

2019 ISKUT LANDFILL ANNUAL REPORT

June 2020

Prepared for:

British Columbia Ministry of
Environment & Climate Change
Strategy
EnvAuthorizationsReporting@gov.bc.ca

Prepared by:

Regional District of Kitimat-Stikine
Suite 300 - 4545 Lazelle Avenue
Terrace, BC V8G 4E1

Iskut Landfill Overview

The Iskut Landfill (Landfill) is owned and operated by the Regional District of Kitimat-Stikine (Regional District or RDKS). It is located 2 km northwest of Iskut; access is gained from the Stewart-Cassiar Highway.

The Landfill is responsible for the management of municipal solid and liquid waste generated by commercial and residential sources in the Iskut area in accordance with the Regional District Kitimat-Stikine Solid Waste Management Plan (1995).

Landfill operations are regulated by the Ministry of Environment and Climate Change Strategy's Operational Certificate MR-4612 under the Environmental Management Act, issued in December 2012, and conducted in accordance with Iskut Landfill Operations and Closure Plan prepared by Sperling Hansen Associates in February 1999.

The footprint for the Iskut Landfill is 3.5 ha in size and includes a landfill, a septage receiving lagoon, a borrow area for cover material, and a designated area for the diversion of metal, tires, and clean wood.

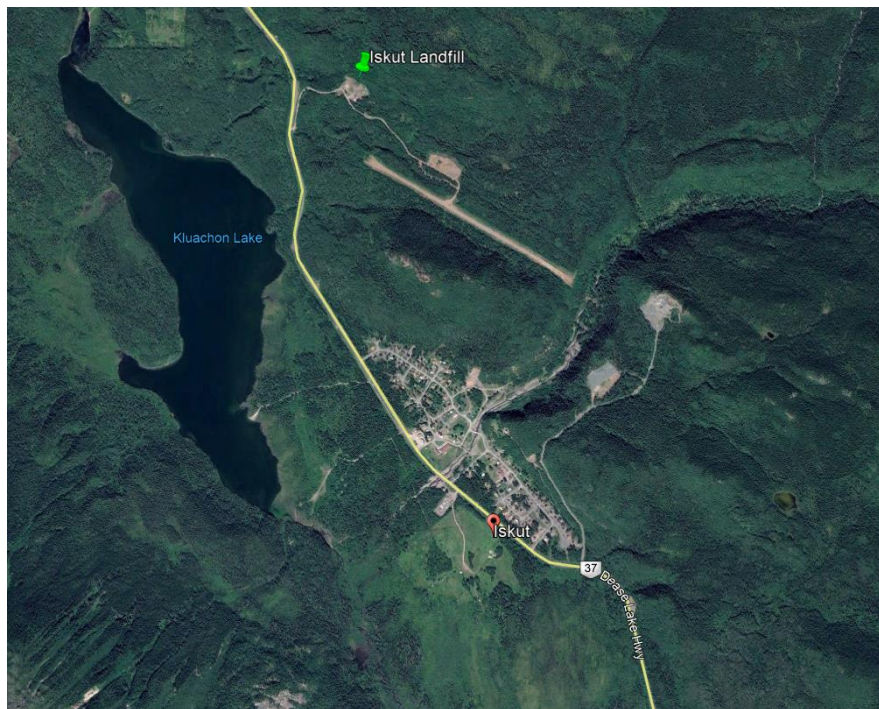


Figure 1 Location of Iskut Landfill

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1.0 Introduction

This annual report covers the period from January to December 2019 and has been prepared to fulfill the requirements of the Landfill's Operational Certificate MR-4612.

Issued by the Ministry of Environment and Climate Change Strategy and last amended in December 2012, the Operational Certificate authorizes the discharge of municipal solid and liquid wastes and outlines the criteria for environmental and human protection at the landfill.

