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BURNCO AGGREGATE PROJECT

Chemical Data Screening for Multimedia Assessment

Submitted to:
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REPORT

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Acronyms and Abbreviations

BC	British Columbia
BC CSR	British Columbia Contaminated Sites Regulation
BC MoE	British Columbia Ministry of Environment
CCME	Canadian Council of Ministers of the Environment
COPC	Contaminant of potential concern
e.g.	*exempli gratia* (for example)
i.e.	*id est* (that is)
RSL	Regional Screening Level
The Proposed Project	BURNCO Aggregate Project
US EPA	United States Environmental Protection Agency

Units of Measure

%	Percent

1.0 INTRODUCTION

This appendix summarizes the selected screening values and outcome of the chemical screening for the human health multimedia risk assessment being completed as part of the overall Environmental Assessment Certificate/Environmental Impact Assessment (hereafter referred to as the EA) for the Proposed BURNCO Aggregate Project (the Proposed Project).

2.0 SCREENING VALUES USED IN THE HUMAN HEALTH MULTIMEDIA RISK ASSESSMENT

A chemical screening process was used to determine the chemicals of potential concern (COPCs) in environmental media as outlined in Section 9.1.4 of the main report.

For the Application Case assessment, the screening for COPCs entailed comparison between predicted concentrations of contaminants in exposure media (e.g., soil and water) against both regulatory guidelines/standards and a 10% or greater increase above the Base Case concentration at any location. Detailed methods for the prediction of environmental concentrations in soil are provided in Appendix 9.1-D. Methods for the prediction of aerial deposition rates and water quality concentrations are provided in Part B, Sections 5.7 and 5.5, respectively.

2.1 Summary of Guidelines and Standards Used

Provincial (British Columbia Ministry of Environment [BC MoE]) and Canadian (e.g., Canadian Council of Ministers of the Environment [CCME] and Health Canada) environmental quality regulations and guidelines were used preferentially as part of the COPC identification process. In the absence of BC or Canadian environmental quality criteria for a particular chemical, an environmental quality criterion from other international regulatory agencies (e.g., United States Environmental Protection Agency [US EPA]) were used. Environmental quality regulations or guidelines used in this assessment are summarized below by media type with the exception of the air quality criteria which are presented in Appendix 9.1-B.

2.1.1 Surface Water

Water quality was predicted for the Proposed Project for the following locations:

- the pit lake (MCF-5);
- the downstream receiving environment including two locations on McNab Creek (MCF-1 and MCF-7);
- a location downstream of the pit lake along a permanent channel (MCF-12); and
- a location within the groundwater channel downstream of the pit lake (MCF-6).

Water quality was predicted for each of the 16 years of the Proposed Project operation and for 2 years of closure using inputs from water quality monitoring conducted between 2010 and 2014. Water quality inputs were developed using the 95th percentile or probability distributions based on the available monitoring data (i.e., the Base Case concentrations). Where insufficient data were available (i.e., less than three observations) a maximum concentration was used instead of the 95th percentile. The predicted maximum yearly concentrations of total metals and nutrients for each of the five locations identified above across the Proposed Project operations and closure were screened against the Base Case concentrations and against the most conservative of the health-based guidelines (Table 9.1-C-1).

The guidelines applied for the screening process included:

- BC Contaminated Sites Regulation (CSR; BC MOE 2011, including updates to 2014) which provides numerical standards representing acceptable concentrations of chemicals for drinking water use (Schedule 6 and 10 of the BC CSR);
- BC Water Quality Guidelines (BC MoE 2014) which provides numerical guidelines for drinking water;
- Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada 2014). The Health Canada drinking water guidelines typically assume a total daily intake allocated to drinking water of 20% (i.e., assuming 20% of a person's tolerable daily intake form a chemical comes from water, and the remaining 80% comes from other sources such as food); and
- US EPA Residential Tap Water Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (US EPA 2014) (in the absence of guidelines from the agencies listed above). For non-carcinogens, US EPA RSLs were adjusted to a hazard quotient of 0.2, and for carcinogens, RSLs were adjusted to reflect a cancer risk level of 1 in 100,000 (consistent with Health Canada guidance). US EPA RSL values were only provided if there were no health-based guidelines or standards from the above sources.

MCF-1 and MCF-7 are located along McNab Creek and the local Strata hold a license to use this water for potable purposes. In addition, the pit lake and MCF-6 and -12 are considered possible sources for incidental ingestion of water through recreational use. For this reason, predicted water quality concentrations were screened against drinking water guidelines. The selected screening value was the lowest human health-based value from the above listed sources.

2.1.2 Soil

Maximum Application Case soil concentrations at selected receptor locations were screened against health-based residential soil quality thresholds (Table 9.1-C-2). The following soil quality thresholds were considered:

- CCME (1999) – Canadian soil quality guidelines for protection of human health. Where available, screening values for relevant pathways were used (i.e., soil ingestion, direct contact). The Canadian soil quality guidelines are typically based on an allocation of 20% of the provisional tolerable daily intake of soil (i.e., assuming 20% of a person's tolerable daily intake of a chemical comes from soil, and the remaining 80% comes from other sources such as food and water);

- BC CSR which provides numerical standards for soil (Schedules 4, 5 and 10) (BC MoE 2011; including updates to 2014). Where available, standards for relevant pathways were used (i.e., soil intake).

BC regional background soil concentrations for the Lower Mainland (BC MoE 2005; 2010) are provided in Table 9.1-C-2. The background soil quality database includes soil data analyzed by two different digestion methods, aqua regia and nitric perchloric. The aqua regia method is considered the preferred analytical method for metals (BC MoE 2010). However, aqua regia results were not available for all metals reported in the background soil quality database. Aqua regia results were not available for bismuth, mercury, and thallium; therefore the nitric perchloric results were utilized for these parameters.

The lower of the BC CSR and/or CCME standards and guidelines was conservatively chosen as the selected screening value. If a BC CSR and CCME standard or guideline was not available, the BC background soil concentration was used for screening purposes. Regional background concentrations were used as a secondary screen to determine whether a chemical that exceeded a guideline/standard and increased by greater than 10% from Base Case concentrations should be retained for further evaluation in the risk assessment. Background values were used instead of screening values available from other jurisdictions because they were specific to soils in BC. In media other than soil, local background concentrations were not available and therefore screening values from other jurisdictions were deferred to in the absence of a provincial or federal standard.

2.2 Elimination of Non-Toxic Chemicals

Some metals and essential minerals are commonly analyzed in environmental samples (as part of the standard suite of metals treated by the analytical method) but generally have low toxicity at concentrations typically found in the environment, even at industrial sites such as a mine. Many of these chemicals are present in parent rock and soil materials and are present in a toxicologically inert form, and some are essential micro- and macro-nutrients.

Although the following metals and essential minerals may be present in media in the area of direct influence, they were excluded from further consideration in the COPC screening process based on their expected low toxicological hazard:

- Calcium, sodium, potassium, magnesium, and phosphorus are essential minerals that serve a variety of biochemical, intracellular, and ion balance purposes in human tissues. These parameters are naturally occurring chemicals and are included in routine analytical chemical analyses. Government agencies often do not develop regulatory criteria for these and other innocuous chemicals. As these chemicals are not known or expected to be associated with on-site activities, they have been excluded from the human health risk assessment.

3.0 RESULTS OF SCREENING

3.1 Water

The predicted water concentrations for the Application Case as well as the Base Case concentrations are provided in Table 9.1-C-2. Water sampling locations are provided in Figure 9.1-2. Results of the screening for each water quality location are provided below:

Pit Lake

A guideline was not available for ammonia, hardness and total titanium and the predicted maximum 95th percentile concentration was greater than 10% above the Base Case concentration. All other parameters were either below the applicable health-based guideline or did not increase by greater than 10% above Base Case. Therefore, ammonia, hardness and titanium were retained as COPCs in the pit lake.

MCF-6, MFC-12

A guideline was not available for ammonia or hardness and the predicted maximum 95th percentile concentration was greater than 10% above the Base Case concentration. All other parameters were either below the applicable health-based guideline or did not increase by greater than 10% above Base Case. Therefore, hardness was retained as a COPC.

MCF-1

A guideline was not available for alkalinity and the predicted maximum 95th percentile concentration was greater than 10% above the Base Case concentration. All other parameters were either below the applicable health-based guideline or did not increase by greater than 10% above Base Case. Therefore, alkalinity was retained as a COPC.

MCF-7

The water quality predictions were either below the applicable health-based guideline or did not increase by greater than 10% above the Base Case.

3.2 Soil

Based on the screening process outlined in Section 2.1.2, no COPCs were retained in soil for the Application Case. None of the metals emitted by the Proposed Project were predicted to increase the concentration in soil by greater than 10% from the Base Case to the Application Case. Although the maximum Application Case concentration for arsenic (15.8 mg/kg) exceeded the selected screening value (12 mg/kg), it was below the regional background concentration of 20 mg/kg and; therefore, not retained for further evaluation in the human health risk assessment.

4.0 SCREENING OF BASELINE DATA

Baseline data including soil, mussels, crabs, and fish collected to support the human health assessment were also screened against applicable guidelines. While significant changes to these media as a result of the Proposed Project are not anticipated because of the minimal changes to soil and water anticipated as a result of the Proposed Project, (see main document; section 9.1; rationale provided in section 9.1.4.6.2), these screened baseline data are presented in Attachment 1 of this appendix for informational purposes. Berries were collected as part of the baseline study; however there are no screening guidelines available for vegetation. Soil was considered a surrogate for assessing vegetation.

4.1 Soil

Baseline soil concentrations were all below the CSR and CCME screening values with the exception of arsenic which exceeded the CCME residential and industrial guideline of 12 mg/kg at three locations (13-BRP-S-01, 02 and 05). The maximum concentration which occurred at 13-BRP-S-05 (15.7 mg/kg) did not exceed the BC MoE regional background concentration of 20 mg/kg. Screened baseline data are presented in Table 1 of Attachment 1 of this appendix.

4.2 Fish, Crab, and Mussel Tissue

Baseline fish, crab, and mussel tissue concentrations compared to screening levels are provided in Tables 2 to 4 of Attachment 1 of this appendix. Screening levels were calculated using the Health Canada (2012) equation for ingestion of contaminated foods (provided below). The equation was rearranged to solve for the concentration of contaminant in food (C_{Foodi}). The equation input values and sources used are provided in Table 9.1-C-3 and Table 9.1-C-4. Ingestion rates for high consumers (eaters only) of fish and shellfish were used so as not to underestimate potential exposure scenarios (e.g., subsistence consumption), so therefore an exceedance of a screening level does not necessarily imply a potential health risk but rather may require some further evaluation if the contaminants are related to those released by the proposed Project.

Toxicity reference values (TRVs) were used from Health Canada (2012) if available. If not, TRVs were used from the hierarchy of sources following Health Canada guidance (2010; Table 9.1-C-4). For non-carcinogenic parameters, the TRV, body weight, and ingestion rate for the toddler (if available) were used to be conservative in the calculation of the screening values. For carcinogenic parameters (e.g., arsenic and benzo(a)pyrene), the TRV, body weight, and ingestion rates for adults were used.

$$\text{Dose (mg/kg bw/day)} = \frac{[\Sigma\,[C_{Foodi} \times IR_{Foodi} \times RAF_{Orali} \times D_i\,]] \times D_4}{BW \times 365 \times LE}$$

Where:
C_{Foodi} = concentration of contaminant in food *i* (mg/kg)
IR_{Foodi} = receptor ingestion rate for food *i* (kg/day)
RAF_{Orali} = relative absorption factor from the gastrointestinal tract for contaminant *i* (unitless)
D_i = days per year during which consumption of food *i* will occur
D_4 = total years exposed to site (for assessment of carcinogens only)
BW = body weight (kg)
365 = total days per year (constant)
LE = life expectancy (years) (for assessment of carcinogens only)

4.2.1 Results

Fish

Available baseline fish data included a single sample collected from McNab Creek, which was analyzed for metals. The concentrations of arsenic, chromium (compared to chromium VI screening value), lead, and mercury exceeded the calculated fish screening levels. The mercury fish tissue concentrations were conservatively compared to a screening value based on methylmercury. Concentrations of the remaining parameters analyzed were below the calculated fish screening levels.

