel	367	0.025-0.15 [F]	0.029	0.0027	50
Phosphorus	367	NG	1.69	0.18	94
Potassium	367	NG	4.75	1.09	8
Selenium	367	0.001	0.0059	0.0005	64
Silver	367	0.0001	0.000135	0.00001	83
Sodium	367	NG	10.5	2.21	63
Strontium	367	NG	0.314	0.13	0
Thallium	367	0.0008	0.00010	0.0001	100
Tin	367	NG	0.00287	0.0001	88
Titanium	367	NG	1.1	0.06	65
Vanadium	367	NG	0.067	0.0039	65
Zinc	367	0.03	0.134	0.005	56

Shaded values indicate an exceedance of the CCME guideline.

All values expressed in mg/L.

CCME = Canadian Council of Ministers of the Environment.

UCLM = upper confidence of the mean.

NG = no guidelines.

UCLM = upper confidence of the mean.

BMDL = below laboratory method detection limit.

A = CCME aluminum guideline = 0.1 mg/L at pH ≥ 6.5; [Ca^{2+}] ≥ 4 mg/L; DOC ≥ 2 mg/L.
Guideline =0.005 mg/L at pH<6.5; [Ca^{2+}] <4 mg/L; DOC<2 mg/L.

B = CCME chromium guideline = 0.001 mg/L (Cr VI), or 0.0089 (Cr III) which is interim.

C = CCME guideline for copper = 0.002 mg/L at 0-120 mg/L [$CaCO_3$], 0.003mg/L at 120 - 180 mg/L [$CaCO_3$], 0.004 mg/L at > 180 mg/L [$CaCO_3$].

D = CCME guideline for lead = 0.001 mg/L for [$CaCO_3$]=0-60 mg/L, 0.002 mg/L for [$CaCO_3$]=60-120 mg/L, 0.004 mg/L for [$CaCO_3$]=120-180 mg/L, 0.007 mg/L for [$CaCO_3$] >180 mg/L.

E = 0.000026 mg/L inorganic Hg, 0.000004 mg/L MeHg

F = CCME guideline for nickel = 0.025 mg/L at 0-60 mg/L [$CaCO_3$], 0.065mg/L at 60 - 120 mg/L [$CaCO_3$], 0.110 mg/L at 120 - 180 mg/L [$CaCO_3$], 0.150 mg/L at > 180 mg/L [$CaCO_3$].

APPENDIX B
MEASURED METALS CONCENTRATIONS IN MOOSE, RAINBOW TROUT AND VEGETATION SAMPLES

Rescan™

Table B-1
Summary of Metals Concentrations in Moose Tissue

Sample ID		MOOSE MUSCLE	MOOSE-M-4	Klap-M1	Klap-M2	Klap-M3	MOOSE-M-3	MOOSE-M-2	MOOSE- A1-M	MOOSE- 1-M	MOOSE- S1-M
Date Sampled		18-AUG-07	23-SEP-07	5/28/2006	7/27/2006	7/27/2006	10-SEP-07	30-SEP-07	9/13/2006	9/27/2006	9/27/2006
ALS Sample ID		L544403-1	L572768-1	1	1	2	L572764-3	L572764-5	2	8	11
Nature		Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
Moisture	%	75.2	74.7	76.4	73.6	73.6	75.1	68	71.0	71.2	72.6
Total Metals											
Aluminum	T-Al	3.60	2.4	<4.0	8.30	<2.0	2.3	3	11.10	15.60	<3.0
Antimony	T-Sb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010
Arsenic	T-As	<0.010	<0.010	<0.010	<0.010	<0.010	0.026	<0.010	<0.010	<0.010	<0.010
Barium	T-Ba	0.10	0.03	0.51	0.17	0.02	<0.020	0.264	0.45	0.20	0.03
Beryllium	T-Be	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth	T-Bi	<0.030	<0.030	<0.10	<0.10	<0.10	<0.030	<0.030	<0.10	<0.10	<0.10
Cadmium	T-Cd	<0.0050	0.0088	<0.0050	0.04	0.01	0.0062	0.0173	0.04	0.02	0.04
Calcium	T-Ca	34.30	43.6	347.00	61.40	35.20	32.3	452	266.00	55.00	43.90
Chromium	T-Cr	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	1.02	0.11	0.13	<0.10
Cobalt	T-Co	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Copper	T-Cu	0.97	1.57	1.42	1.23	1.52	1.63	2.32	1.21	1.96	1.42
Lead	T-Pb	26.60	33.1	47.30	39.70	47.80	25.5	38.4			
Lithium	T-Li	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.030	<0.020	<0.020	0.09
Magnesium	T-Mg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese	T-Mn	209.00	326	206.00	226.00	260.00	253	258	270.00	249.00	261.00
Mercury	T-Hg	0.26	0.176	0.14	0.29	0.17	0.116	0.335	0.59	0.53	0.40
Molybdenum	T-Mo	<0.0010	0.0048	<0.0050	<0.0050	<0.0050	0.0039	0.0016	<0.0050	<0.0050	<0.0050
Nickel	T-Ni	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	0.055	0.01	<0.010	<0.010
Selenium	T-Se	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.71	<0.10	<0.10	<0.10
Strontium	T-Sr	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Thallium	T-Tl	0.08	0.048	0.37	0.15	0.02	0.022	0.376	0.25	0.12	0.03
Tin	T-Sn	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	T-U	<2.0	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Vanadium	T-V	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc	T-Zn	55.80	55.1	44.90	47.20	38.90	58.4	58.2	71.30	59.50	55.90

Metals results expressed as milligrams per wet kilogram except where noted.

< = Less than the detection limit indicated.

(continued)

Table B-1
Summary of Metals Concentrations in Moose Tissue (continued)

Sample ID	JBM 01 M	JBM 02 M	M-R21-M	M-R5-M	M-K4-M	MOOSE-L-3	MOOSE- S1-L	JBM 01 L	JBM 02 L	JBM 03 L	M-R4-L
Date Sampled						10-SEP-07	9/27/2006				
ALS Sample ID	1	3	L526821-1	L526821-7	L526821-5	L572764-4	12	2	4	5.00	L526821-6
Nature	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
Moisture %	75.1	74.3	76.1	73.8	72.2	70.5	70.0	71.7	71.0	72.8	74.2
Total Metals											
Aluminum T-Al	11.30	4.90	<2.0	<2.0	2.40	<2.0	<4.0	<2.0	3.30	2.20	<2.0
Antimony T-Sb	<0.010	<0.010	<0.010	0.01	0.02	<0.010	<0.010	<0.010	0.01	0.06	<0.010
Arsenic T-As	<0.010	<0.010	<0.010	<0.010	<0.010	0.15	<0.010	<0.010	<0.010	0.03	<0.010
Barium T-Ba	0.63	0.06	0.03	0.04	0.06	<0.040	0.09	0.07	0.16	0.09	0.10
Beryllium T-Be	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth T-Bi	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.030
Cadmium T-Cd	0.18	0.02	0.02	0.04	0.47	1.93	6.39	4.86	5.79	6.29	1.38
Calcium T-Ca	765.00	53.80	43.40	40.20	48.40	59.5	47.90	46.50	58.70	42.30	56.10
Chromium T-Cr	0.17	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0.10	<0.10	0.13
Cobalt T-Co	<0.020	<0.020	<0.020	<0.020	<0.020	0.097	0.11	0.09	0.13	0.16	0.10
Copper T-Cu	1.33	1.07	2.15	1.49	1.06	51.3	131.00	54.60	133.00	103.00	71.10
Lead T-Pb						69.6					
Lithium T-Li	0.12	<0.020	<0.020	0.04	<0.020	<0.020	<0.020	<0.020	<0.020	0.05	<0.020
Magnesium T-Mg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese T-Mn	233.00	271.00	263.00	229.00	207.00	231	189.00	181.00	189.00	184.00	146.00
Mercury T-Hg	1.71	0.25	0.29	0.22	0.27	4.42	2.35	4.73	4.26	3.85	3.47
Molybdenum T-Mo	<0.0050	<0.0050	0.00	<0.0010	<0.0010	0.0021	<0.0050	<0.0050	<0.0050	<0.0050	0.00
Nickel T-Ni	0.01	<0.010	0.01	<0.010	0.01	1.37	1.17	0.82	0.97	1.32	1.05
Selenium T-Se	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.66
Strontium T-Sr	<0.20	<0.20	<0.20	<0.20	<0.20	0.82	2.23	0.23	0.93	0.77	0.49
Thallium T-Tl	0.86	0.06	0.03	0.03	0.05	0.04	0.04	0.08	0.06	0.05	0.05
Tin T-Sn	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium T-U	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Vanadium T-V	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc T-Zn	58.80	61.10	51.30	50.10	43.20	31.8	24.40	26.50	29.30	23.60	18.10

Metals results expressed as milligrams per wet kilogram except where noted.