This report meets the requirements in Section (11.5) of the Operational Certificate by providing the following information:

- Total volume or tonnage of waste discharged to the landfill during 2019;
- Total volume or tonnage of waste diverted during 2019;
- Occurrences or observations of wildlife attempting to access the facility; and
- The results and evaluation of all the monitoring programs, which has been undertaken by Tattersfield Consulting, and is shown in Appendix A.

2.0 Waste Disposal

The Iskut Landfill serves the residents and businesses in Iskut and the surrounding area. Large industry in the area haul materials to the Meziadin Landfill. In 2019, the population that utilized the Landfill was approximately 300 residents.

2.1 Solid Waste Disposal

The total tonnages collected at Iskut landfill from January through to December 2019 of municipal solid waste, metal, and tires are shown in Table 1. Details on some of these materials is included below.

Table 1: Waste Discharge Qualities for 2018

Material	2018 (tonnes)	Quantity
Waste Discharge		
Garbage	378.7 ^{*1}	
Diverted Wastes		
Tires		0.5 ^{*2}
Metal		41.24
Total	378.7*	41.74

Note: ^{*1}This volume is based on population and is not a scaled value, calculation done by Sperling Hansen Associates.

^{*2} This number is an estimate

2.1.1 Garbage

Garbage is defined as discharged materials not including hazardous waste.

In 2019, 378.7 tonnes of garbage was disposed of in the Iskut landfill.

3.0 Diverted Materials

During 2019, there were segregated areas at the Iskut facility for metal materials including appliances, scrap metal, and tires. Clean wood is also segregated, and then burned as outlined in the Operation Certificate.

3.1.1 Metal

In 2019, a total of 41.24 tonnes of metal was collected and diverted at the Iskut Facility. Metal is currently collected from site by Terrace-based metal recycler ABC Recycling.

3.1.2 Tires

In 2019, a total estimate of 0.5 tonnes of tires were collected at the Iskut Facility for recycling by the Tire Stewardship of BC.

3.1.3 Septage

Septage is disposed of into the septage receiving lagoon. Septage is defined as septic tank pumpage and treated sewage sludge, but does not include Other Sewage Wastes (wastewater, sewage or slurry, including catch basins, oil water separators, or shop floor drains).

Septage volumes were not tracked in 2019 at the Iskut Facility.

4.0 Wildlife Occurrences and Observations

The Iskut Landfill is located in an area with bears, wolves, coyotes, several species of birds of prey, and many other species of mammals that may attempt access to the facility. An electric fence surrounds the landfill area to prevent access and is kept charged from spring until late fall. Soil from site is used as daily cover, and as intermediate cover at the end of filling a cell to prevent bird access, reduce odour, and avoid wind-blown litter.

Facility operators are required to inspect the fence line weekly, testing for proper voltage, proper tension on fence stands, overall condition of the fence, and signs of wildlife activity. The inspections are recorded on the Daily Operation Inspection Form. There were significant challenges in obtaining completed Daily Operation Inspection Forms from the contracted site operator throughout 2019. Additional inspections were conducted by RDKS staff in March, July, August, September, and October 2019.

On August 25, 2019 three black bears were witnessed in the active face of the landfill during an inspection by a Ministry Environmental Protection Officer. Additional access to the active face by wildlife is likely due to challenges with facility gates being left open and gate locks being cut off to gain unauthorized access. RDKS staff inspections on August 27, September 18, and October 16, 2019 indicate the site as being unattended with gates open.

Vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens) is also noted, as ensuring proper cover of the active face by the operations contractor has been challenging. The RDKS has been in continued discussions with the site operator regarding improved facility operations. The site has been supplied Revelstoke Iron Grizzly (RIG) plates to use as an alternative daily cover and reduce vector access to the active face. RDKS staff inspections indicate operator use of the supplied RIG plates is limited to nil.