Crab

Available baseline crab data include seven samples collected from a reference site (Camp Potlatch) and nine samples from the proposed Project area. Both muscle and organ tissue samples were collected from each crab and analyzed for metals. The concentrations of arsenic (ranging from 1.06 to 12.20 mg/kg ww) exceeded the shellfish screening level (0.06 mg/kg ww) in all tissue samples collected from the reference site and the proposed Project area. The concentration of copper exceeded the shellfish screening level (33.4 mg.kg ww) in three organ samples only; one sample from the reference site (58.1 mg.kg ww) and two from the proposed Project area (33.5 and 35.9 mg/kg ww) The concentration of mercury exceeded the screening level of 0.07 mg.kg ww in both muscle and organ tissue samples collected from the reference site (Camp Potlatch) for three crabs and in one muscle tissue sample collected from the proposed Project area. The concentrations of strontium exceeded the screening value in one organ tissue sample collected from Camp Potlatch and in two organ samples collected from the proposed Project area. No muscle tissue samples exceeded the strontium screening value. In general, concentrations of metals and PAHs in crab in muscle and organ tissues collected at the reference site and the Project area, were quite similar.

Mussel

Available baseline mussel data included ten samples collected from a reference site (Camp Potlatch) and ten samples collected from the proposed Project area. All mussel samples were analyzed for metals and five samples were analyzed for polycyclic aromatic hydrocarbons (PAHs). The following metals had concentrations in the proposed Project area that exceeded the screening levels: arsenic, cadmium, copper, lead, and zinc. All mussel samples collected from Camp Potlatch had concentrations exceeding the screening levels for arsenic and cadmium, and one sample also had exceedances for aluminum, chromium, cobalt, iron, and vanadium. There were no exceedances of the PAH screening levels in samples collected from Camp Potlatch or from the proposed Project area. In general, concentrations of metals and PAHs in mussels collected at the reference site and the Project area, were quite similar.

5.0 CLOSURE

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.

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Table 9.1-C-1: Drinking Water Screening for Pit Lake, MCF-6, MCF-12, MCF-1, and MCF-7
Public Health Assessment
Proposed Burnco Aggregate Project

Parameter	BC CSR - Drinking Water[1]	Notes	BC WQG - Drinking Water[2]	Notes	Health Canada Drinking Water Guidelines[3]	Notes	US EPA RSL (Tap water)[4]	Notes	Selected Screening Value[5]	Conservative Scenario Baseline Surface Water Quality	Pit Lake					MCF-6					MCF-12				
											Maximum[6]	Year	Does Maximum Exceed Screening Value?	Is % Change Greater than 10%?	Is Parameter a COPC?	Maximum[6]	Year	Does Maximum Exceed Screening Value?	Is % Change Greater than 10%?	Is Parameter a COPC?	Maximum[6]	Year	Does Maximum Exceed Screening Value?	Is % Change Greater than 10%?	Is Parameter a COPC?
Conventional																									
Total Dissolved Solids[a]	-		-		500	AO	-		**500**	36	63	Year 2	No	Yes	No	63	Year 2	No	Yes	No	63	Year 2	No	Yes	No
Alkalinity[b]	-		-		-		-		-	6.3	5.4	Year 1	NG	No	No	5.4	Year 1	NG	No	No	5.4	Year 1	NG	No	No
Hardness[c]	-		-		-		-		-	8.05	21	Year 3	NG	Yes	**Yes**	21	Year 3	NG	Yes	**Yes**	21	Year 3	NG	Yes	**Yes**
Major Ions																									
Calcium	-		-		-		-		-	2.7	7	Year 3	NG	Yes	No [j]	7.2	Year 3	NG	Yes	No [j]	7.2	Year 3	NG	Yes	No [j]
Chloride	250		250		250	AO	-		**250**	1.1	1.3	Year 11	No	Yes	No	1.3	Year 11	No	Yes	No	1.3	Year 11	No	Yes	No
Fluoride	1.5		1.5		1.5		-		**1.5**	0.010	0.026	Year 3	No	Yes	No	0.026	Year 3	No	Yes	No	0.026	Year 3	No	Yes	No
Magnesium	100	TO	-		-		-		**100**	0.31	0.86	Year 10	No	Yes	No	0.86	Year 10	No	Yes	No	0.86	Year 10	No	Yes	No
Potassium	-		-		-		-		-	1.0	1.69	Year 10	NG	Yes	No [j]	1.7	Year 10	NG	Yes	No [j]	1.7	Year 10	NG	Yes	No [j]
Sodium	200	TO	-		200	AO	-		**200**	1.0	37.6	Year 2	No	Yes	No	38	Year 2	No	Yes	No	38	Year 2	No	Yes	No
Sulphate	500		500		500	AO	-		**500**	4.7	6	Year 3	No	Yes	No	6.1	Year 3	No	Yes	No	6.1	Year 3	No	Yes	No
Nutrients																									
Ammonia	-		-		-		-		-	0.0025	0.015	Year 3	NG	Yes	**Yes**	0.015	Year 3	NG	Yes	**Yes**	0.015	Year 3	NG	Yes	**Yes**
Nitrate (as N)	10	d	10		10		-		**10**	0.43	0.19	Year 2	No	No	No	0.19	Year 2	No	No	No	0.19	Year 2	No	No	No
Nitrite (as N)	3.2		1		1		-		**1**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Total Kjeldhal Nitrogen	-		-		-		-		-	0.11	0.063	Year 2	NG	No	No	0.063	Year 2	NG	No	No	0.063	Year 2	NG	No	No
Total Phosphorus	-		0.01	f	-		-		**0.01**	0.0084	0.009	Year 3	No	No	No	0.0087	Year 3	No	No	No	0.0087	Year 3	No	No	No
Dissolved Metals[7]																									
Aluminum	9.5	e	0.2	dis.	0.1	OG	-		**0.2**	0.071	0.044	Year 10	No	No	No	0.044	Year 10	No	No	No	0.044	Year 10	No	No	No
Antimony	0.006		0.014	g, W	0.006		-		**0.006**	0.00025	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No
Arsenic	0.01		0.025	h	0.01		-		**0.01**	0.00025	0.00076	Year 3	No	Yes	No	0.00076	Year 3	No	Yes	No	0.00076	Year 3	No	Yes	No
Barium	1		-		-		-		**1**	0.010	0.013	Year 3	No	Yes	No	0.013	Year 3	No	Yes	No	0.013	Year 3	No	Yes	No
Beryllium	-		0.004	W	-		-		**0.004**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Boron	5		5		5		-		**5**	0.050	0.050	Year 2	No	No	No	0.050	Year 2	No	No	No	0.050	Year 2	No	No	No
Cadmium	0.005		-		0.005		-		**0.005**	0.000024	0.000017	Year 2	No	No	No	0.000017	Year 2	No	No	No	0.000017	Year 2	No	No	No
Chromium	0.05		-		0.05		-		**0.05**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Cobalt	-		-		-		0.0012	NC	**0.0012**	0.00015	0.00018	Year 14	No	Yes	No	0.00018	Year 14	No	Yes	No	0.00018	Year 14	No	Yes	No
Copper	1	TO	0.5		1	AO	-		**0.5**	0.00050	0.00071	Year 14	No	Yes	No	0.00071	Year 14	No	Yes	No	0.00071	Year 14	No	Yes	No
Iron	6.5	e	-		0.3	AO	-		**6.5**	0.015	0.042	Year 3	No	Yes	No	0.042	Year 3	No	Yes	No	0.042	Year 3	No	Yes	No
Lead	0.01		0.05		0.01		-		**0.01**	0.00025	0.00025	Year 8	No	No	No	0.00025	Year 8	No	No	No	0.00025	Year 8	No	No	No
Lithium	0.73		-		-		-		**0.73**	0.0025	0.0025	Year 2	No	No	No	0.0025	Year 2	No	No	No	0.0025	Year 2	No	No	No
Manganese	0.55	e	-		0.05	AO	-		**0.55**	0.0093	0.050	Year 3	No	Yes	No	0.050	Year 3	No	Yes	No	0.050	Year 3	No	Yes	No
Mercury	0.001		0.001		0.001		-		**0.001**	0.0000050	0.0000050	Year 2	No	No	No	0.0000050	Year 2	No	No	No	0.0000050	Year 2	No	No	No
Molybdenum	0.25		0.25		-		-		**0.25**	0.00050	0.00090	Year 3	No	Yes	No	0.00090	Year 3	No	Yes	No	0.00090	Year 3	No	Yes	No
Nickel	-		-		-		0.078	i, NC	**0.044**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Selenium	0.01		0.01		0.05		-		**0.01**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Silicon	-		-		-		-		-	9.1	Year 10	NG	-	-	No	9.1	Year 10	NG	-	-	9.1	Year 10	NG	-	-
Silver	-		-		-		0.019	NC	**0.02**	0.000010	0.000011	Year 3	No	No	No	0.000011	Year 3	No	No	No	0.000011	Year 3	No	No	No
Thallium	-		0.0005	W	-		-		**0.0005**	0.00010	0.00010	Year 2	No	No	No	0.00010	Year 2	No	No	No	0.00010	Year 2	No	No	No
Tin	22		-		-		-		**22**	0.00025	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No
Titanium	-		-		-		-		-	0.0050	0.0050	Year 2	NG	No	No	0.0050	Year 2	NG	No	No	0.0050	Year 2	NG	No	No
Uranium	0.02		-		0.02		-		**0.02**	0.00010	0.00010	Year 14	No	No	No	0.00010	Year 14	No	No	No	0.00010	Year 14	No	No	No
Vanadium	-		-		-		0.017	NC	0.017	0.00050	0.00074	Year 10	No	Yes	No	0.00074	Year 10	No	Yes	No	0.00074	Year 10	No	Yes	No
Zinc	5	TO	5	AO	5	AO	1.2	NC	**1.2**	0.0025	0.0026	Year 13	No	No	No	0.0026	Year 13	No	No	No	0.0026	Year 13	No	No	No
Total Metals																									
Aluminum	9.5	e	-		0.1	OG	-		**9.5**	0.32	0.12	Year 2	No	No	No	0.044	Closure	No	No	No	0.044	Year 10	No	No	No
Antimony	0.006		0.014	g, W	0.006		-		**0.006**	0.00025	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No
Arsenic	0.01		0.025	h	0.01		-		**0.01**	0.00025	0.00078	Year 3	No	Yes	No	0.00076	Year 3	No	Yes	No	0.00076	Year 3	No	Yes	No
Barium	1		-		-		-		**1**	0.010	0.013	Year 3	No	Yes	No	0.013	Year 3	No	Yes	No	0.013	Year 3	No	Yes	No
Beryllium	-		0.004	W	-		-		**0.004**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Boron	5		5		5		-		**5**	0.050	0.050	Year 2	No	No	No	0.050	Year 2	No	No	No	0.050	Year 2	No	No	No
Cadmium	0.005		-		0.005		-		**0.005**	0.000031	0.000018	Year 2	No	No	No	0.000017	Year 2	No	No	No	0.000017	Year 2	No	No	No
Chromium	0.05		-		0.05		-		**0.05**	0.00050	0.00053	Year 1	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Cobalt	-		-		-		0.0012	NC	**0.0012**	0.00015	0.00019	Year 3	No	Yes	No	0.00018	Year 14	No	Yes	No	0.00018	Year 14	No	Yes	No
Copper	1	TO	0.5		1	AO	-		**0.5**	0.00050	0.00076	Year 14	No	Yes	No	0.00072	Year 14	No	Yes	No	0.00072	Year 14	No	Yes	No
Iron	6.5	e	-		0.3	AO	-		**6.5**	0.18	0.083	Year 2	No	No	No	0.043	Year 3	No	No	No	0.043	Year 3	No	No	No
Lead	0.01		0.05		0.01		-		**0.01**	0.00025	0.00027	Year 1	No	No	No	0.00025	Year 8	No	No	No	0.00025	Year 8	No	No	No
Lithium	0.73		-		-		-		**0.73**	0.0025	0.0025	Year 2	No	No	No	0.0025	Year 2	No	No	No	0.0025	Year 2	No	No	No
Manganese	0.55	e	-		0.05	AO	-		**0.55**	0.011	0.050	Year 3	No	Yes	No	0.050	Year 3	No	Yes	No	0.050	Year 3	No	Yes	No
Mercury	0.001		0.001		0.001		-		**0.001**	0.0000050	0.0000051	Year 1	No	No	No	0.0000050	Year 2	No	No	No	0.0000050	Year 2	No	No	No
Molybdenum	0.25		0.25		-		-		**0.25**	0.00050	0.00091	Year 3	No	Yes	No	0.00090	Year 3	No	Yes	No	0.00090	Year 3	No	Yes	No
Nickel	-		-		-		0.078	i, NC	**0.044**	0.00050	0.00051	Year 1	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Selenium	0.01		0.01		0.05		-		**0.01**	0.00050	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No	0.00050	Year 2	No	No	No
Silver	-		-		-		0.019	NC	**0.02**	0.000010	0.000011	Year 3	No	Yes	No	0.000011	Year 3	No	No	No	0.000011	Year 3	No	No	No
Thallium	-		0.0005	W	-		-		**0.0005**	0.00010	0.00010	Year 2	No	No	No	0.00010	Year 2	No	No	No	0.00010	Year 2	No	No	No
Tin	22		-		-		-		**22**	0.00025	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No	0.00025	Year 2	No	No	No
Titanium	-		-		-		-		-	0.0050	0.0056	Year 1	NG	Yes	**Yes**	0.0050	Year 2	NG	No	No	0.0050	Year 2	NG	No	No
Uranium	0.02		-		0.02		-		**0.02**	0.00010	0.00010	Year 14	No	No	No	0.00010	Year 14	No	No	No	0.00010	Year 14	No	No	No
Vanadium	-		-		-		0.017	NC	0.017	0.00050	0.00075	Year 10	No	Yes	No	0.00074	Year 10	No	Yes	No	0.00074	Year 10	No	Yes	No
Zinc	5	TO	5	AO	5	AO	1.2	NC	**1.2**	0.0025	0.0028	Year 3	No	Yes	No	0.0026	Year 13	No	No	No	0.0026	Year 13	No	No	No