< = Less than the detection limit indicated.

(continued)

Table B-1
Summary of Metals Concentrations in Moose Tissue (completed)

Sample ID		M-R21-L	MOOSE- S1-K	JBM 03 K	JBM 04 K	M-R2-K	M-R1-K	M-R6-K	M-R7-K	MOOSE-M-1	MOOSE-K-1
Date Sampled			9/27/2006							24-SEP-07	24-SEP-07
ALS Sample ID		L526821-2	13	6	7	L526821-3	L526821-4	L526821-8	L526821-9	L572764-1	L572764-2
Nature		Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
Moisture	%	55.5	77.0	71.4	70.6	79.1	80.6	67.2	78.4	74	63.7
Total Metals											
Aluminum	T-Al	<2.0	<3.0	2.80	<2.0	2.30	<2.0	<2.0	<2.0	2.3	<2.0
Antimony	T-Sb	<0.010	<0.010	0.07	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010
Arsenic	T-As	<0.010	<0.010	0.03	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Barium	T-Ba	0.08	0.10	0.10	0.10	0.15	0.21	0.13	0.25	<0.050	0.206
Beryllium	T-Be	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth	T-Bi	<0.030	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium	T-Cd	5.11	19.00	18.90	8.08	23.10	41.50	39.70	32.10	0.0231	5.11
Calcium	T-Ca	60.40	98.70	74.60	87.50	106.00	111.00	95.00	127.00	37.4	57.5
Chromium	T-Cr	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.1
Cobalt	T-Co	0.08	0.06	0.05	0.05	0.05	0.06	0.05	0.04	<0.020	0.086
Copper	T-Cu	149.00	4.00	3.91	4.36	4.19	2.69	3.13	3.79	1.76	217
Lead	T-Pb									38.1	298
Lithium	T-Li	<0.020	<0.020	0.05	<0.020	<0.020	<0.020	<0.020	<0.020	<0.030	<0.020
Magnesium	T-Mg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese	T-Mn	152.00	178.00	151.00	172.00	165.00	166.00	129.00	165.00	274	176
Mercury	T-Hg	2.69	2.34	3.63	3.72	3.59	0.82	1.79	4.03	0.249	1.87
Molybdenum	T-Mo	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.0038	0.0073
Nickel	T-Ni	0.95	0.40	0.33	0.27	0.19	0.24	0.21	0.44	<0.010	1.08
Selenium	T-Se	<0.10	<0.10	0.14	0.13	0.11	<0.10	<0.10	<0.10	<0.10	<0.10
Strontium	T-Sr	0.85	0.94	0.88	0.79	0.88	0.78	0.81	1.36	<0.20	5.17
Thallium	T-Tl	0.07	0.10	0.09	0.09	0.12	0.17	0.11	0.14	0.059	0.107
Tin	T-Sn	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	T-U	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Vanadium	T-V	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc	T-Zn	19.80	29.40	26.60	29.20	36.90	38.70	39.80	42.00	37.8	66.5

Metals results expressed as milligrams per wet kilogram except where noted.

< = Less than the detection limit indicated.

Table B-2
Summary of Metals Concentrations in Rainbow Trout Muscle Tissue

Sample ID	WC-1 RB FILLET #1	WC-1 RB FILLET #2	WC-1 RB FILLET #3	WC-1 RB FILLET #4	WC-1 RB FILLET #5	WC-1 RB FILLET #6	WC-1 RB FILLET #7	WC-1 RB FILLET #8	WC-1 RB FILLET #9	WC-1 RB FILLET #10	WC-1 RB FILLET #11	WC-1 RB FILLET #12	WC-1 RB FILLET #13	WC-1 RB FILLET #14	SKC-4A RB FILLET #1	SKC-4A RB FILLET #2
ALS Sample ID	L589140-1	L589140-2	L589140-3	L589140-4	L589140-5	L589140-6	L589140-7	L589140-8	L589140-9	L589140-10	L589140-11	L589140-12	L589140-13	L589140-14	L589140-15	L589140-16
Nature	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Moisture %	77.6	80.9	76	74.8	80.9	80.1	78	74.5	83.2	78.9	77.6	75.5	80.1	77	78.5	81.5
Total Metals																
Aluminum T-Al	10.3	20.6	9.3	11.9	35.4	8.8	84.2	26.6	6.8	4.9	7.8	4.2	6.7	9.5	7.2	11.1
Antimony T-Sb	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic T-As	0.024	0.021	0.013	0.028	0.023	0.081	0.071	0.028	0.017	0.018	0.015	0.011	0.014	0.013	<0.010	0.021
Barium T-Ba	0.187	0.366	0.137	0.111	0.179	0.123	0.718	0.292	0.169	0.088	0.109	0.059	0.073	1.42	0.105	0.148
Beryllium T-Be	<0.10	<0.10	<0.10	<0.10	<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 T-Bi	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium T-Cd	0.0173	0.0156	0.0054	0.006	0.006	0.0058	0.0154	0.0065	<0.0050	<0.0050	0.0123	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium T-Ca	577	337	176	341	307	541	897	398	178	179	174	134	146	200	143	189
Chromium T-Cr	0.19	2.02	0.16	<0.10	0.5	0.18	2.76	0.33	0.21	<0.10	0.14	<0.10	0.24	0.14	0.13	0.18
Cobalt T-Co	0.033	0.071	<0.020	0.034	0.043	<0.020	0.192	0.048	0.032	<0.020	0.022	<0.020	<0.020	0.024	0.021	<0.020
Copper T-Cu	0.85	0.818	0.618	0.732	0.588	0.774	0.762	0.659	0.46	0.616	0.659	0.462	0.659	0.643	0.557	0.395
Iron (Fe)-Total	28.4	60.2	16	34.9	51.4	33.2	431	52.4	64.8	8.53	14.6	6.64	15	17.9	11.8	16.7
Lead T-Pb	0.039	<0.020	<0.020	<0.020	<0.020	<0.020	0.042	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Lithium T-Li	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium T-Mg	314	304	342	357	339	282	413	338	296	299	310	302	285	318	335	318
Manganese T-Mn	1.1	2.15	0.489	1.19	1.22	0.871	9.31	1.4	1.99	0.354	0.56	0.252	0.473	0.565	0.413	0.488
Mercury T-Hg	0.0173	0.0152	0.0099	0.0097	0.0167	0.0214	0.0125	0.0357	0.0422	0.0223	0.0158	0.0124	0.0243	0.0248	0.0273	0.0309
Molybdenum T-Mo	0.012	0.091	<0.010	<0.010	0.026	0.019	0.187	0.025	0.017	0.025	<0.010	<0.010	0.02	<0.010	<0.010	0.013
Nickel T-Ni	<0.10	1.08	<0.10	<0.10	0.27	0.11	1.9	0.2	0.13	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	0.1
Selenium T-Se	0.6	0.42	0.44	0.53	0.38	0.36	0.54	0.53	0.46	0.4	0.35	0.39	0.46	0.38	0.32	0.3
Strontium T-Sr	0.405	0.277	0.095	0.213	0.227	0.397	0.792	0.334	0.169	0.111	0.109	0.069	0.095	0.17	0.074	0.122
Thallium T-Tl	<0.010	0.013	<0.010	0.011	0.013	0.011	0.011	0.011	<0.010	0.015	<0.010	<0.010	<0.010	0.01	<0.010	<0.010
Tin T-Sn	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium T-U	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	0.0114	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium T-V	<0.10	0.13	<0.10	<0.10	0.16	<0.10	0.55	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc T-Zn	5.92	5.72	4.95	5.88	5.51	6.22	7.83	6.93	5.25	5	4.8	4.07	5.39	6.63	4.36	4.15

Metals results expressed as milligrams per wet kilogram.