5.0 Environmental Monitoring Report

Environmental monitoring for the Iskut Facility was conducted by a Regional District of Kitimat-Stikine Environmental Technician, following Ministry of Environment and Climate Change Strategy, 2013 British Columbia Field Sampling Manual. All in-situ and surface water monitoring results have been analyzed and reviewed by Tattersfield Consulting. The complied data, interpretation, and recommendations from Tattersfield Consulting can be found in Appendix A.

Document prepared by:



Erin Blaney, B.Sc.
Acting Environmental Services Coordinator
Regional District of Kitimat-Stikine
300 – 4545 Lazelle Avenue
Terrace, BC V8G 4E1
eblaney@rdks.bc.ca

Document reviewed by:



Megan Haley, P.Chem.
Solid Waste Manager
Regional District of Kitimat-Stikine
300 – 4545 Lazelle Avenue
Terrace, BC V8G 4E1
mhaley@rdks.bc.ca

Appendix A

ISKUT LANDFILL 2019 ENVIRONMENTAL MONITORING REPORT

Prepared for:

Regional District of Kitimat-Stikine
Suite 300 - 4545 Lazelle Avenue
Terrace, BC V8G 4E1

Prepared by:

Tattersfield Consulting
Terrace, BC.

March 2020

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1. Introduction

The Regional District of Kitimat-Stikine (RDKS) is required to report annually on their environmental monitoring program for the Iskut Landfill including trend analysis and an evaluation of any identified impacts of the discharges on the receiving environment.

The on-going Environmental Monitoring program currently reflects interim monitoring requirements outlined in Section 10 – Monitoring Requirements in the Iskut Operational Certificate (Figure 1).

Sampling Locations ¹ and EMS ID	Frequency ³	Parameters ³
Un-named Creek U/S of Iskut Landfill E282678	twice annually, in April and September	Field Measurements: pH, dissolved oxygen, specific conductance, temperature
Un-named Creek D/S of Iskut Landfill E282679		Lab Analysis: BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals ²
¹ Sampling locations are shown on the site plan ² Lab analysis for dissolved metals shall use a low level scan ³ May be altered in future, depending on results		

Figure 1. Interim monitoring requirements as shown in the Iskut Landfill OC.

1.1. Site Setting

The Iskut landfill is located approximately 2 km north of Iskut to the east of Highway 37 north (Figure 2).



Figure 2. The Iskut Landfill is located ~2 km north of Iskut to the east of Hwy 37 north.

2. Surface Water Quality Monitoring

Surface water sampling is currently completed twice annually at two locations along an unnamed creek, as per Section 10 – Monitoring Requirements in the Iskut Operation Certificate (OC) (Figure 1).

The sample creek is located downslope to the north west of the landfill. In 2019, surface water sampling was completed May 14 and attempted October 16 (the stream was frozen) at the following locations (Figure 3):

- Un-named Creek upstream (U/S) of Iskut Landfill (E282678)
- Un-named Creek downstream (D/S) of Iskut Landfill (E282679)

Historic sample dates include:

- June 26, 2013
- July 30, 2014
- May 20, 2015
- July 18, 2016
- 2017 – no samples
- May 15, 2018
- September 5, 2018