Notes:
Bolded and shaded values exceed the selected screening value.
Units in milligrams per litre (mg/L), unless otherwise noted.

"-" = no value or not measured; % = percent; AO = Aesthetic objective; COPC = contaminant of potential concern; dis. = Dissolved guideline; OG = Operational guideline; NC = Non-carcinogenic endpoint; TDS = total dissolved solids; TO = taste and odour concerns; W = Working Water Quality Guidelines.

1. British Columbia Contaminated Sites Regulation (BC CSR) Schedule 6 (Generic Numerical Water Standards) and Schedule 10 (Generic Numerical Soil and Water Standards) for Drinking Water (including amendments to January 31, 2014). Available at: http://www.env.gov.bc.ca/epd/remediation/leg_regs/csr.htm. Accessed March 2016.

2. British Columbia Water Quality Guidelines (BC WQG). Available at: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html#approved. Accessed March 2016

3. Health Canada. 2014. Guidelines for Canadian Drinking Water Quality Summary Table (October 2014).

4. United States Environmental Protection Agency (US EPA) Regional Screening Levels for Residential Tapwater (RSL) (updated as of November 2014). Available at: http://www.epa.gov/region9/superfund/prg/. Accessed March 2016. Non-carcinogenic values are multiplied by 0.2 and carcinogenic values are multipled by 10 to adjust to a target Hazard Quotient of 0.2 and an Incremental Lifetime Cancer Risk of $1x10^{-5}$, respectively. Where both non-carcinogenic and carcinogenic RSLs were available for a parameter, the lower of the two adjusted values was selected as the screening level. RSLs are only shown when health-based BC CSR, BC WQG and Health Canada Drinking Water Guidelines screening values are not available.

5. Selected screening value is the lowest health-based standard or guideline from BC CSR, BC WQG and Health Canada Drinking Water Guidelines.
6. Maximum concentration for each parameter at each location is based on the predicted Conservative Scenario concentrations.
7. Total metal standards/guidelines/screening levels are used in the absence of dissolved metal screening values, unless otherwise indicated.
a. Calculated value: Calculated TDS based on standard methods (APHA 2005).
b. Assumed alkalinity based on mean of SFE test, used for calculation of TDS.
c. Calculated hardness based on concentrations of calcium and magnesium.
d. Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
e. Protective of human health, based on toxicological reference value protective of adults. Standards may not address aesthetic concerns related to drinking water quality and water treatment may be required.
f. Related to taste and odour from algae.
g. Human health protection from consumption of water and organisms.
h. Interim guideline.
i. As nickel soluble salts.
j. An innocuous substance or is calculated based on innocuous substances, therefore not a COPC (Health Canada 2010).

Table 9.1-C-1: Drinking Water Screening for Pit Lake, MCF-6, MCF-12, MCF-1, and MCF-7
Public Health Assessment
Proposed Burnco Aggregate Project

Parameter	BC CSR - Drinking Water[1]	Notes	BC WQG - Drinking Water[2]	Notes	Health Canada Drinking Water Guidelines[3]	Notes	US EPA RSL (Tap water)[4]	Notes	Selected Screening Value[5]	MCF-1						MCF-7					
										Conservative Scenario Baseline Surface Water Quality	Maximum[6]	Year	Does Maximum Exceed Screening Value?	Is % Change Greater than 10%?	Is Parameter a COPC?	Conservative Scenario Baseline Surface Water Quality	Maximum[6]	Year	Does Maximum Exceed Screening Value?	Is % Change Greater than 10%?	Is Parameter a COPC?
Conventional																					
Total Dissolved Solids[a]	-		-		500	AO	-		**500**	27	30	Year 1	No	Yes	No	27	33	Closure	No	Yes	No
Alkalinity[b]	-		-		-		-		-	1.0	5.4	Year 1	NG	Yes	**Yes**	5.0	5.4	Year 1	NG	No	No
Hardness[c]	-		-		-		-		-	3.7	3.8	Year 1	NG	No	No	3.9	3.9	Closure	NG	No	No
Major Ions																					
Calcium	-		-		-		-		-	1.24	1.3	Year 1	NG	No	No	1.4	1.3	Closure	NG	No	No
Chloride	250		250		250	AO	-		**250**	0.60	0.60	Year 1	No	No	No	1.7	1.7	Closure	No	No	No
Fluoride	1.5		1.5		1.5		-		**1.5**	0.010	0.010	Year 1	No	No	No	0.027	0.027	Closure	No	No	No
Magnesium	100	TO	-		-		-		**100**	0.14	0.15	Year 1	No	No	No	0.18	0.16	Closure	No	No	No
Potassium	-		-		-		-		-	1.0	1.0	Year 1	NG	No	No	1.0	1.0	Closure	NG	No	No
Sodium	200	TO	-		200	AO	-		**200**	1.0	1.0	Year 1	No	No	No	1.0	1.1	Closure	No	No	No
Sulphate	500		500		500	AO	-		**500**	0.93	0.93	Year 1	No	No	No	3.3	3.3	Closure	No	No	No
Nutrients																					
Ammonia	-		-		-		-		-	0.0025	0.0025	Year 1	NG	No	No	0.035	0.035	Closure	NG	No	No
Nitrate (as N)	10	d	10		10		-		**10**	0.47	0.51	Year 1	No	No	No	0.33	0.33	Closure	No	No	No
Nitrite (as N)	3.2		1		1		-		**1**	0.00050	0.00050	Year 1	No	No	No	0.0025	0.0025	Year 16	No	No	No
Total Kjeldhal Nitrogen	-		-		-		-		-	0.087	0.089	Year 1	NG	No	No	0.38	0.38	Closure	NG	No	No
Total Phosphorus	-		0.01	f	-		-		**0.01**	0.0039	0.0039	Year 1	No	No	No	**0.011**	**0.011**	Closure	Yes	No	No
Dissolved Metals[7]																					
Aluminum	9.5	e	0.2	dis.	0.1	OG	-		**0.2**	0.11	0.12	Year 1	No	No	No	0.099	0.099	Closure	No	No	No
Antimony	0.006		0.014	g, W	0.006		-		**0.006**	0.00025	0.00025	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Arsenic	0.01		0.025	h	0.01		-		**0.01**	0.00025	0.00025	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Barium	1		-		-		-		**1**	0.010	0.010	Year 1	No	No	No	0.010	0.010	Closure	No	No	No
Beryllium	-		0.004	W	-		-		**0.004**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Boron	5		5		5		-		**5**	0.050	0.050	Year 1	No	No	No	0.050	0.050	Closure	No	No	No
Cadmium	0.005		-		0.005		-		**0.005**	0.0000085	0.0000085	Year 1	No	No	No	0.000027	0.000027	Year 16	No	No	No
Chromium	0.05		-		0.05		-		**0.05**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Cobalt	-		-		-		0.0012	NC	**0.0012**	0.00015	0.00015	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Copper	1	TO	0.5		1	AO	-		**0.5**	0.00050	0.00050	Year 1	No	No	No	0.00074	0.00074	Closure	No	No	No
Iron	6.5	e	-		0.3	AO	-		**6.5**	0.015	0.015	Year 1	No	No	No	0.025	0.025	Closure	No	No	No
Lead	0.01		0.05		0.01		-		**0.01**	0.00025	0.00025	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Lithium	0.73		-		-		-		**0.73**	0.0025	0.0025	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Manganese	0.55	e	-		0.05	AO	-		**0.55**	0.0019	0.0019	Year 1	No	No	No	0.0011	0.0011	Closure	No	No	No
Mercury	0.001		0.001		0.001		-		**0.001**	0.0000050	0.0000050	Year 1	No	No	No	0.000010	0.000010	Year 15	No	No	No
Molybdenum	0.25		0.25		-		-		**0.25**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Nickel	-		-		-		0.078	i, NC	**0.044**	0.00050	0.00050	Year 1	No	No	No	0.00068	0.00068	Closure	No	No	No
Selenium	0.01		0.01		0.05		-		**0.01**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Silicon	-		-		-		-		-	-	6.0	Year 1	NG	-	No	-	6.0	Closure	NG	-	No
Silver	-		-		-		0.019	NC	**0.02**	0.000010	0.000010	Year 1	No	No	No	0.00010	0.00010	Year 1	No	No	No
Thallium	-		0.0005	W	-		-		**0.0005**	0.00010	0.00010	Year 1	No	No	No	0.00010	0.00010	Closure	No	No	No
Tin	22		-		-		-		**22**	0.00025	0.00025	Year 1	No	No	No	0.0025	0.0025	Year 14	No	No	No
Titanium	-		-		-		-		-	0.0050	0.0050	Year 1	NG	No	No	0.0050	0.0050	Closure	NG	No	No
Uranium	0.02		-		0.02		-		**0.02**	0.00022	0.00022	Year 1	No	No	No	0.00020	0.00020	Closure	No	No	No
Vanadium	-		-		-		0.017	NC	0.017	0.00050	0.00050	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Zinc	5	TO	5	AO	5	AO	1.2	NC	**1.2**	0.0025	0.0025	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Total Metals																					
Aluminum	9.5	e	-		0.1	OG	-		**9.5**	0.17	0.17	Year 1	No	No	No	0.13	0.13	Year 16	No	No	No
Antimony	0.006		0.014	g, W	0.006		-		**0.006**	0.00025	0.00025	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Arsenic	0.01		0.025	h	0.01		-		**0.01**	0.00025	0.00025	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Barium	1		-		-		-		**1**	0.010	0.010	Year 1	No	No	No	0.010	0.010	Closure	No	No	No
Beryllium	-		0.004	W	-		-		**0.004**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Boron	5		5		5		-		**5**	0.050	0.050	Year 1	No	No	No	0.050	0.050	Closure	No	No	No
Cadmium	0.005		-		0.005		-		**0.005**	0.000016	0.000017	Year 1	No	No	No	0.000034	0.000034	Closure	No	No	No
Chromium	0.05		-		0.05		-		**0.05**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Cobalt	-		-		-		0.0012	NC	**0.0012**	0.00015	0.00015	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Copper	1	TO	0.5		1	AO	-		**0.5**	0.00050	0.00050	Year 1	No	No	No	0.0024	0.0024	Closure	No	No	No
Iron	6.5	e	-		0.3	AO	-		**6.5**	0.069	0.073	Year 1	No	No	No	0.042	0.043	Closure	No	No	No
Lead	0.01		0.05		0.01		-		**0.01**	0.00025	0.00025	Year 1	No	No	No	0.00025	0.00025	Closure	No	No	No
Lithium	0.73		-		-		-		**0.73**	0.0025	0.0025	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Manganese	0.55	e	-		0.05	AO	-		**0.55**	0.0023	0.0023	Year 1	No	No	No	0.0015	0.0015	Closure	No	No	No
Mercury	0.001		0.001		0.001		-		**0.001**	0.0000050	0.0000050	Year 1	No	No	No	0.000014	0.000014	Closure	No	No	No
Molybdenum	0.25		0.25		-		-		**0.25**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Nickel	-		-		-		0.078	i, NC	**0.044**	0.00050	0.00050	Year 1	No	No	No	0.0010	0.0010	Closure	No	No	No
Selenium	0.01		0.01		0.05		-		**0.01**	0.00050	0.00050	Year 1	No	No	No	0.00050	0.00050	Closure	No	No	No
Silver	-		-		-		0.019	NC	**0.02**	0.000010	0.000010	Year 1	No	No	No	0.00010	0.00010	Year 14	No	No	No
Thallium	-		0.0005	W	-		-		**0.0005**	0.00010	0.00010	Year 1	No	No	No	0.00010	0.00010	Closure	No	No	No
Tin	22		-		-		-		**22**	0.00025	0.00025	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Titanium	-		-		-		-		-	0.0050	0.0050	Year 1	NG	No	No	0.0050	0.0050	Closure	NG	No	No
Uranium	0.02		-		0.02		-		**0.02**	0.00024	0.00024	Year 1	No	No	No	0.00020	0.00020	Closure	No	No	No
Vanadium	-		-		-		0.017	NC	0.017	0.00050	0.00050	Year 1	No	No	No	0.0025	0.0025	Closure	No	No	No
Zinc	5	TO	5	AO	5	AO	1.2	NC	**1.2**	0.0025	0.0025	Year 1	No	No	No	0.0051	0.0051	Closure	No	No	No