(continued)

< = Less than the detection limit indicated.

Table B-2
Summary of Metals Concentrations in Rainbow Trout Muscle Tissue (continued)

Sample ID	SKC-4A RB FILLET #3	SKC-4A RB FILLET #4	SKC-4A RB FILLET #5	SKC-4A RB FILLET #7	YC-1 RB FILLET #1	YC-1 RB FILLET #2	JC-3 RB FILLET #1	JC-3 RB FILLET #2	JC-3 RB FILLET #3	JC-3 RB FILLET #4	JC-3 RB FILLET #5	JC-3 RB FILLET #6	JC-3 RB FILLET #7	JC-3 RB FILLET #8	JC-3 RB FILLET #9	JC-3 RB FILLET #10	JC-3 RB FILLET #11
ALS Sample ID	L589140-17	L589140-18	L589140-19	L589140-20	L589140-21	L589140-22	L589140-23	L589140-24	L589140-25	L589140-26	L589140-27	L589140-28	L589140-29	L589140-30	L589140-31	L589140-32	L589140-33
Nature	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Moisture %	76	81.1	79.9	84.4	80.3	82.9	75.9	80.7	78.1	81.9	77.5	79.8	77.3	77.2	77.9	79.5	77.2
Total Metals																	
Aluminum T-Al	3.1	5.1	7.8	6.8	28.6	33.3	6.3	3.3	4.7	4.6	6.2	3.3	2.3	5.4	8.9	2.2	3.2
Antimony T-Sb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic T-As	0.012	0.015	0.017	0.01	0.028	0.026	0.019	0.018	0.042	0.021	0.016	<0.010	0.025	0.051	0.03	0.02	0.017
Barium T-Ba	0.079	0.144	0.182	0.186	0.211	0.292	0.098	0.074	0.103	0.073	0.096	0.094	0.062	0.046	0.046	0.048	0.052
Beryllium T-Be	<0.10	<0.10	<0.10	<0.10	<0.10	<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 T-Bi	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium T-Cd	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium T-Ca	167	342	344	273	250	200	199	210	175	168	188	173	127	180	165	147	168
Chromium T-Cr	<0.10	<0.10	0.28	<0.10	0.5	0.29	0.12	<0.10	0.1	<0.10	0.15	<0.10	<0.10	<0.10	0.13	<0.10	<0.10
Cobalt T-Co	0.028	0.022	0.054	<0.020	0.039	0.051	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.025	<0.020	<0.020	<0.020
Copper T-Cu	0.657	0.57	0.427	0.517	0.663	0.488	0.47	0.487	0.451	0.409	0.467	0.475	0.522	0.615	0.638	0.502	0.425
Iron (Fe)-Total	6.62	7.62	11.7	7.43	33.1	52.4	10.5	6.33	7.8	8.75	8.28	8.75	3.75	7.15	10.4	5.94	5.56
Lead T-Pb	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Lithium T-Li	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium T-Mg	318	351	353	337	361	352	325	304	322	293	309	274	298	350	311	307	308
Manganese T-Mn	0.349	0.392	0.626	0.42	0.808	1.55	0.373	0.287	0.389	0.284	0.355	0.333	0.176	0.27	0.431	0.234	0.194
Mercury T-Hg	0.034	0.0268	0.0336	0.0361	0.0102	0.0085	0.0255	0.0199	0.0248	0.0313	0.0188	0.0519	0.0187	0.0357	0.0176	0.0387	0.0232
Molybdenum T-Mo	<0.010	<0.010	0.019	<0.010	0.04	0.013	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	0.011	<0.010	<0.010
Nickel T-Ni	<0.10	<0.10	0.14	<0.10	0.36	0.26	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium T-Se	0.3	0.27	0.32	0.23	0.41	0.36	0.44	0.28	0.3	0.46	<0.20	0.32	0.24	0.66	0.29	<0.20	0.27
Strontium T-Sr	0.092	0.213	0.22	0.178	0.228	0.263	0.131	0.109	0.126	0.112	0.13	0.104	0.08	0.11	0.15	0.085	0.1
Thallium T-Tl	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin T-Sn	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium T-U	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium T-V	<0.10	<0.10	<0.10	<0.10	0.12	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc T-Zn	5.77	5.6	5.32	5.89	5.52	5.18	4.44	4.79	5.79	4.68	4.19	5.98	4.88	5.88	5.86	6.11	4.16

Metals results expressed as milligrams per wet kilogram.

(continued)

< = Less than the detection limit indicated.

Table B-2
Summary of Metals Concentrations in Rainbow Trout Muscle Tissue (completed)

Sample ID	JC-3 RB FILLET #12	JC-3 RB FILLET #13	JC-3 RB FILLET #14	SKC-4 RB FILLET #1	SKC-4 RB FILLET #2	SKC-4 RB FILLET #3	SKC-4 RB FILLET #4	SKC-4 RB FILLET #5	SKC-4 RB FILLET #7	SKC-4 RB FILLET #8	SKC-4 RB FILLET #9
ALS Sample ID	L589140-34	L589140-35	L589140-36	L589140-37	L589140-38	L589140-39	L589140-40	L589140-41	L589140-42	L589140-43	L589140-44
Nature	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Moisture %	77.9	78.8	74.4	79.3	80.1	77.9	74.8	78.1	81.4	78.6	78.8
Total Metals											
Aluminum T-Al	2.6	<2.0	4	5.2	4.1	6.8	3.2	7.4	3	3	3.4
Antimony T-Sb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic T-As	0.02	0.024	0.013	0.017	0.024	<0.010	0.047	0.027	<0.010	0.013	0.019
Barium T-Ba	0.045	0.051	0.061	0.097	0.072	0.138	0.046	0.088	0.047	0.038	0.09
Beryllium T-Be	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth T-Bi	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium T-Cd	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium T-Ca	185	146	175	197	166	310	179	187	178	169	217
Chromium T-Cr	<0.10	<0.10	0.14	0.17	<0.10	0.19	<0.10	<0.10	0.11	<0.10	<0.10
Cobalt T-Co	<0.020	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	0.05	<0.020	<0.020	<0.020
Copper T-Cu	0.672	0.464	0.444	0.705	0.519	0.515	0.775	0.575	0.419	0.517	0.477
Iron (Fe)-Total	5.75	4.74	6.37	14.1	6.23	11.5	7.22	9.89	5.83	8.13	6.07
Lead T-Pb	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.032	<0.020	<0.020	<0.020
Lithium T-Li	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium T-Mg	323	288	258	336	311	301	318	352	319	317	325
Manganese T-Mn	0.207	0.187	0.217	0.293	0.266	0.463	0.242	0.383	0.261	0.184	0.358
Mercury T-Hg	0.0208	0.0184	0.0297	0.203	0.0241	0.0417	0.0251	0.0312	0.0319	0.244	0.0707
Molybdenum T-Mo	<0.010	0.011	<0.010	0.012	<0.010	0.02	<0.010	<0.010	0.012	<0.010	<0.010
Nickel T-Ni	<0.10	<0.10	<0.10	0.11	<0.10	0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium T-Se	0.63	0.36	<0.20	1.34	0.48	0.23	0.54	0.65	<0.20	1.52	0.38
Strontium T-Sr	0.109	0.089	0.099	0.089	0.094	0.188	0.101	0.111	0.089	0.065	0.105
Thallium T-Tl	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin T-Sn	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium T-U	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium T-V	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc T-Zn	4.8	4.96	4.18	4.97	5.24	4.66	5.25	5.24	4.28	4.69	4.21

Metals results expressed as milligrams per wet kilogram.

< = Less than the detection limit indicated.