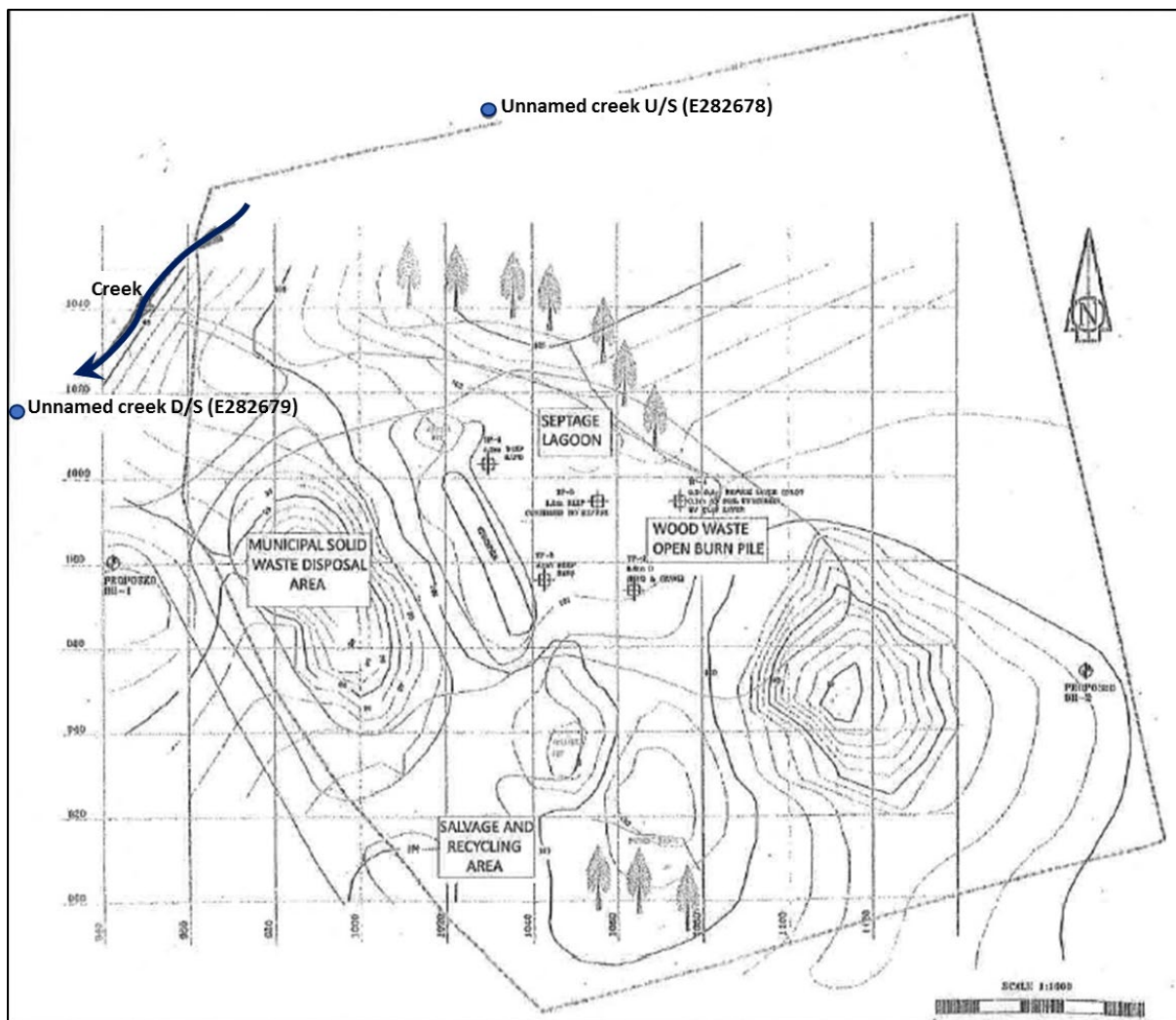


Figure 3. Site plan showing U/S and D/S sampling locations on Unnamed Creek adjacent to the Iskut Landfill (from the Iskut Landfill OC).

2.1. Protocol

Surface water samples were collected by a Regional District of Kitimat-Stikine Environmental Technician following methods that align with the Ministry of Environment and Climate Change Strategy, 2013 BC Field Sampling Manual and the Guidelines for Environmental Monitoring at Municipal Solid waste Landfills. RDKS' general surface water sampling methods include the following:

- Samples are taken by dipping bottles into streams for those not requiring filtering.
- Syringes with filters are used for dissolved metals and dissolved mercury samples.
- Samples are transported in coolers with ice packs.
- Typically, RDKS obtains:
 - an unfiltered, unpreserved sample for general parameters,
 - an unfiltered sample for nutrients analysis, preserved with sulfuric acid,

- an unfiltered sample for total metals analysis, preserved with nitric acid,
- a filtered sample, for dissolved metals preserved with nitric acid,
- an unfiltered sample for total mercury analysis, preserved with hydrochloric acid, and,
- a filtered sample for dissolved mercury, preserved with hydrochloric acid.
- pH, dissolved oxygen, specific conductance and temperature were recorded in the Field using a YSI meter.