Notes:

Bolded and shaded values exceed the selected screening value.
Units in milligrams per litre (mg/L), unless otherwise noted.

"-" = no value or not measured; % = percent; AO = Aesthetic objective; COPC = contaminant of potential concern; dis. = Dissolved guideline; OG = Operational guideline; NC = Non-carcinogenic endpoint; TDS = total dissolved solids; TO = taste and odour concerns; W = Working Water Quality Guidelines.

1. British Columbia Contaminated Sites Regulation (BC CSR) Schedule 6 (Generic Numerical Water Standards) and Schedule 10 (Generic Numerical Soil and Water Standards) for Drinking Water (including amendments to January 31, 2014). Available at: http://www.env.gov.bc.ca/epd/remediation/leg_regs/csr.htm. Accessed March 2016.

2. British Columbia Water Quality Guidelines (BC WQG). Available at: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html#approved. Accessed March 2016

3. Health Canada. 2014. Guidelines for Canadian Drinking Water Quality Summary Table (October 2014).

4. United States Environmental Protection Agency (US EPA) Regional Screening Levels for Residential Tapwater (RSL) (updated as of November 2014). Available at: http://www.epa.gov/region9/superfund/prg/. Accessed March 2016. Non-carcinogenic values are multiplied by 0.2 and carcinogenic values are multipled by 10 to adjust to a target Hazard Quotient of 0.2 and an Incremental Lifetime Cancer Risk of $1x10^{-5}$, respectively. Where both non-carcinogenic and carcinogenic RSLs were available for a parameter, the lower of the two adjusted values was selected as the screening level. RSLs are only shown when health-based BC CSR, BC WQG and Health Canada Drinking Water Guidelines screening values are not available.

5. Selected screening value is the lowest health-based standard or guideline from BC CSR, BC WQG and Health Canada Drinking Water Guidelines.
6. Maximum concentration for each parameter at each location is based on the predicted Conservative Scenario concentrations.
7. Total metal standards/guidelines/screening levels are used in the absence of dissolved metal screening values, unless otherwise indicated.
a. Calculated value: Calculated TDS based on standard methods (APHA 2005).
b. Assumed alkalinity based on mean of SFE test, used for calculation of TDS.
c. Calculated hardness based on concentrations of calcium and magnesium.
d. Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
e. Protective of human health, based on toxicological reference value protective of adults. Standards may not address aesthetic concerns related to drinking water quality and water treatment may be required.
f. Related to taste and odour from algae.
g. Human health protection from consumption of water and organisms.
h. Interim guideline.
i. As nickel soluble salts.
j. An innocuous substance or is calculated based on innocuous substances, therefore not a COPC (Health Canada 2010).

Table 9.1-C-2: Soil Screening - Application Case
Public Health Assessment
Proposed Burnco Aggregate Project

Parameter	BC CSR-Standards for the Protection of Human Health				CCME- Guidelines for the Protection of Human Health				BC Regional Background	Selected Screening Value[e]	Maximum Base Case Soil Concentration (mg/kg dry weight)	Maximum Predicted Application Case Soil Concentration (mg/kg dry weight)	Location of Maximum Application Soil Concentration	Is Predicted Application Soil Concentration >Base Case + 10%?	Is Predicted Application Soil Concentration >BC CSR or CCME?	Is Predicted Application Soil Concentration Below BC Background Concentration?	Is Parameter a COPC?
	Residential Land Use	Notes	Industrial Land Use	Notes	Residential Land Use	Notes	Industrial Land Use	Notes	Lower Mainland								
Aluminum (Al)									45,000	45,000	44,000	44,001	McNab Creek Strata	No	NG	Yes	No
Antimony (Sb)	**20**	G	40	G	20	G	40	G	15	20	1.14	1.14	McNab Creek Strata	No	No	Yes	No
Arsenic (As)	**100**	I	300	I	12	SI	12	SI	20	12	15.8	15.8	McNab Creek Strata	No	Yes	Yes	No
Barium (Ba)	**6500**	I	>1,000,000	I	6800	DC	130000	DC	300	6500	217	217	McNab Creek Strata	No	No	Yes	No
Beryllium (Be)	**4**	G	8	G	75	DC	1400	DC	1.5	4	0.378	0.378	McNab Creek Strata	No	No	Yes	No
Bismuth (Bi)									-	-	0.308	0.308	McNab Creek Strata	No	NG	NC	No (NG)
Cadmium (Cd)	**3**	Ia	3500	I	14	SI	2090	SI	0.4	3	0.188	0.188	McNab Creek Strata	No	No	Yes	No
Calcium (Ca)									8000	8000	4132	4132	McNab Creek Strata	No	NG	NC	No
Chromium (Cr)	**100**	I b	20000	I b	220	SI c	6700	SI c	80	100	35.8	35.8	McNab Creek Strata	No	No	Yes	No
Cobalt (Co)	**50**	G	300	G	50	G	300	G	30	50	11.1	11.1	McNab Creek Strata	No	No	Yes	No
Copper (Cu)	**15000**	I	200000	I	1100	SI	20000	SI	45	1100	40.2	40.2	McNab Creek Strata	No	No	Yes	No
Iron (Fe)									45,000	45,000	28,001	28,003	McNab Creek Strata	No	NG	Yes	No
Lead (Pb)	**400**	I	4000	I	140	SI	8200	SI	60	140	58.0	58.0	McNab Creek Strata	No	No	Yes	No
Lithium (Li)	**1600**	G	20000	G					-	1600	17.1	17.1	McNab Creek Strata	No	No	NC	No
Magnesium (Mg)									10,000	10,000	8114	8114	McNab Creek Strata	No	NG	NC	No
Manganese (Mn)	**1800**	G	19000	G					800	1800	497	497	McNab Creek Strata	No	No	Yes	No
Mercury (Hg)	**15**	I	2000	I	6.6	SI	690	SI	0.15	6.6	0.382	0.382	McNab Creek Strata	No	No	No	No
Molybdenum (Mo)	**10**	G	40	G	10	G	40	G	1[f]	10	0.882	0.882	McNab Creek Strata	No	No	Yes	No
Nickel (Ni)	**100**	G	500	G	200	SI/DC	5100	DC	80	100	23.1	23.1	McNab Creek Strata	No	No	Yes	No
Phosphorus (P)									2000	2000	864	864	McNab Creek Strata	No	NG	NC	No
Potassium (K)									5000	5000	2388	2388	McNab Creek Strata	No	NG	NC	No
Selenium (Se)	**3**	G	10	G	80	DC	4050	DC	4[f]	3	0.565	0.565	McNab Creek Strata	No	No	Yes	No
Silver (Ag)	**20**	G	40	G	20	G	40	G	1[f]	20	0.140	0.140	McNab Creek Strata	No	No	Yes	No
Sodium (Na)	**>1,000,000**	I	>1,000,000	I					900	1,000,000	658	658	McNab Creek Strata	No	NG	Yes	No
Strontium (Sr)	**47000**	G	100000	G					75	47,000	40.8	40.8	McNab Creek Strata	No	No	Yes	No
Thallium (Tl)					1	SI , P	1	SI , P	-	1	0.135	0.135	McNab Creek Strata	No	No	NC	No
Tin (Sn)	**50**	G	300	G	50	G	300	G	4[f]	50	2.00	2.00	McNab Creek Strata	No	No	Yes	No
Titanium (Ti)									2500	2500	1750	1750	McNab Creek Strata	No	NG	Yes	No
Uranium (U)	**16**	G	200	G	23	DC	510	DC	-	16	3.14	3.14	McNab Creek Strata	No	No	NC	No
Vanadium (V)	**200**	G							150	200	73.5	73.5	McNab Creek Strata	No	No	Yes	No
Zinc (Zn)	**10000**	I	>1,000,000	I					100	10,000	63.4	63.4	McNab Creek Strata	No	No	Yes	No

Notes:
Units in milligram per kilogram dry weight (mg/kg dw), unless otherwise noted.
CSR-Contaminated Sites Regulations Soil Standards-Schedules 4, 5 and 10 BC Regs 375/96, December 16, 1996, updates to January 2014.
CCME-Canadian Environmental Quality Guidelines - Canadian Council of Ministers of the Environment, 1999, includes updates to 2015.
BC Regional Background soil concentrations were obtained from BC MoE (2010) Protocol 4 - Determining Background Soil Quality, Table 1 - Regional background soil quality estimates for inorganic substances, Lower Mainland.
> = greater than; DC = Direct contact; I = Soil Intake; G = Generic guideline or standard; NC = no background concentration available; mg/kg = milligram per kilogram; P = Provisional; SI = Soil ingestion pathway
a. Standard for land used to grow produce for human consumption
b. Standard is for Chromium VI
c. Standard is for total chromium
d. Non-toxic essential mineral
e. Lower of BC CSR and CCME. If a value was not available from BC CSR or CCME, BC regional background was used.
f. Background concentration based on half of the detection limit