Table B-3
Summary of Metals Concentrations in Vegetation (mg/kg wet weight)

Sample ID	LEDUGRD1	LEDUGRD2	LEDUGRD3	LEDUGRD4	LEDUGRD5	LEDUGRD6	PLOT046	PLOT038	PLOT043	PLOT065	PLOT079
Date Sampled	29-JUL-07	28-JUL-07	30-JUL-07	31-JUL-07	26-JUL-07	25-JUL-07	30-JUL-07	29-JUL-07	29-JUL-07	31-JUL-07	02-AUG-07
Time Sampled	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
ALS Sample ID	L539647-1	L539647-2	L539647-3	L539647-4	L539647-5	L539647-6	L539647-7	L539647-8	L539647-9	L539647-10	L539647-11
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
% Moisture	68.5	58.7	59.4	66.1	74.6	63.9	73.3	81.7	75.6	78.2	71.9
Total Metals											
Aluminum (Al)-Total	11.9	12.6	5.8	5.0	23.2	14.9	55.4	78.8	124	96.5	7.2
Antimony (Sb)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.030	<0.010	<0.010
Arsenic (As)-Total	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.030	0.014	<0.010
Barium (Ba)-Total	148	110	67.9	97.7	135	79.3	94.0	77.8	104	103	24.2
Beryllium (Be)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.30	<0.10	<0.10
Bismuth (Bi)-Total	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.060	<0.090	<0.030	<0.030
Cadmium (Cd)-Total	0.0076	<0.0050	0.0059	<0.0050	<0.0050	<0.0050	0.0236	0.013	<0.015	0.0082	0.0050
Calcium (Ca)-Total	2500	2780	2880	2270	2150	2800	2030	1130	1570	1390	1750
Chromium (Cr)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	<0.20	<0.30	0.16	<0.10
Cobalt (Co)-Total	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.060	0.045	<0.020
Copper (Cu)-Total	2.30	2.55	1.14	2.54	2.11	2.20	2.90	2.55	1.77	2.05	1.93
Iron (Fe)-Total	25.6	20.5	25.4	10.2	14.7	29.3	15.9	20.2	22.3	41.5	19.3
Lead (Pb)-Total	0.021	0.021	<0.020	<0.020	<0.020	0.027	0.031	<0.040	<0.060	0.033	<0.020
Lithium (Li)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.30	<0.10	<0.10
Manganese (Mn)-Total	318	238	230	105	374	59.7	523	634	1200	341	23.4
Mercury (Hg)-Total	<0.0010	<0.0010	0.0022	0.0022	0.0034	0.0021	0.0018	0.0012	0.0033	0.0043	0.0013
Molybdenum (Mo)-Total	0.434	0.060	1.93	0.054	0.062	0.112	1.15	0.394	0.160	0.451	0.437
Nickel (Ni)-Total	<0.10	<0.10	<0.10	<0.10	0.17	0.20	0.27	0.24	<0.30	0.43	1.04
Phosphorus (P)-Total	522	506	381	595	586	550	442	495	453	435	563
Potassium (K)-Total	2350	2140	1890	2500	2140	2140	2530	2090	2680	3090	3230
Selenium (Se)-Total	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.60	<0.20	<0.20
Sodium (Na)-Total	<20	<20	<20	<20	<20	<20	<20	21	<20	<20	<20
Strontium (Sr)-Total	6.03	9.79	3.62	3.88	1.88	12.7	1.89	0.670	3.60	0.991	3.98
Thallium (Tl)-Total	<0.010	<0.010	<0.010	<0.010	0.024	<0.010	<0.010	<0.020	<0.030	<0.010	<0.010
Tin (Sn)-Total	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.15	<0.050	<0.050
Titanium (Ti)-Total	0.63	0.73	0.27	0.22	0.31	1.02	0.30	0.81	0.48	1.49	0.31
Uranium (U)-Total	0.0026	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0060	<0.0020	<0.0020
Vanadium (V)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.30	0.12	<0.10
Zinc (Zn)-Total	9.16	12.7	12.5	12.5	9.57	10.0	8.14	12.4	5.48	5.58	4.35

(continued)

Table B-3
Summary of Metals Concentrations in Vegetation (mg/kg wet weight) (continued)

Sample ID	PLOT052	PLOT026	PLOT025	PLOT029	PIT 1- EQUIARV	PIT 2- EQUIARV	PIT 3- EQUIARV	PIT 8- EQUIARV	PIT 9- VACCMEM (BERRIES)	PIT 5- EQUIARV	PIT 7- EQUIARV
Date Sampled	30-JUL-07	28-JUL-07	28-JUL-07	28-JUL-07	28-AUG-07	28-AUG-07	28-AUG-07	29-AUG-07	29-AUG-07	29-AUG-07	29-AUG-07
Time Sampled	00:00	00:00	00:00	00:00	12:28	14:23	15:45	15:27	17:14	09:55	13:04
ALS Sample ID	L539647-12	L539647-13	L539647-14	L539647-15	L551584-1	L551584-2	L551584-3	L551584-4	L551584-5	L551584-6	L551584-7
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
% Moisture	75.6	82.3	80.0	76.5	82.6	80.3	83.9	79.3	86.4	79.2	85.4
Total Metals											
Aluminum (Al)-Total	4.9	6.0	9.2	15.7	2.8	<2.0	2.0	4.6	6.2	4.1	9.6
Antimony (Sb)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Barium (Ba)-Total	5.16	12.9	12.4	25.6	20.5	22.5	36.5	29.6	11.4	50.4	51.6
Beryllium (Be)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)-Total	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd)-Total	<0.0050	<0.0050	<0.0050	0.0067	0.0518	0.0202	0.0223	0.0102	<0.0050	0.0102	0.0479
Calcium (Ca)-Total	943	629	1480	5350	6790	8020	5100	9730	209	8860	5790
Chromium (Cr)-Total	0.39	<0.10	0.10	0.13	0.18	0.19	0.20	0.21	<0.10	0.21	0.27
Cobalt (Co)-Total	0.022	<0.020	<0.020	0.022	0.021	0.038	<0.020	0.123	<0.020	0.364	0.329
Copper (Cu)-Total	1.18	1.44	1.28	1.49	1.81	1.07	1.08	0.792	0.832	0.849	1.97
Iron (Fe)-Total	12.7	7.96	18.0	29.9	7.34	6.49	7.57	14.4	2.72	7.64	8.85
Lead (Pb)-Total	<0.020	0.025	0.035	0.076	<0.020	<0.020	<0.020	0.027	<0.020	0.044	0.071
Lithium (Li)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese (Mn)-Total	10.5	5.06	10.1	13.4	5.20	16.2	4.97	26.8	11.9	9.39	11.2
Mercury (Hg)-Total	0.0019	<0.0010	0.0016	0.0030	0.0025	0.0016	0.0026	0.0019	<0.0010	0.0012	0.0016
Molybdenum (Mo)-Total	0.312	0.346	0.218	0.419	9.76	25.3	9.16	0.363	0.210	0.502	0.803
Nickel (Ni)-Total	3.89	0.57	0.38	1.18	<0.10	0.17	0.12	<0.10	0.14	0.27	1.50
Phosphorus (P)-Total	446	453	403	627	147	212	158	155	180	245	241
Potassium (K)-Total	4710	2030	2100	5860	5400	4680	6560	5050	991	5250	3790
Selenium (Se)-Total	<0.20	<0.20	<0.20	<0.20	0.24	0.66	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na)-Total	<20	<20	31	90	<20	<20	<20	<20	<20	68	65
Strontium (Sr)-Total	2.05	0.652	2.27	6.32	38.8	26.5	39.9	58.9	0.265	41.7	57.0
Thallium (Tl)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium (Ti)-Total	0.21	0.16	0.59	0.97	0.18	0.17	0.17	0.26	<0.10	0.21	0.30
Uranium (U)-Total	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn)-Total	3.93	3.05	2.86	3.51	3.55	8.40	7.22	7.14	1.20	9.98	11.9

(continued)

Table B-3
Summary of Metals Concentrations in Vegetation (mg/kg wet weight) (continued)

Sample ID	PIT 6- EQUIARV	PIT 4- EQUIARV	PIT 9- VACCMEN (TISSUE)	TAIL A1-LEDUGRV	TAIL A2- EQUIARV	TAIL B1- EQUIARV	TAIL B2- EQUIARV	TAIL A3- EQUIARV	BB-2	BB-3	SB-3
Date Sampled	29-AUG-07	29-AUG-07	29-AUG-07	30-AUG-07	30-AUG-07	30-AUG-07	30-AUG-07	30-AUG-07	19-AUG-07	19-AUG-07	19-AUG-07
Time Sampled	11:33	08:37	17:04	08:45	09:41	14:35	15:24	11:27	00:00	00:00	00:00
ALS Sample ID	L551584-8	L551584-9	L551584-10	L551584-11	L551584-12	L551584-13	L551584-14	L551584-15	L544403-2	L544403-3	L544403-4
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
% Moisture	79.8	76.8	70.2	49.8	79.0	87.4	84.1	77.2	83.3	82.8	78.6
Total Metals											
Aluminum (Al)-Total	2.8	4.7	113	3.4	2.9	2.1	<2.0	<2.0	3.9	2.7	4.0
Antimony (Sb)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Barium (Ba)-Total	25.4	36.3	108	57.6	15.2	40.7	36.8	23.2	2.31	1.01	1.58
Beryllium (Be)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)-Total	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd)-Total	0.0120	0.0127	0.0131	<0.0050	0.0059	0.0347	0.0227	0.0285	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	6190	9320	2590	2920	4590	3770	5160	5910	248	248	402
Chromium (Cr)-Total	0.19	0.26	0.27	<0.10	0.21	0.13	0.16	0.16	<0.10	<0.10	<0.10
Cobalt (Co)-Total	0.020	0.248	0.034	<0.020	0.057	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Copper (Cu)-Total	1.41	0.836	2.38	1.67	1.18	1.18	1.04	1.31	1.15	1.16	1.04
Iron (Fe)-Total	9.03	11.6	27.5	13.1	7.36	7.53	6.86	6.80	2.74	2.24	8.68
Lead (Pb)-Total	0.047	0.063	0.097	0.033	0.039	0.033	0.029	<0.020	<0.020	<0.020	<0.020
Lithium (Li)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese (Mn)-Total	8.23	9.15	558	109	9.49	2.78	5.36	9.79	31.5	20.7	3.18
Mercury (Hg)-Total	0.0010	0.0014	0.0027	0.0011	0.0034	0.0023	0.0020	0.0024	<0.0010	<0.0010	<0.0010
Molybdenum (Mo)-Total	3.51	0.676	0.501	0.172	0.142	0.209	0.080	0.203	0.508	0.039	0.188
Nickel (Ni)-Total	0.31	0.63	0.39	<0.10	0.94	<0.10	0.24	0.28	<0.10	<0.10	0.49
Phosphorus (P)-Total	178	202	480	458	215	240	248	160	191	232	339
Potassium (K)-Total	4830	2680	1840	1690	4810	5730	5480	5180	1150	1200	2120
Selenium (Se)-Total	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.20	<0.20	<0.20	<0.20
Sodium (Na)-Total	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Strontium (Sr)-Total	42.3	26.6	2.17	4.74	9.27	27.4	8.39	14.8	0.574	0.264	0.791
Thallium (Tl)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<2.0	<2.0	<2.0
Titanium (Ti)-Total	0.24	0.40	0.97	0.16	0.11	0.13	0.11	<0.10	<0.10	<0.10	0.12
Uranium (U)-Total	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn)-Total	10.8	6.77	10.9	11.6	6.03	5.28	6.49	3.94	1.77	1.93	2.92

(continued)

Table B-3
Summary of Metals Concentrations in Vegetation (mg/kg wet weight) (completed)

Sample ID	MB-1	MB-2	SB-1	SB-2	BB-1	HB-1	GB-1	DC-1	C1	BR1
Date Sampled	19-AUG-07	19-AUG-07	19-AUG-07	19-AUG-07	19-AUG-07	18-AUG-07	19-AUG-07	19-AUG-07		
Time Sampled	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00		
ALS Sample ID	L544403-5	L544403-6	L544403-7	L544403-8	L544403-9	L544403-10	L544403-11	L544403-12	L544403-13	L544403-14
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests										
% Moisture	86.1	86.7	75.7	77.1	84.8	77.9	85.6	86.3	90.0	87.8
Total Metals										
Aluminum (Al)-Total	2.9	3.6	3.2	2.6	2.3	<2.0	3.1	3.1	2.0	4.5
Antimony (Sb)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Barium (Ba)-Total	0.627	0.862	0.895	0.975	1.23	7.61	6.33	12.3	3.59	8.21
Beryllium (Be)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)-Total	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd)-Total	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0099	<0.0050	0.0242	0.0134	0.0150
Calcium (Ca)-Total	94.0	134	242	255	177	530	588	675	314	175
Chromium (Cr)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co)-Total	<0.020	<0.020	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Copper (Cu)-Total	0.738	0.865	1.19	1.11	1.05	0.893	0.908	2.06	0.607	0.779
Iron (Fe)-Total	2.89	4.32	7.84	5.86	2.77	4.19	4.22	6.00	2.81	7.20
Lead (Pb)-Total	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.22	<0.020	<0.020
Lithium (Li)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese (Mn)-Total	4.44	5.99	3.85	2.62	34.1	4.76	4.00	10.4	1.74	3.81
Mercury (Hg)-Total	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Molybdenum (Mo)-Total	0.174	0.287	0.337	0.192	0.540	0.629	0.079	0.148	<0.010	0.023
Nickel (Ni)-Total	<0.10	<0.10	0.89	0.46	<0.10	0.26	<0.10	0.37	<0.10	<0.10
Phosphorus (P)-Total	81.6	160	393	346	189	247	454	446	200	243
Potassium (K)-Total	1020	1270	2260	2010	1120	2150	2590	3190	1930	2750
Selenium (Se)-Total	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na)-Total	<20	<20	<20	<20	<20	<20	<20	<20	333	767
Strontium (Sr)-Total	0.092	0.103	0.753	0.908	0.277	1.07	1.02	1.59	2.75	2.64
Thallium (Tl)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	<4.0	<4.0	<2.0	<2.0	<2.0	<2.0	<0.300	<4.0	<4.0	<4.0
Titanium (Ti)-Total	<0.10	0.17	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.24
Uranium (U)-Total	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn)-Total	1.02	1.41	3.25	2.36	1.61	3.97	2.12	4.24	2.55	6.51

APPENDIX C
METHODS FOR ESTIMATED METALS CONCENTRATIONS IN SNOWSHOE HARE AND GROUSE

Appendix C – Predicted Tissue Concentrations

1. Introduction

Snowshoe hare and grouse tissue concentrations were estimated based on a food chain model. The model used the established baseline concentrations in soil, vegetation and water, animal specific ingestion rates and metal specific biotransfer factors.

2. Methods

The following equation was used to predict the animal tissue concentrations:

$$C_{meat}\ (mg/kg) = C_{msoil} + C_{mveg} + C_{mwater}$$

Where:
Cmsoil = Concentration in meat from the animals exposure to metals in soil.
Cmveg = Concentration in meat from the animals exposure to metals in vegetation.
Cmwater = Concentration in meat from the animals exposure to metals in water.

The terrestrial wildlife uptake equations used to obtain the concentrations in meat from exposure to soil, vegetation and water are presented in Table C-1.

Table C-1
Terrestrial Wildlife Uptake Equations

Pathway	Equation and Equation Parameters
Soil ingestion	$C_{msoil} = BTF_{tissue\text{-}food}$ (day/kg) x C_{soil} (mg/kg) x IR_{soil} (mg/day) x fw
Vegetation ingestion	$C_{mveg} = BTF_{tissue\text{-}food}$ (day/kg) x C_{veg} (mg/kg wet weight) x IR_{veg} (mg weight/day) x fw
Water ingestion	$C_{mwater} = BTF_{tissue\text{-}food}$ (day/kg) x C_{water} (mg/L) x IR_{water} (L/day) x fw

BTF = Biotransfer Factor (day/kg).
IR = ingestion rate for snowshoe hare and grouse.
C = concentration.
fw = fraction of daily consumption (assumed 1; unitless).