Table 9.1-C-3: Input Values and Sources Used to Calculate Fish and Shellfish Screening Levels

Parameter	Input Value		Units	Source
	Adult	Toddler		
Body weight (BW)	70.7	16.5	kg	Health Canada 2010
Ingestion rate (fish)	0.04	0.02	kg/day	Health Canada 2007; eaters only sport/subsistance
Ingestion rate (shellfish)	0.009	-	kg/day	Health Canada 2007; eaters only intake
Oral RAF	1	1	unitless	Health Canada 2010; default assumption
Non-cancer TRV (oral RfD)	see Table 9.1-C-4	see Table 9.1-C-4	mg/kg BW/day	Health Canada 2010
Cancer TRV (oral slope factor)	see Table 9.1-C-4	see Table 9.1-C-4	$(mg/kg\ BW/day)^{-1}$	Health Canada 2010
Target/acceptable hazard quotient	0.2	0.2	unitless	Health Canada 2010
Target/acceptable ILCR	1.00E-05	1.00E-05	unitless	Health Canada 2010
Life stage duration (for carcinogens)	60	N/A	years	Health Canada 2010
Life expectancy (for carcinogens)	80	N/A	years	Health Canada 2010
Days per year consuming fish/shellfish	365	365	days	Health Canada 2007

Abbreviations:

ILCR: incramental lifetime cancer risk; kg: kilogram; mg: miligram; RAF: relative absorption factor; RfD: reference dose; TRV: toxicity reference value

References:

Health Canada. 2010. Fereral Contaminated Site Risk Assessment in Canada, Guidance on Human Health Preliminary Quantitaive Risk Assessment (PQRA), Version 2.0.

Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Chemical Safety Food Directorate Health Products and Food Branch. ON, Canada.

Parameter	Carcinogenic Classification	Non-Cancer TRV			Cancer TRV	
		Oral Reference Dose (RfD) mg/kg BW/day			Oral Slope Factor (SF) (mg/kg BW/day)$^{-1}$	
		Toddler	Adult	Source	Adult	Source
Metals						
Aluminum (Al)	NC	1.0	1.0	ATSDR 2008	-	-
Antimony (Sb)	NC	0.0004	0.0004	U.S. EPA 1987	-	-
Arsenic (As)	C	0.0003	0.0003	U.S. EPA 1991	1.8	Health Canada 2010
Barium (Ba)	NC	0.2	0.2	Health Canada 2010	-	-
Beryllium (Be)	NC	0.002	0.002	U.S. EPA 1998	-	-
Bismuth (Bi)	NC	-	-	-	-	-
Boron (B)	NC	0.0175	0.0175	Health Canada 2010	-	-
Cadmium (Cd)	NC	0.001	0.001	Health Canada 2010	-	-
Calcium (Ca)	NC	-	-	-	-	-
Cesium (Cs)	NC	-	-	-	-	-
Chromium (Cr)	NC	0.001	0.001	Health Canada 2010	-	-
Chromium-VI (Cr-VI)	NC	0.003	0.003	U.S. EPA 1998	-	-
Cobalt (Co)	NC	0.0014	0.0014	RIVM 2001	-	-
Copper (Cu)	NC	0.091	0.141	Health Canada 2010	-	-
Gallium (Ga)	NC	-	-	-	-	-
Iron (Fe)	NC	0.8	0.8	WHO 1983	-	-
Lead (Pb)	NC	0.0006	0.0013	SNC 2012, WHO 2011	-	-
Lithium (Li)	NC	-	-	-	-	-
Magnesium (Mg)	NC	-	-	-	-	-
Manganese (Mn)	NC	0.136	0.156	Health Canada 2010	-	-
Mercury (Hg)	NC	0.0002	0.0002	Health Canada 2010 [a]	-	-
Molybdenum (Mo)	NC	0.023	0.028	Health Canada 2010	-	-
Nickel (Ni)	NC	0.011	0.011	Health Canada 2010 [b]	-	-
Phosphorus (P)	NC	-	-	-	-	-
Potassium (K)	NC	-	-	-	-	-
Rhenium (Re)	NC	-	-	-	-	-
Rubidium (Rb)	NC	-	-	-	-	-
Selenium (Se)	NC	0.0062	0.0057	Health Canada 2010	-	-
Silver (Ag)	NC	0.005	0.005	U.S. EPA 1991	-	-
Sodium (Na)	NC	-	-	-	-	-
Strontium (Sr)	NC	0.13	0.13	WHO 2010	-	-
Tellurium (Te)	NC	-	-	-	-	-
Thallium (Tl)	NC	0.00061	0.00014	WHO 1996 [c]	-	-
Thorium (Th)	NC	-	-	-	-	-
Tin (Sn)	NC	2	2	WHO 1982	-	-
Uranium (U)	NC	0.0006	0.0006	Health Canada 2010	-	-
Vanadium (V)	NC	0.00504	0.00504	U.S. EPA 1988 [d]	-	-
Yttrium (Y)	NC	-	-	-	-	-
Zinc (Zn)	NC	0.48	0.57	Health Canada 2010	-	-
Zirconium (Zr)	NC	-	-	-	-	-
PAHs						
Acenaphthene	NC	0.06	0.06	U.S. EPA 1990	-	-
Acenaphthylene	NC	0.06	0.06	U.S. EPA 1990 [e]	-	-
Anthracene	NC	0.3	0.3	U.S. EPA 1990	-	-
Benz(a)anthracene	C	-	-	-	0.23	Health Canada 2010
Benzo(a)pyrene	C	-	-	-	2.3	Health Canada 2010
Benzo(b)fluoranthene	C	-	-	-	0.23	Health Canada 2010
Benzo(g,h,i)perylene	C	-	-	-	0.023	Health Canada 2010
Benzo(k)fluoranthene	C	-	-	-	0.23	Health Canada 2010
Chrysene	C	-	-	-	0.023	Health Canada 2010
Dibenz(a,h)anthracene	C	-	-	-	2.3	Health Canada 2010
Fluoranthene	NC	0.04	0.04	U.S. EPA 1990	-	-
Fluorene	NC	0.04	0.04	U.S. EPA 1990 [f]	-	-
Indeno(1,2,3-c,d)pyrene	C	-	-	-	0.23	Health Canada 2010
2-Methylnaphthalene	NC	0.004	0.004	Health Canada 2010	-	-
Naphthalene	NC	0.02	0.02	Health Canada 2010	-	-
Phenanthrene	NC	0.04	0.04	RIVM 2001	-	-
Pyrene	NC	0.03	0.03	Health Canada 2010	-	-

Abbreviations:

BW: body weight; C: carcinogen; NC: non-carcinogen; mg: milligram; kg: kilogram; TRV: toxicity reference value

"-" : value is not available

Notes:

[a] Values are for methylmercury. Value for women of child-bearing age and children < 12 years.

[b] Value for soluble nickle

[c] The oral RfD for thallium is based on a urine concentration of 5 ug/L below which adverse human health effects are unlikely, which corresponds to a daily dose of less than 10 ug in the form of a soluble compound. The daily dose was adjusted by the age-specific body weight (16.5 kg for toddlers and 70.7 kg for adults) to derive the oral RfD.

[d] Derived from the oral RfD for vanadium pentoxide of 0.009 mg/kg-day based upon the proportion of the compound that is vanadium metal. Therefore, 0.009 mg/kg-day x 56% = 0.00504 mg/kg-day.

[e] A RfD is not available for acenaphthylene, therefore the value for acenaphthene was used as a surrogate.

[f] A RfD is not available for fluorene, therefore the value for fluoranthene was used as a surrogate.

Sources:

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U.S. EPA (United States Environmental Protection Agency). Integrated Risk Information System. Online Database. Available online from www.epa.gov/iris/. Accessed March 2, 2016. Assessment date is provided for each chemical.

Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada, Part II: Toxicological Reference Values (TRVs) and Chemical-Specific Factors. Version 2.0. Health Canada. Ottawa, ON.

RIVM (Rijksinstituut Voor Volksgezondheid en Milieu; National Institute of Public Health and the Environment). 2001. Re-evaluation of Human Toxicological Maximum Permissible Risk Levels. RIVM Report No. 711701 025. Bilthoven, Netherlands.

SNC Lavalin. 2012. Proposed Toxicological Reference Values for Lead (Pb). Prepared by Ross Wilson. May 29, 2012.

WHO (World Health Organization). 1982. Toxicological evaluation of certain food additives. WHO Food Additives Series, No. 17, no 552: Tin and Stannous Chloride

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WHO. 2010. CICAD (Concise International Chemical Assessment Document) 77: Strontium and Strontium Compounds.

WHO. 2011. WHO Food Additive Series: 64. Safety Evaluation of Certain Food Additives and Contaminants. Prepared by the seventy-third meeting of JECFA. Joint FAO/WHO Expert Committee on Food Additives. WHO Press, Geneva, Switzerland. ISBN 978 924 166064 8.

ATTACHMENT 1

Screened Baseline Soil and Tissue Concentrations

Table 1: Baseline Soil Screening
Public Health Assessment
Proposed Burnco Aggregate Project