2.1 Metal Concentrations in Environmental Media

Rescan conducted several field studies to determine the current metal concentrations in the soil, vegetation and water of the Project area. A summary of the data collected between 2006 and 2007 is presented in Table C-2. Maximum concentrations and 95% UCLMs were calculated using the ProUCL 3.1 software. These concentrations were used to predict the concentrations in snowshoe hare and grouse tissue.

Table C-2
Summary of Maximum and 95% UCLM Metal Concentrations in Soil, Plant Tissue and Surface Water

Metal	Maximum Soil (mg/kg)[1]	95% UCLM Soil (mg/kg)[1]	Maximum Plant Tissue (mg/kg wet weight)[2]	95% UCLM Plant Tissue (mg/kg wet weight)[2]	Maximum Surface Water (mg/L)[3]	95 % UCLM Surface Water (mg/L)[3]
Aluminum	44800	20488	124	61.36	23	2.76
Antimony	54	6[4]	0.015	0.005[4]	0.0047	0.0002[4]
Arsenic	123	39	0.015	0.006[4]	0.0119	0.0017
Chromium	468	139	0.39	0.115[4]	0.027	0.0022[4]
Copper	16300	2870	2.9	1.61	0.0829	0.008
Lead	15	15	0.12	0.03[4]	0.0067	0.0004[4]
Mercury	1.67	0.3	0.005	0.0029	0.00048	0.00001[4]
Molybdenum	71	10[4]	25.3	2.20	0.0512	0.004
Nickel	260	82	3.89	1.37	0.029	0.0027
Selenium	3	1[4]	1.2	0.14[4]	0.0059	0.0005[4]
Vanadium	181	125	0.15	0.06[4]	0.067	0.0039
Zinc	251	84	12.7	7.27	0.134	0.005[4]

1: Rescan, 2008a. Schaft Creek Project Soils Baseline Report.
2: Rescan, 2008b. Schaft Creek Vegetation Baseline Report 2007.
3: Rescan, 2008c. Schaft Creek 2007 Aquatics Resource Baseline Report
4: Average concentration used when 95% UCLM were not calculated (due to > 50% of samples less than the laboratory detection limit or not enough samples to calculate).
UCLM = upper confidence limit of the mean.

Data used from the soil sampling program included 53 soil samples collected from depths ranging from 0 to 20 cm below ground surface.

The data used from the plant tissue sampling program included 43 samples collected from the project area (Figure C-1). Table C-3 presents the vegetation species that were analysed for metals and Table B-3 in Appendix B presents the analytical results. For berry producing plants, the berries were submitted for analysis. For non-berry producing plants, the root was submitted for analysis (*i.e.* carrot and beet).

The data used from the water sampling program included 367 surface water samples collected from weekly and monthly sampling stations throughout 2006 and 2007. Since it was not practical to evaluate scenarios for each of the water sources, all water data were pooled to obtain the maximum concentration and 95% UCLM for each metal.

2.2 Terrestrial Wildlife Characteristics

Terrestrial wildlife characteristics were based on values provided in the primary literature and guidance from the Oakridge National Laboratory (ORNL, 1997). Table C-4 presents the species specific characteristics that were used to predict meat concentrations. It was assumed that grouse and snowshoe hare spend all year eating and drinking from within the Project area *(i.e.*, mine site and road route).

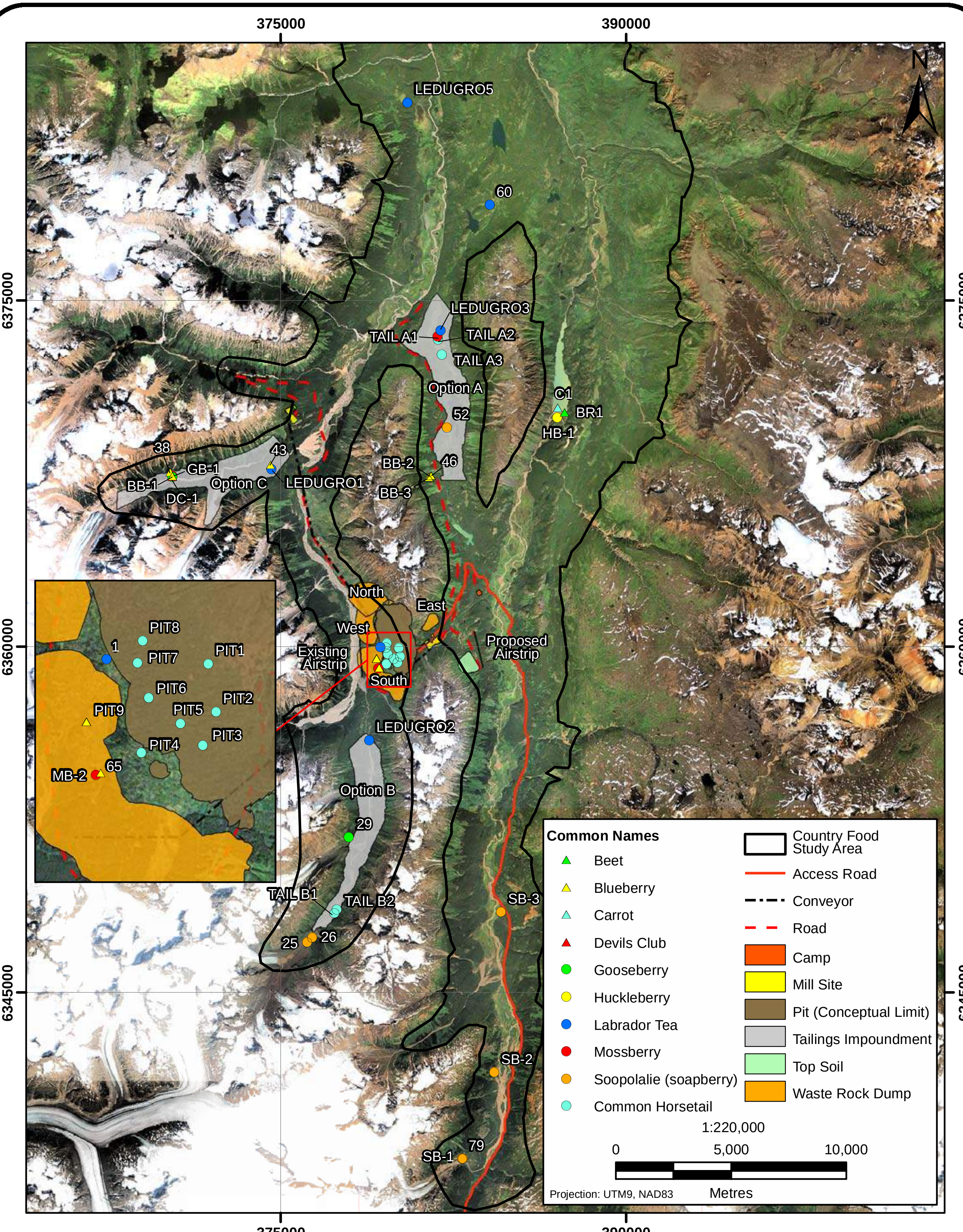

FIGURE C-1

Schaft Creek Project Country Foods Vegetation Sampling Locations

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Table C-3
Vegetation Species Collected and Analysed for Metals

Genus Species Name	Common Name
Sherpherdia canadensis	Soopolalie (soapberry)
Vaccinium ssp.	Blueberry
Vaccinium ssp.	Huckleberry
Equisetum arvense	Common Horsetail
Oplopanax horridus	Devil's Club
Ribes lacustre	Gooseberry
Empetrum nigrum	Mossberry
Ledum groenlandicum	Labrador Tea
Daucus carota	Carrot
Beta vulgaris	Beet

Table C-4
Terrestrial Wildlife Characteristics

Receptor	Body Weight (kg)[2,3]	Food Ingestion Rate (kg wet weight/day)[1]	Vegetation Ingestion Rate (kg wet weight/day)[1]	Soil Ingestion Rate (kg/day)[4]	Water Ingestion Rate (L/day)[1]	Fraction of Year at Site
Snowshoe hare	4.8	0.6	0.5	0.005	0.41	1
Grouse	1.2	0.1	0.084	0.001	0.07	1

[1] **US EPA, 1993**
[2] **ORNL, 1997**
[3] **Silva and Downing, 1995**
[4] **Beyer *et al.*, 1994**

2.3 Biotransfer Factors

The tissue uptake calculations were based on metal specific biotransfer factors (BTF). No data on snowshoe hare BTFs were available, therefore beef BTFs were used. The use of beef BTFs for wild mammals is considered to be a conservative approach (RAIS, 2007). For each of the three pathways, the metal-specific BTFs for food-to-tissue were used, because no BTFs were found for soil-to-tissue or water-to-tissue (Table C-5). This methodology is based on the document entitled *Guidance for Country Foods Surveys for the Purpose of Human Health Risk Assessment, 2005* prepared for Health Canada by Golder and Associates (2005).

The Risk Assessment Information System (RAIS, 2007) states that beef BTFs are not appropriate for use with birds. Chicken BTFs were used because BTFs for grouse were not available. The metal specific food-to-tissue chicken BTFs were used for all exposure pathways for grouse (Table C-5).

Table C-5
Biotransfer Factors Used to Predict Metal Uptake into Terrestrial Wildlife Tissue

Metal	BTF_{beef} (day/kg)[1]	$BTF_{chicken}$ (day/kg)	$BTF_{chicken}$ Reference
Aluminium	0.0015	0.014	PNNL (2003)[2]
Antimony	0.00004	0.006	PNNL (2003)
Arsenic	0.002	0.83	PNNL (2003)
Chromium	0.009	0.2	PNNL (2003)
Copper	0.009	0.5	PNNL (2003)
Lead	0.0004	0.8	PNNL (2003)
Mercury	0.01	0.03	PNNL (2003)
Molybdenum	0.001	0.18	PNNL (2003)
Nickel	0.005	0.001	PNNL (2003)
Selenium	0.1	1.13	US EPA (2005)
Vanadium	0.0025	0.2	PNNL (2003)[3]
Zinc	0.1	0.009	US EPA (2005)

1: RAIS, 2007.
2: No Avian BTF; used BTF for fluorine.
3: No Avian BTF; used BTF for chromium (because chromium and vanadium are chemically similar and compete for the same cell membrane uptake receptors).

3. Sample Calculation and Results

Table C-6 provides a sample calculation for the concentration of aluminium in grouse muscle tissue. Tables C-7 to C-9 present the estimated tissue concentrations in snowshoe hare and grouse from uptake of soil, vegetation and water. Table C-10 presents the estimated total concentration in meat tissue.

Table C-6
Sample Calculation of Grouse Meat Tissue Concentration for Aluminum

	Parameter		Parameter Value
Cmsoil = BTF x Csoil x IRsoil x fp x fw	BTF =	Biotransfer factor (day/kg)	0.0015
	Csoil =	concentration in soil (mg/kg)	66100
= 0.0015 day/kg x 66,100 mg/kg x 0.63 kg/day x 1 x 1	Cveg =	concentration in vegetation (mg/kg wet weight)	243
	Cwater =	concentration in water (mg/L)	1.55
= 62.46 mg/kg	IRsoil =	soil ingestion rate (kg/day)	0.63
	IRveg=	vegetation ingestion rate (kg wet weight/day)	30.9
	IRwater =	water ingestion rate (L/day)	25
Cmveg = BTF x Cveg x IRveg x fp x fw	fp =	fraction of the year the animal is onsite (unitless)	1.0
	fw =	fraction of daily consumption (asumed to be 1; untiless)	1
= 0.0015 day/kg x 243 mg/kg ww x 30.9 kg ww/day x 1 x 1	C_{meat} =	metal concentration in meat (mg/kg)	
= 11.26 mg/kg			
Cmwater= BTF x Cwater x IRwater x fp x fw			
= 0.0015 day/kg x 1.55 mg/L x 25 L/day x 1 x 1			
= 0.058 mg/kg			
Cmeat = Cmsoil + Cmveg + Cmwater			
= 62.46 mg/kg + 11.26 mg/kg + 0.058 mg/kg			
= 73.8 mg/kg			

Appendix C-7
Estimated Concentration in Meat from Exposure to Soil (mg/kg)

Cmsoil = BTF x Csoil x IRsoil x fp x fw

BTF = biotransfer factor (day/kg)
IRsoil = soil ingestion rate (kg/day)
Csoil = concentration in soil (mg/kg)
fp = fraction of the year the animal is onsite (unitless)
fw = fraction of daily consumption (asumed to be 1; untiless)

	Snowshoe Hare		Grouse	
Parameter	**Max Soil Concentration**	**95% UCLM Soil Concentration**	**Max Soil Concentration**	**95% UCLM Soil Concentration**
Aluminium	1.55E+00	7.07E-01	6.27E+00	2.87E+00
Antimony	4.97E-05	5.52E-06	3.24E-03	3.60E-04
Arsenic	5.66E-03	1.78E-03	1.02E+00	3.20E-01
Chromium	9.69E-02	2.88E-02	9.36E-01	2.78E-01
Copper	3.37E+00	5.94E-01	8.15E+01	1.44E+01
Lead	1.38E-04	1.38E-04	1.20E-01	1.20E-01
Mercury	3.84E-04	6.65E-05	5.01E-04	8.67E-05
Molybdenum	1.63E-03	2.30E-04	1.27E-01	1.80E-02
Nickel	2.99E-02	9.47E-03	2.60E-03	8.23E-04
Selenium	5.75E-03	2.30E-03	2.83E-02	1.13E-02
Vanadium	1.04E-02	7.17E-03	3.62E-01	2.49E-01
Zinc	5.77E-01	1.94E-01	2.26E-02	7.58E-03

Appendix C-8
Estimated Concentration in Meat from Exposure to Vegetation (mg/kg)

Cmvegetation = BTF x Cveg x IRveg x fp x fw

BTF =	biotransfer factor (day/kg)
IRveg=	vegetation ingestion rate (kg wet weight/day)
Cveg =	concentration in vegetation (mg/kg wet weight)
fp =	fraction of the year the animal is onsite (unitless)
fw =	fraction of daily consumption (asumed to be 1; untiless)

	Snowshoe Hare		Grouse	
Parameter	**Max Veg Concentration**	**Average Veg Concentration**	**Max Veg Concentration**	**Average Veg Concentration**
Aluminium	2.05E-01	1.01E-01	5.21E-01	2.58E-01
Antimony	6.60E-07	2.35E-07	2.70E-05	9.63E-06
Arsenic	3.30E-05	1.27E-05	3.74E-03	1.44E-03
Chromium	3.86E-03	1.14E-03	2.34E-02	6.91E-03
Copper	2.87E-02	1.59E-02	4.35E-01	2.41E-01
Lead	5.28E-05	1.17E-05	2.88E-02	6.37E-03
Mercury	5.50E-05	3.14E-05	4.50E-05	2.57E-05
Molybdenum	2.78E-02	2.42E-03	1.37E+00	1.19E-01
Nickel	2.14E-02	7.53E-03	1.17E-03	4.11E-04
Selenium	1.32E-01	1.56E-02	4.07E-01	4.81E-02
Vanadium	4.13E-04	1.52E-04	9.00E-03	3.31E-03
Zinc	1.40E+00	8.00E-01	3.43E-02	1.96E-02

Appendix C-9
Estimated Concentration in Meat from Exposure to Water (mg/L)

Cmwater= BTF x Cwater x IRwater x fp x fw

BTF = biotransfer factor (day/kg)
IRwater = water ingestion rate (L/day)
Cwater = concentration in water (mg/L)
fp = fraction of the year the animal is onsite (unitless)
fw = fraction of daily consumption (asumed to be 1; untiless)