Sample ID Date Sampled ALS Sample ID QA/QC		BC CSR-Standards for the Protection of Human Health				CCME- Guidelines for the Protection of Human Health				BC Regional Background	Selected Screening Value[d]	13-BRP-S-01 19-Aug-13 L1350062-11	13-BRP-S-02 19-Aug-13 L1350062-12	13-BRP-S-03 19-Aug-13 L1350062-13	13-BRP-S-04 19-Aug-13 L1350062-14	13-BRP-S-05 19-Aug-13 L1350062-15	13-BRP-S-06 19-Aug-13 L1350062-16	13-BRP-S-07 19-Aug-13 L1350062-17 FDA	13-BRP-S-08 19-Aug-13 L1350062-18	13-BRP-S-09 19-Aug-13 L1350062-19
	Units	Residential Land Use	Notes	Industrial Land Use	Notes	Residential Land Use	Notes	Industrial Land Use	Notes	Lower Mainland										
Physical Tests																				
pH	pH units											4.40	4.05	3.63	3.65	5.01	4.83	5.02	5.23	5.85
Metals																				
Aluminum (Al)	mg/kg									45,000	45,000	16,600	11,400	3420	3910	17,000	44,000	12,600	18,400	17,000
Antimony (Sb)	mg/kg	**20**	G	40	G	20	G	40	G	15	20	0.53	0.53	0.80	1.14	0.34	0.17	0.25	0.32	0.34
Arsenic (As)	mg/kg	**100**	I	300	I	12	SI	12	SI	20	12	13.4	12.7	4.77	8.64	15.7	5.39	9.49	11.5	10.8
Barium (Ba)	mg/kg	**6500**	I	>1,000,000	I	6800	DC	130000	DC	300	6500	70.5	57.6	34.0	67.1	75.9	217	76.4	78.0	61.2
Beryllium (Be)	mg/kg	**4**	G	8	G	75	DC	1400	DC	1.5	4	<0.20	<0.20	<0.20	<0.20	<0.20	0.36	<0.20	<0.20	0.21
Bismuth (Bi)	mg/kg									-	-	0.21	0.23	<0.20	0.29	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)	mg/kg	**3**	I[a]	3500	I	14	SI	2090	SI	0.4	3	0.137	0.157	0.186	0.133	0.101	0.090	0.051	0.073	0.106
Calcium (Ca)	mg/kg									8000	8000	3080	4130	2990	4040	2870	3530	2740	3190	3070
Chromium (Cr)	mg/kg	**100**	I[b]	20000	I[b]	220	SI[c]	6700	SI[c]	80	100	21.9	16.6	5.14	7.50	25.6	23.1	29.0	30.2	35.8
Cobalt (Co)	mg/kg	**50**	G	300	G	50	G	300	G	30	50	6.32	4.31	1.01	1.40	9.76	11.1	6.44	8.19	7.46
Copper (Cu)	mg/kg	**15000**	I	200000	I	1100	SI	20000	SI	45	1100	24.7	23.2	21.8	14.4	26.5	40.2	26.9	23.8	24.3
Iron (Fe)	mg/kg									45,000	45,000	17,900	13,100	3640	4870	19,100	28,000	18,200	22,000	22,100
Lead (Pb)	mg/kg	**400**	I	4000	I	140	SI	8200	SI	60	140	36.1	37.2	58.0	46.1	5.20	6.61	3.00	3.40	5.44
Lithium (Li)	mg/kg	**1600**	G	20000	G					-	1600	10.8	7.1	<5.0	<5.0	16.1	14.9	15.2	14.7	16.9
Magnesium (Mg)	mg/kg									10,000	10,000	4180	3040	638	1130	4800	8110	4730	5310	5910
Manganese (Mn)	mg/kg	**1800**	G	19000	G					800	1800	202	178	119	36.8	297	497	228	316	391
Mercury (Hg)	mg/kg	**15**	I	2000	I	6.6	SI	690	SI	0.15	6.6	0.105	0.329	0.380	0.336	0.0336	0.0230	0.0085	0.0264	0.0117
Molybdenum (Mo)	mg/kg	**10**	G	40	G	10	G	40	G	1 [HDL]	10	0.88	0.79	0.63	0.59	0.62	0.72	0.51	0.75	0.82
Nickel (Ni)	mg/kg	**100**	G	500	G	200	SI/DC	5100	DC	80	100	11.8	12.0	7.51	7.23	18.7	17.6	19.7	16.3	23.1
Phosphorus (P)	mg/kg									2000	2000	325	592	853	713	483	704	406	364	408
Potassium (K)	mg/kg									5000	5000	890	960	500	340	1850	2320	1710	1490	1760
Selenium (Se)	mg/kg	**3**	G	10	G	80	DC	4050	DC	4 [HDL]	3	0.42	0.40	0.40	0.53	<0.20	<0.20	<0.20	0.27	<0.20
Silver (Ag)	mg/kg	**20**	G	40	G	20	G	40	G	1 [HDL]	20	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg	**>1,000,000**	I	>1,000,000	I					900	1,000,000	590	400	180	180	390	300	370	490	510
Strontium (Sr)	mg/kg	**47000**	G	100000	G					75	47,000	24.6	25.7	17.5	29.2	19.3	40.8	20.6	22.3	22.7
Thallium (Tl)	mg/kg					1	SI , P	1	SI , P	-	1	0.103	0.094	<0.050	<0.050	0.117	0.110	0.101	0.131	0.104
Tin (Sn)	mg/kg	**50**	G	300	G	50	G	300	G	4 [HDL]	50	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg									2,500	2,500	827	498	133	188	666	1750	528	711	573
Uranium (U)	mg/kg	**16**	G	200	G	23	DC	510	DC	-	16	1.98	1.39	0.254	0.209	3.14	0.803	1.24	2.14	0.502
Vanadium (V)	mg/kg	**200**	G							150	200	53.7	36.2	12.1	16.5	49.9	73.5	50.6	70.0	56.6
Zinc (Zn)	mg/kg	**10000**	I	>1,000,000	I					100	10,000	35.5	38.3	34.7	33.2	44.5	63.1	41.5	43.8	57.6

Notes:

CSR-Contaminated Sites Regulations Soil Standards-Schedules 4, 5 and 10 BC Regs 375/96, December 16, 1996, updates to January 2014.

CCME-Canadian Environmental Quality Guidelines - Canadian Council of Ministers of the Environment, 1999, includes updates to 2015.

BC Regional Background soil concentrations were obtained from BC MoE (2010) Protocol 4 - Determining Background Soil Quality, Table 1 - Regional background soil quality estimates for inorganic substances, Lower Mainland.

1. Where screening values were not available from BC CSR or CCME, US EPA RSLs (Regional Screening Levels) for Residential Soils (2014) were used. RSLs were adjusted from an HQ = 1 to HQ = 0.2 by dividing by 5.
2. Non-toxic essential mineral

< = below laboratory detection limit; DC = Direct contact; I = Soil Intake; FD = Field duplicate; FDA = Field duplicate available; G = Generic guideline or standard; HDL = Half the detection limit; mg/kg = milligram per kilogram; P = Provisional; QA/QC = Quality assurance/quality control; SI = Soil ingestion pathway; US EPA = United States Environmental Protection Agency.

a. Standard for land used to grow produce for human consumption
b. Standard is for chromium VI
c. Standard is for total chromium
d. Lower of BC CSR and CCME. If a value was not available from BC CSR or CCME, BC regional background was used.

Table 2: Baseline Fish Tissue Screening
Public Health Assessment
Proposed Burnco Aggregate Project

Location	Fish Screening Level [1]	Notes	McNab Creek
Sample ID			ONCL
Date Sampled			9-Dec-13
Matrix			Tissue
Units			mg/kg wwt
Physical Tests			
% Moisture	-		76.2
Metals			
Aluminum (Al)	**165**		1.68
Antimony (Sb)	**0.07**		0.0047
Arsenic (As)	**0.01**		**0.381**
Barium (Ba)	**33.0**		0.058
Beryllium (Be)	**0.33**		<0.0020
Bismuth (Bi)	-		<0.0020
Boron (B)	**2.89**		<0.20
Cadmium (Cd)	**0.17**		0.0083
Calcium (Ca)	-		1260
Cesium (Cs)	-		0.0230
Chromium (Cr)	**0.17**	2	**0.259**
Chromium (Cr)	**0.50**	3	0.259
Cobalt (Co)	**0.23**		0.0112
Copper (Cu)	**15.0**		1.62
Gallium (Ga)	-		<0.0040
Iron (Fe)	**132**		15.0
Lead (Pb)	**0.10**		**2.35**
Lithium (Li)	**-**		<0.020
Magnesium (Mg)	-		364
Manganese (Mn)	**22.4**		0.335
Mercury (Hg)	**0.03**	4	**0.099**
Molybdenum (Mo)	**3.80**		0.0175
Nickel (Ni)	**1.82**	5	0.097
Phosphorus (P)	-		3190
Potassium (K)	-		3850
Rhenium (Re)	-		<0.0020
Rubidium (Rb)	-		1.53
Selenium (Se)	**1.02**		0.489
Silver (Ag)	**0.83**		0.0018
Sodium (Na)	-		509
Strontium (Sr)	**21.5**		4.62
Tellurium (Te)	-		<0.0040
Thallium (Tl)	**0.10**		0.00062
Thorium (Th)	-		<0.0020
Tin (Sn)	**330**		<0.020
Uranium (U)	**0.10**		<0.00040
Vanadium (V)	**0.83**		0.104
Yttrium (Y)	-		<0.0020
Zinc (Zn)	**79.2**		34.5
Zirconium (Zr)	**-**		<0.040

Notes:

1. Screening values determined using Health Canada (2010) ingestion of contaminated foods equation. Details provided in text.

2. Screening value for chromium VI; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

3. Screening value for chromium III; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

4. Screening value for methylmercury

5. Screening value for soluble nickel

"-" = no value; < = below laboratory detection limit; mg/kg wwt = milligrams per kilogram in wet weight; ONCL= cutthroat trout.

Value	indicates exceedance of the screening level
Value	indicates detection limit exceeds the screening level

Table 3: Baseline Crab Tissue Screening
Public Health Assessment
Proposed Burnco Aggregate Project

Location	Shellfish Screening Level [1]	Notes	Camp Potlatch													
Sample ID			CP CRAB-TS-1	CP CRAB-TS-2	CP CRAB-TS-3	CP CRAB-TS-4	CP CRAB-TS-5	CP CRAB-TS-6	CP CRAB-TS-7	CP CRAB-TS-1	CP CRAB-TS-2	CP CRAB-TS-3	CP CRAB-TS-4	CP CRAB-TS-5	CP CRAB-TS-6	CP CRAB-TS-7
Date Sampled			5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13
Matrix			Muscle Tissue							Organ Tissue						
Physical Tests																
% Moisture	-		81.5	84.2	84.2	81.0	82.0	82.9	81.8	75.0	86.7	90.5	88.1	88.9	91.3	86.6
Metals																
Aluminum (Al)	**367**		0.98	1.11	3.52	3.71	2.15	1.71	4.23	2.21	3.86	8.77	1.85	13.9	3.35	2.51
Antimony (Sb)	**0.15**		<0.0020	<0.0020	0.0023	<0.0020	0.0028	<0.0020	<0.0020	0.0024	0.0061	<0.0020	<0.0020	0.0040	0.0029	0.0026
Arsenic (As)	**0.06**		**3.76**	**3.10**	**9.48**	**3.50**	**11.60**	**1.66**	**4.84**	**3.81**	**1.72**	**5.45**	**1.82**	**6.31**	**1.06**	**3.15**
Barium (Ba)	**73.3**		0.015	0.021	0.047	0.071	0.048	0.023	0.038	0.047	0.129	0.108	0.144	0.840	0.071	0.135
Beryllium (Be)	**0.73**		<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
Bismuth (Bi)	**-**		<0.0020	<0.0020	0.0044	<0.0020	0.0064	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020
Boron (B)	**6.42**		0.71	0.88	1.38	1.12	1.37	0.96	1.13	1.11	1.06	1.47	0.88	1.54	0.93	1.16
Cadmium (Cd)	**0.37**		0.0205	0.0180	0.0139	0.0086	0.0144	0.0101	0.0131	0.1980	0.1540	0.0952	0.0486	0.1030	0.0720	0.1140
Calcium (Ca)	**-**		642	840	682	927	764	645	450	3000	2870	819	1480	3570	889	1800
Cesium (Cs)	**-**		0.0033	0.0030	0.0044	0.0034	0.0032	0.0032	0.0037	0.0035	0.0029	0.0031	0.0026	0.0035	0.0047	0.0054
Chromium (Cr)	**0.37**	2	0.015	0.014	<0.010	0.011	<0.010	0.012	<0.010	0.018	0.106	0.010	0.015	0.065	0.072	0.011
Chromium (Cr)	**1.10**	3	0.015	0.014	<0.010	0.011	<0.010	0.012	<0.010	0.018	0.106	0.010	0.015	0.065	0.072	0.011
Cobalt (Co)	**0.51**		0.0215	0.0315	0.0408	0.0368	0.0518	0.0337	0.0431	0.0644	0.0734	0.0855	0.0557	0.106	0.0884	0.107
Copper (Cu)	**33.4**		5.18	5.43	11.0	8.33	12.3	9.06	12.5	6.86	4.85	**58.1**	10.8	33.1	16.6	30.1
Gallium (Ga)	**-**		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0068	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron (Fe)	**293**		3.41	3.62	7.18	5.01	4.90	3.53	6.71	19.2	37.3	19.4	11.2	19.0	12.3	17.3
Lead (Pb)	**0.22**		<0.0040	<0.0040	0.0062	0.0048	<0.0040	0.0045	<0.0040	0.0222	0.0658	0.123	0.0229	0.0821	0.0233	0.0416
Lithium (Li)	**-**		0.098	0.112	0.096	0.073	0.076	0.111	0.051	0.130	0.095	0.146	0.089	0.134	0.133	0.089
Magnesium (Mg)	**-**		448	543	532	376	445	498	398	745	927	735	509	830	1080	821
Manganese (Mn)	**49.9**		0.0923	0.111	0.123	0.195	0.180	0.106	0.120	0.520	0.883	0.695	0.523	2.57	0.437	1.16
Mercury (Hg)	**0.07**	4	0.0340	0.0298	**0.151**	0.0544	**0.296**	0.0248	**0.0988**	0.0160	0.0533	**0.0861**	0.0236	**0.117**	0.0250	0.0518
Molybdenum (Mo)	**8.43**		0.0122	0.0240	0.0124	0.0147	0.0116	0.0390	0.0104	0.0735	0.466	0.0641	0.0601	0.0529	0.437	0.0654
Nickel (Ni)	**4.03**	5	0.017	0.015	0.025	0.012	0.015	0.018	0.011	0.050	0.055	0.027	0.017	0.080	0.062	0.024
Phosphorus (P)	**-**		1040	868	999	1270	1120	943	1380	1080	1550	1020	858	1960	1280	2300
Potassium (K)	**-**		2550	2300	2550	2670	2530	2330	2670	1800	1050	1330	1260	1550	1420	1950
Rhenium (Re)	**-**		<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
Rubidium (Rb)	**-**		0.820	0.750	0.701	0.719	0.667	0.790	0.660	0.731	0.480	0.450	0.517	0.605	0.845	0.846
Selenium (Se)	**2.27**		0.288	0.298	0.326	0.331	0.427	0.271	0.330	0.649	0.618	0.559	0.340	0.532	0.399	0.769
Silver (Ag)	**1.83**		0.0357	0.0555	0.0569	0.0539	0.0772	0.0843	0.100	0.0799	0.136	0.877	0.107	0.414	0.217	0.566
Sodium (Na)	**-**		4490	5560	4810	3980	3800	5090	3350	5550	4510	5610	4220	5420	5550	5240
Strontium (Sr)	**47.7**		7.28	14.5	8.10	11.2	9.01	8.29	4.30	23.9	36.6	13.7	20.3	**64.0**	13.2	31.5
Tellurium (Te)	**-**		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	**0.22**		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00066	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Thorium (Th)	**-**		<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
Tin (Sn)	**733**		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.058	0.089	0.084	0.049	0.043	0.054	<0.020
Uranium (U)	**0.22**		0.00080	0.00094	0.00840	0.00098	0.00054	0.00055	0.00049	0.0350	0.0898	0.00743	0.0169	0.0256	0.0218	0.0201
Vanadium (V)	**1.85**		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.029	0.066	0.043	0.026	0.074	0.108	0.037
Yttrium (Y)	**-**		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0030	0.0148	0.0042	<0.0020	0.0108	0.0033	0.0036
Zinc (Zn)	**176**		26.1	26.4	29.8	28.4	30.5	27.0	32.3	10.1	10.9	10.3	8.21	10.7	9.23	23.2
Zirconium (Zr)	**-**		<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Notes:

Units in milligram per kilogram wet weight (mg/kg ww) unless otherwise specified.

1. Screening values determined using Health Canada (2010) ingestion of contaminated foods equation. Details provided in text.

2. Screening value for chromium VI; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

3. Screening value for chromium III; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

4. Screening value for methylmercury

5. Screening value for soluble nickel

"-" = no value; < = below laboratory detection limit; FDA = Field duplicate available; QA/QC = Quality assurance/quality control.

Value indicates exceedance of the screening level

Value indicates detection limit exceeds the screening level

Table 3: Baseline Crab Tissue Screening
Public Health Assessment
Proposed Burnco Aggregate Project

Location		Proposed Project Area																	
Sample ID	Shellfish Screening Level [1]	MCNAB - CRAB-TS-1	MCNAB - CRAB-TS-2	MCNAB - CRAB-TS-3	MCNAB - CRAB-TS-4	MCNAB - CRAB-TS-5	MCNAB - CRAB-TS-6	MCNAB - CRAB-TS-7	MCNAB - CRAB-TS-9	MCNAB - CRAB-TS-10	MCNAB - CRAB-TS-1	MCNAB - CRAB-TS-2	MCNAB - CRAB-TS-3	MCNAB - CRAB-TS-4	MCNAB - CRAB-TS-5	MCNAB - CRAB-TS-6	MCNAB - CRAB-TS-7	MCNAB - CRAB-TS-9	MCNAB - CRAB-TS-10
Date Sampled		5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13
Matrix		Muscle Tissue									Organ Tissue								
Physical Tests																			
% Moisture	-	80.8	82.8	86.9	79.6	81.3	81.5	88.3	82.5	86.8	90.9	84.7	86.4	79.4	81.8	84.4	88.4	87.6	86.6
Metals																			
Aluminum (Al)	**367**	1.55	1.80	1.88	1.40	1.11	2.32	2.02	3.73	1.87	0.67	2.68	0.89	5.85	0.99	1.66	1.68	0.73	1.40
Antimony (Sb)	**0.15**	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028	<0.0020	0.0033	<0.0020	0.0033	0.0021	<0.0020	0.0048	0.0020	0.0025	<0.0020	0.0022	<0.0020
Arsenic (As)	**0.06**	**2.79**	**3.71**	**1.25**	**2.93**	**2.80**	**8.15**	**1.77**	**12.20**	**5.56**	**1.66**	**1.96**	**1.08**	**3.01**	**2.66**	**4.87**	**1.60**	**7.12**	**3.33**
Barium (Ba)	**73.3**	0.021	0.030	0.050	0.029	0.040	0.029	0.064	0.059	0.052	0.314	0.136	0.106	0.089	0.087	0.055	0.085	0.085	0.087
Beryllium (Be)	**0.73**	<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	<0.0020
Bismuth (Bi)	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0046	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020
Boron (B)	**6.42**	1.47	1.70	1.40	1.56	1.12	1.18	0.87	2.10	1.19	1.23	1.57	1.20	1.28	0.93	1.00	0.90	1.45	1.09
Cadmium (Cd)	**0.37**	0.0097	0.0392	0.0121	0.0251	0.0343	0.0229	0.0521	0.0087	0.0384	0.0816	0.2210	0.0371	0.3040	0.3280	0.1540	0.1930	0.0503	0.1100
Calcium (Ca)	-	655	908	815	989	1070	859	1960	895	1110	2160	3390	2750	3220	2410	1510	2420	1370	2980
Cesium (Cs)	-	0.0038	0.0039	0.0031	0.0040	0.0038	0.0041	0.0027	0.0041	0.0031	0.0040	0.0034	0.0023	0.0046	0.0034	0.0032	0.0024	0.0031	0.0020
Chromium (Cr)	**0.37**	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.024	0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	0.015
Chromium (Cr)	**1.10**	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.024	0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	0.015
Cobalt (Co)	**0.51**	0.0266	0.0271	0.0257	0.0333	0.0293	0.0387	0.0243	0.0570	0.0416	0.0427	0.0416	0.0380	0.0751	0.0648	0.0797	0.0349	0.0902	0.0639
Copper (Cu)	**33.4**	10.1	8.68	8.88	8.37	7.57	13.4	4.99	10.5	10.7	15.4	9.55	12.2	17.8	13.5	**35.9**	6.62	**33.5**	18.3
Gallium (Ga)	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron (Fe)	**293**	4.64	3.81	3.45	3.53	3.70	6.51	2.96	8.44	4.18	25.7	11.9	4.56	11.7	14.7	19.6	4.46	8.38	8.91
Lead (Pb)	**0.22**	0.0043	<0.0040	<0.0040	<0.0040	<0.0040	0.0041	<0.0040	0.0057	<0.0040	0.0404	0.0273	0.0284	0.0426	0.0096	0.0230	0.0104	0.0141	0.0240
Lithium (Li)	-	0.088	0.124	0.158	0.075	0.088	0.083	0.172	0.107	0.161	0.111	0.151	0.175	0.105	0.113	0.121	0.172	0.137	0.158
Magnesium (Mg)	-	476	578	682	468	437	486	669	602	672	836	1010	889	679	523	584	783	649	707
Manganese (Mn)	**49.9**	0.132	0.148	0.134	0.117	0.165	0.373	0.153	2.83	0.338	0.915	1.01	0.334	0.649	0.789	1.94	0.434	3.51	0.686
Mercury (Hg)	**0.07**	0.0301	0.0493	0.0243	0.0355	0.0297	0.0627	0.0367	**0.0932**	0.0492	0.0288	0.0470	0.0103	0.0273	0.0160	0.0391	0.0205	0.0488	0.0262
Molybdenum (Mo)	**8.43**	0.0154	0.0170	0.0140	0.0122	0.0127	0.0160	0.0124	0.0295	0.0135	0.0835	0.0537	0.0301	0.0670	0.0457	0.0453	0.0329	0.0345	0.0305
Nickel (Ni)	**4.03**	0.017	0.015	0.022	0.025	0.013	0.017	0.014	0.020	0.016	0.025	0.028	0.024	0.032	0.021	0.017	0.017	0.022	0.029
Phosphorus (P)	-	1020	873	698	1000	1050	996	719	919	700	1460	1580	849	1110	1310	949	958	1300	719
Potassium (K)	-	2680	2490	1900	2830	2740	2640	1730	2500	1870	1270	1910	1590	2280	2100	1870	1360	1840	1440
Rhenium (Re)	-	<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	<0.0020
Rubidium (Rb)	-	0.732	0.803	0.729	0.815	0.796	0.713	0.649	0.750	0.693	0.607	0.632	0.539	0.832	0.724	0.596	0.544	0.563	0.443
Selenium (Se)	**2.27**	0.284	0.377	0.251	0.331	0.314	0.273	0.229	0.415	0.286	0.375	0.603	0.291	0.548	0.526	0.522	0.345	0.521	0.374
Silver (Ag)	**1.83**	0.102	0.0839	0.126	0.0860	0.0864	0.115	0.0697	0.145	0.136	0.192	0.194	0.144	0.229	0.290	0.384	0.0826	1.02	0.234
Sodium (Na)	-	4410	5130	6520	3760	4300	4190	8600	4430	6650	4780	6200	7560	5370	5280	5330	7360	5700	7200
Strontium (Sr)	**47.7**	7.38	15.5	21.2	11.9	14.4	10.2	25.5	11.0	23.5	41.7	**51.5**	**51.1**	32.2	29.7	18.6	31.0	20.6	38.1
Tellurium (Te)	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	**0.22**	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Thorium (Th)	-	0.0029	<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
Tin (Sn)	**733**	<0.020	0.029	0.035	0.027	0.022	<0.020	0.040	0.065	0.026	0.031	0.122	0.121	0.067	0.102	0.062	0.121	0.111	0.108
Uranium (U)	**0.22**	0.00062	0.00050	0.00045	0.00050	0.00051	0.00119	0.00098	0.00146	0.00261	0.0241	0.0243	0.00594	0.0232	0.0159	0.0268	0.0272	0.0183	0.0422
Vanadium (V)	**1.85**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.025	<0.020	0.023	<0.020	<0.020	0.054	0.024	0.028	0.023	0.025	0.029
Yttrium (Y)	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0035	<0.0020	0.0039	<0.0020	<0.0020	0.0044	<0.0020	0.0028
Zinc (Zn)	**176**	34.2	31.8	24.5	35.3	30.5	33.9	18.6	32.7	21.6	9.08	9.89	9.72	12.2	14.3	15.7	9.24	14.2	8.77
Zirconium (Zr)	-	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Notes:

Units in milligram per kilogram wet weight (mg/kg ww) ur

1. Screening values determined using Health Canada (2

2. Screening value for chromium VI; speciation data is nc

3. Screening value for chromium III; speciation data is nc

4. Screening value for methylmercury

5. Screening value for soluble nickel

"-" = no value; < = below laboratory detection limit; FDA

Value indicates exceedance of

Value indicates detection limit

Table 4: Baseline Mussel Screening
Public Health Assessment
Proposed Burnco Aggregate Project