	Snowshoe Hare		Grouse	
Parameter	**Max Water Concentration**	**95% UCLM Water Concentration**	**Max Water Concentration**	**95% UCLM Water Concentration**
Aluminium	1.40E-02	1.68E-03	2.25E-02	2.71E-03
Antimony	7.57E-08	3.25E-09	1.96E-06	8.40E-08
Arsenic	9.67E-06	1.41E-06	6.91E-04	1.01E-04
Chromium	9.83E-05	8.04E-06	3.77E-04	3.08E-05
Copper	3.03E-04	2.88E-05	2.90E-03	2.75E-04
Lead	1.08E-06	6.50E-08	3.72E-04	2.24E-05
Mercury	1.95E-06	4.06E-08	1.01E-06	2.10E-08
Molybdenum	2.08E-05	1.62E-06	6.45E-04	5.04E-05
Nickel	5.83E-05	5.41E-06	2.01E-06	1.87E-07
Selenium	2.39E-04	2.03E-05	4.65E-04	3.96E-05
Vanadium	6.80E-05	3.92E-06	9.38E-04	5.40E-05
Zinc	5.44E-03	2.03E-04	8.44E-05	3.15E-06

Appendix C-10
Estimated Total Concentration in Meat from Exposure to Soil, Vegetation and Water (mg/kg)

Cmeat (mg/kg) = Cmsoil + Cmveg + Cmwater

	Snowshoe Hare		Grouse	
Parameter	**Max Concentrations**	**95% UCLM Concentrations**	**Max Concentrations**	**95% UCLM Concentrations**
Aluminium	1.76E+00	8.10E-01	6.82E+00	3.13E+00
Antimony	5.04E-05	5.76E-06	3.27E-03	3.70E-04
Arsenic	5.70E-03	1.79E-03	1.03E+00	3.22E-01
Chromium	1.01E-01	2.99E-02	9.60E-01	2.85E-01
Copper	3.40E+00	6.10E-01	8.19E+01	1.46E+01
Lead	1.92E-04	1.50E-04	1.49E-01	1.26E-01
Mercury	4.41E-04	9.79E-05	5.47E-04	1.12E-04
Molybdenum	2.95E-02	2.65E-03	1.49E+00	1.37E-01
Nickel	5.14E-02	1.70E-02	3.77E-03	1.23E-03
Selenium	1.38E-01	1.79E-02	4.36E-01	5.94E-02
Vanadium	1.09E-02	7.33E-03	3.72E-01	2.53E-01
Zinc	1.98E+00	9.94E-01	5.70E-02	2.72E-02

4. References

An explanation of the acronyms used throughout this reference list can be found in the *Acronyms and Abbreviations* section of the main report.

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APPENDIX D
SAMPLE CALCULATION OF ESTIMATED DAILY INTAKE

Table D-1
Sample Calculation of the Estimated Daily Intake of Zinc for a Toddler Consuming Moose Muscle

$$EDI_{meat} = \frac{IR \times Fs \times Cmeat}{BW}$$

$$= \frac{0.092 \text{ kg/day} \times 0.997 \times 71.3 \text{ mg/kg} \times 1000}{16.5 \text{ kg}}$$

EDI_{meat} = 395 µg/kg bw/day

Parameter		Parameter Value
IR =	ingestion rate (kg/day)	0.092
Fs =	fraction of year consuming meat	0.997
C_{meat} =	maximum predicted aluminium concentration in meat (mg/kg)	73.8
BW =	receptor body weight (kg)	16.5
EDI =	estimated daily intake (mg/kg/bw-day)	

APPENDIX E
METAL SPECIFIC RECOMMENDED MAXIMUM WEEKLY INTAKES

Table E-1
Metal-specific Recommended Maximum Weekly Intakes

$$RMWI = \frac{TRV \times BW \times 7}{C_{food}}$$

RMWI	= recommended maximum weekly intake of food (g/week)
TRV	= toxicological reference value (μg/kg body weight per day)
BW	= receptor body weight (kg)
7	= days/week
C_{food}	= metal concentration in food (μg/g)

	Moose Muscle		Moose Liver		Moose Kidney		Snowshoe Hare Muscle	
	Toddler	**Adult**	**Toddler**	**Adult**	**Toddler**	**Adult**	**Toddler**	**Adult**
Parameter								
Aluminium	2.51E+04	1.07E+05	7.03E+04	3.01E+05	7.97E+04	3.41E+05	6.55E+04	2.81E+05
Antimony	4.82E+04	2.07E+05	2.48E+04	1.06E+05	2.39E+04	1.02E+05	6.87E+06	2.94E+07
Arsenic	1.83E+04	7.84E+04	3.96E+03	1.70E+04	1.44E+04	6.19E+04	2.03E+04	8.68E+04
Chromium	1.30E+06	5.58E+06	2.25E+06	9.62E+06	3.08E+06	1.32E+07	1.72E+06	7.36E+06
Copper	9.58E+03	4.11E+04	1.46E+02	6.25E+02	4.75E+02	2.04E+03	4.24E+03	1.82E+04
Lead	1.67E+04	7.16E+04	2.70E+04	1.16E+05	2.82E+04	1.21E+05	2.15E+06	9.21E+06
Mercury	3.45E+04	1.48E+05	3.36E+04	1.44E+05	7.71E+03	3.30E+04	1.86E+05	7.97E+05
Molybdenum	3.65E+05	1.56E+06	3.49E+03	1.49E+04	9.66E+03	4.14E+04	1.29E+05	5.54E+05
Nickel	3.16E+04	1.36E+05	2.11E+04	9.02E+04	3.67E+04	1.57E+05	5.62E+04	2.41E+05
Selenium	1.16E+04	4.95E+04	1.28E+03	5.48E+03	7.96E+02	3.41E+03	8.37E+03	3.59E+04
Vanadium	3.47E+04	1.48E+05	3.47E+04	1.48E+05	3.47E+04	1.48E+05	1.59E+05	6.82E+05
Zinc	1.53E+03	6.54E+03	3.26E+03	1.40E+04	2.09E+03	8.97E+03	4.08E+04	1.75E+05
Maximum Weekly Intake	1.53E+03	6.54E+03	1.46E+02	6.25E+02	4.75E+02	2.04E+03	4.24E+03	1.82E+04

	Grouse Muscle		Rainbow Trout		Blueberry		Soapberry	
	Toddler	**Adult**	**Toddler**	**Adult**	**Toddler**	**Adult**	**Toddler**	**Adult**
Parameter								
Aluminium	1.69E+04	7.26E+04	9.39E+03	4.02E+04	3.89E+04	1.67E+05	3.54E+04	1.52E+05
Antimony	1.06E+05	4.54E+05	6.93E+04	2.97E+05	6.93E+04	2.97E+05	6.93E+04	2.97E+05
Arsenic	1.13E+02	4.83E+02	3.50E+03	1.50E+04	2.31E+04	9.90E+04	2.31E+04	9.90E+04
Chromium	1.81E+05	7.73E+05	3.09E+05	1.33E+06	3.47E+06	1.48E+07	3.47E+06	1.48E+07
Copper	1.76E+02	7.55E+02	2.41E+04	1.03E+05	1.29E+04	5.52E+04	1.30E+04	5.56E+04
Lead	2.76E+03	1.18E+04	3.44E+04	1.47E+05	4.12E+04	1.77E+05	4.12E+04	1.77E+05
Mercury	1.50E+05	6.42E+05	1.30E+03	5.58E+03	1.64E+05	7.03E+05	1.64E+05	7.03E+05
Molybdenum	2.55E+03	1.09E+04	2.38E+05	1.02E+06	1.05E+04	4.51E+04	1.59E+04	6.83E+04
Nickel	7.66E+05	3.28E+06	2.06E+04	8.84E+04	5.78E+04	2.47E+05	4.71E+03	2.02E+04
Selenium	2.65E+03	1.14E+04	2.75E+03	1.18E+04	1.16E+04	4.95E+04	1.16E+04	4.95E+04
Vanadium	4.66E+03	2.00E+04	2.48E+04	1.06E+05	3.47E+04	1.48E+05	3.47E+04	1.48E+05
Zinc	1.42E+06	6.08E+06	1.48E+04	6.34E+04	4.57E+04	1.96E+05	2.84E+04	1.22E+05
Maximum Weekly Intake	1.13E+02	4.83E+02	1.30E+03	5.58E+03	1.05E+04	4.51E+04	4.71E+03	2.02E+04