Location			Camp Potlatch										Proposed Project Area								
Sample ID	Shellfish Screening Level [1]	Notes	BMREF1-T	BMREF2-T	CP MUSSEL-TS-1A	CP MUSSEL-TS-2	CP MUSSEL-TS-3	CP MUSSEL-TS-4	CP MUSSEL-TS-5	CP MUSSEL-TS-6	CP MUSSEL-TS-7	CP MUSSEL-TS-8	MCM1	MCM2	MCM3	MCNAB-MUSSEL-TS-1A	MCNAB-MUSSEL-TS-5	MCNAB-MUSSEL-TS-6	MCNAB-MUSSEL-TS-7	MCNAB-MUSSEL-TS-8	MCNAB-MUSSEL-TS-9	MCNAB-MUSSEL-TS-10
Date Sampled			12-Sep-12	12-Sep-12	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	17-Aug-12	17-Aug-12	17-Aug-12	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13	5-Dec-13
Matrix			Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
QA/QC					FDA											FDA						
Physical Tests																						
% Moisture	-		83.8	92.6	82.5	81.7	79.4	81.0	79.8	74.4	82.1	80.8	84.4	91.5	90.4	65.3	82.3	81.5	78.1	82.1	82.7	76.3
Metals																						
Aluminum (Al)	**367**		185	84	49.4	40.6	29.5	**1160**	40.0	87.1	83.9	37.5	171	17.7	145	114	21.1	90.7	19.3	59.5	62.4	91.4
Antimony (Sb)	**0.15**		<0.010	<0.010	0.0025	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0027	<0.0020	<0.010	<0.010	<0.010	0.0059	<0.0020	0.0028	<0.0020	0.0023	0.0028	0.0030
Arsenic (As)	**0.06**		**1.09**	**1.25**	**1.22**	**1.76**	**1.55**	**0.846**	**1.04**	**1.22**	**1.32**	**1.17**	**1.51**	**0.678**	**0.794**	**1.38**	**1.29**	**1.30**	**1.24**	**1.32**	**1.18**	**0.969**
Barium (Ba)	**73.3**		1.35	0.948	0.316	0.250	0.189	13.1	0.202	0.443	0.379	0.268	1.68	0.152	1.21	0.750	0.170	0.679	0.176	0.365	0.425	0.569
Beryllium (Be)	**0.73**		<0.10	<0.10	<0.0020	<0.0020	<0.0020	0.0191	<0.0020	<0.0020	<0.0020	<0.0020	<0.10	<0.10	<0.10	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)	**-**		<0.030	<0.030	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.030	<0.030	<0.030	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron (B)	**6.42**		-	-	3.53	4.03	3.82	4.13	3.82	4.05	3.85	3.79	-	-	-	3.91	3.57	3.02	3.49	3.29	2.97	3.39
Cadmium (Cd)	**0.37**		**0.502**	**0.538**	**0.428**	**0.639**	**0.541**	**0.450**	**0.392**	**0.390**	**0.399**	**0.376**	**0.558**	**2.13**	**0.563**	**0.405**	0.307	**0.393**	0.304	**0.449**	**0.373**	0.297
Calcium (Ca)	**-**		550	3040	571	709	704	659	573	768	622	596	1730	217	2110	693	614	615	1520	797	540	515
Cesium (Cs)	**-**		-	-	0.0052	0.0036	0.0040	0.338	0.0036	0.0082	0.0061	0.0047	-	-	-	0.0093	0.0027	0.0078	0.0026	0.0050	0.0054	0.0067
Chromium (Cr)	**0.37**	2	0.22	0.11	0.070	0.103	0.059	**0.993**	0.033	0.066	0.074	0.069	0.22	<0.10	0.20	0.152	0.055	0.132	0.039	0.117	0.097	0.080
Chromium (Cr)	**1.10**	3	0.22	0.11	0.070	0.103	0.059	0.993	0.033	0.066	0.074	0.069	0.22	<0.10	0.20	0.152	0.055	0.132	0.039	0.117	0.097	0.080
Cobalt (Co)	**0.51**		0.136	0.083	0.0654	0.101	0.0644	**0.886**	0.0507	0.0615	0.0767	0.0823	0.155	0.026	0.132	0.0859	0.0360	0.0721	0.0432	0.0630	0.0623	0.0596
Copper (Cu)	**33.4**		1.04	0.819	1.04	0.860	1.09	0.623	0.912	0.783	0.948	0.805	1.26	**35.7**	1.25	1.33	0.735	0.990	1.05	0.936	1.07	0.907
Gallium (Ga)	**-**		-	-	0.0113	0.0078	0.0110	0.321	0.0115	0.0191	0.0186	0.0085	-	-	-	0.0272	0.0055	0.0245	0.0047	0.0137	0.0136	0.0206
Iron (Fe)	**293**		-	-	65.1	49.9	45.8	**1410**	45.9	63.8	84.7	56.0	-	-	-	120	38.0	119	33.8	76.8	82.8	99.0
Lead (Pb)	**0.22**		0.046	0.026	0.0758	0.0620	0.0345	0.0613	0.0372	0.0554	0.0449	0.0286	0.091	0.028	0.094	**0.465**	0.0344	0.0790	0.0365	0.0742	0.0644	0.0736
Lithium (Li)	**-**		0.22	0.1	0.164	0.134	0.106	1.41	0.126	0.215	0.146	0.103	0.23	<0.10	0.16	0.139	0.079	0.128	0.066	0.136	0.089	0.119
Magnesium (Mg)	**-**		438	435	848	838	1030	1120	862	961	900	798	568	267	344	780	777	726	709	808	645	670
Manganese (Mn)	**49.9**		6.33	3.67	1.79	1.26	1.81	15.5	2.52	2.59	3.30	1.70	6.57	0.992	5.48	4.51	1.98	3.39	2.24	2.82	2.72	2.85
Mercury (Hg)	**0.07**	4	0.0056	0.006	0.0085	0.0152	0.0104	0.0075	0.0066	0.0072	0.0082	0.0066	0.0122	0.0103	0.011	0.0080	0.0065	0.0074	0.0071	0.0088	0.0083	0.0060
Molybdenum (Mo)	**8.43**		0.106	0.036	0.0876	0.103	0.0887	0.0719	0.0654	0.0752	0.133	0.0882	0.078	0.011	0.062	0.101	0.0679	0.0716	0.0757	0.0971	0.0766	0.0683
Nickel (Ni)	**4.03**	5	0.23	0.15	0.141	0.142	0.171	0.851	0.114	0.126	0.202	0.150	0.28	<0.10	0.3	0.236	0.078	0.135	0.107	0.129	0.125	0.131
Phosphorus (P)	**-**		-	-	1050	1400	1410	988	1040	1230	1070	1410	-	-	-	1230	1520	1310	1730	1220	1200	1060
Potassium (K)	**-**		-	-	1210	1520	1240	1380	1390	1360	1240	1310	-	-	-	1580	1360	1260	1460	1100	1120	1510
Rhenium (Re)	**-**		-	-	<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
Rubidium (Rb)	**-**		-	-	0.564	0.651	0.565	1.66	0.629	0.652	0.588	0.564	-	-	-	0.723	0.621	0.629	0.666	0.466	0.511	0.691
Selenium (Se)	**2.27**		0.22	0.24	0.327	0.379	0.455	0.276	0.362	0.349	0.419	0.365	0.31	0.2	<0.20	0.387	0.361	0.348	0.441	0.325	0.339	0.368
Silver (Ag)	**1.83**		-	-	0.0052	0.0076	0.0057	0.0024	0.0058	0.0067	0.0051	0.0051	-	-	-	0.0043	0.0046	0.0040	0.0051	0.0034	0.0038	0.0045
Sodium (Na)	**-**		-	-	5720	4840	5350	5860	5930	6050	5710	5480	-	-	-	4850	5140	4310	4280	4860	3640	4640
Strontium (Sr)	**47.7**		5.37	25.9	6.76	7.59	6.98	8.40	6.73	8.88	7.16	6.98	16.1	2.15	19	7.20	5.96	6.60	8.40	7.34	4.71	5.31
Tellurium (Te)	**-**		-	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	-	-	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	**0.22**		<0.010	<0.010	0.00163	0.00060	0.00123	0.00970	0.00084	0.00093	0.00148	0.00103	<0.010	<0.010	<0.010	0.00342	0.00090	0.00145	0.00167	0.00143	0.00172	0.00206
Thorium (Th)	**-**		-	-	0.0050	0.0045	0.0041	0.0357	0.0028	0.0039	0.0057	0.0024	-	-	-	0.0142	0.0031	0.0105	0.0026	0.0073	0.0089	0.0105
Tin (Sn)	**733**		<0.050	<0.050	0.088	0.089	0.028	0.052	0.060	0.061	0.064	0.057	<0.050	<0.050	<0.050	0.080	0.064	0.071	0.042	0.055	0.052	0.071
Uranium (U)	**0.22**		0.0765	0.0211	0.0333	0.0581	0.0317	0.0350	0.0200	0.0255	0.0352	0.0247	0.119	0.0299	0.128	0.0515	0.0210	0.0348	0.0231	0.0328	0.0295	0.0236
Vanadium (V)	**1.85**		0.66	0.27	0.229	0.198	0.172	**3.76**	0.160	0.249	0.446	0.206	0.63	<0.10	0.54	0.336	0.124	0.372	0.094	0.212	0.233	0.294
Yttrium (Y)	**-**		-	-	0.0335	0.0505	0.0227	0.152	0.0163	0.0312	0.0340	0.0157	-	-	-	0.0550	0.0168	0.0502	0.0166	0.0387	0.0400	0.0424
Zinc (Zn)	**176**		8.07	8.01	10.2	17.5	9.39	9.71	10.4	8.19	8.12	10.4	14.4	**210**	12.1	12.2	13.1	9.80	12.6	11.3	11.1	11.2
Zirconium (Zr)	**-**		-	-	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	-	-	-	0.041	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Polycyclic Aromatic Hydrocarbons																						
Acenaphthene	**22.0**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.040	<0.070	-	-	-	-	-	-	-
Acenaphthylene	**22.0**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Anthracene	**110**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Benz(a)anthracene	**0.46**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Benzo(a)pyrene	**0.05**		<0.010	<0.010	-	-	-	-	-	-	-	-	*<0.060*	<0.010	*<0.070*	-	-	-	-	-	-	-
Benzo(b)fluoranthene	**0.46**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	**4.55**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Benzo(k)fluoranthene	**0.46**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Chrysene	**4.55**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.020	<0.070	-	-	-	-	-	-	-
Dibenz(a,h)anthracene	**0.05**		<0.010	<0.010	-	-	-	-	-	-	-	-	*<0.060*	<0.010	*<0.070*	-	-	-	-	-	-	-
Fluoranthene	**14.7**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Fluorene	**14.7**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	**0.46**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
2-methylnaphthalene	**1.47**		<0.010	<0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	**7.33**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Phenanthrene	**14.7**		<0.010	<0.010	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-
Pyrene	**11.0**		<0.010	<0.030	-	-	-	-	-	-	-	-	<0.060	<0.010	<0.070	-	-	-	-	-	-	-

Notes:
Units in milligram per kilogram wet weight (mg/kg ww) unless otherwise specified.

1. Screening values determined using Health Canada (2010) ingestion of contaminated foods equation. Details provided in text.

2. Screening value for chromium VI; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

3. Screening value for chromium III; speciation data is not available, therefore, the total chromium concentration is compared to both the chromium VI and chromium III screening values.

4. Screening value for methylmercury

5. Screening value for soluble nickel

"-" = no value or not measured; < = below laboratory detection limit; FDA = Field duplicate available; QA/QC = Quality assurance/quality control.

Value indicates exceedance of the screening level

Value indicates detection limit exceeds the screening level

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