2.2. Analysis

Water samples were sent to ALS Environmental laboratory for analysis. The analytical reports for 2019 are attached in Appendix A. Data was compiled for all sample dates (Appendix B) and reviewed against the following guidelines, which were provided by RKDS:

- BC MoE Water Quality Guidelines for aquatic life (BCWQG -AW)
- BC MoE Water Quality Guidelines for drinking water (BCWQG-DW)
- BC MoE Contaminated Site Regulation guidelines for drinking water (CSR-DW)

The following parameters, as specified in the OC, are summarized below for each site.

Field:

- pH, dissolved oxygen, specific conductance, temperature

Lab:

- BOD, total nitrogen, phosphorus, ammonia, pH
- Total and dissolved metals; specifically, the following indicator parameters, which have been noted in previous annual reports:
 - chloride, sulphate, aluminum, iron, manganese

2.3. Results

2.3.1. E282678 Un-named Creek U/S from Iskut Landfill

The E282678 sample site is located U/S from potential leachate effects and establishes background surface water quality. No exceedances were noted in the 2019 data.

The following lists the range of values for each indicator parameter, which have been noted in previous annual reports, for all sample dates:

Field:

- pH: 7.14-8.1
- dissolved oxygen: 9.0-15 mg/L
- specific conductance: 122-252 μ S/cm
- temperature: 0.7-8.1 °C

Lab:

- BOD: <2 -<4 mg/L
- total nitrogen: 0.120-0.158 mg/L

- phosphorus: total <0.020-< 0.050 mg/L; dissolved <.050
- ammonia: total as N <0.0050-0.09 mg/L
- pH: 7.9-8
- Total and dissolved metals:
 - chloride: <0.1 mg/L
 - sulphate: 27.6-32.5 mg/L
 - aluminum: total 0.0057-0.157 mg/L; dissolved 0.0021-0.0035 mg/L
 - iron: total 0.012-0.22 mg/L; dissolved <0.010 mg/L
 - manganese: total 0.0012 – 0.0118 mg/L; dissolved 0.0004-0.00035 mg/L

2.3.2. E282679 Un-named creek D/S from Iskut Landfill

The E282679 sample site is located D/S from potential leachate effects. No exceedances were noted in the 2019 data.

The following lists the range of values for each parameter of interest, specifically, indicator parameters, which have been noted in previous annual reports, for all sample dates:

Field:

- pH: 7.61-7.8
- dissolved oxygen: 9.1-14.2 mg/L
- specific conductance: 123.4-257 μ S/cm
- temperature: 1.0-9.1 °C

Lab:

- BOD: <2.0-<4.0 mg/L
- total nitrogen: 0.092-0.158 mg/L
- phosphorus: total 0.01-<0.050 mg/L; dissolved <0.050 mg/L
- ammonia: total as N <0.0050-0.033 mg/L
- pH: 8.0-8.3
- total and dissolved metals:
 - chloride: <1.0
 - sulphate: 20.2-32.5 mg/L
 - aluminum: total 0.003-0.0194 mg/L; dissolved <0.0010-0.0028mg/L
 - iron: total 0.005-0.03 mg/L; dissolved <0.010 mg/L
 - manganese: total 0.0002-0.00226 mg/L; dissolved 0.00034-0.00043 mg/L

3. Trends

Trends are limited to data from 2013-2019. Figures 4-6 illustrate existing data points for U/S (E282678) and D/S (E282679) locations for conductivity (field & lab), total aluminum and total iron.

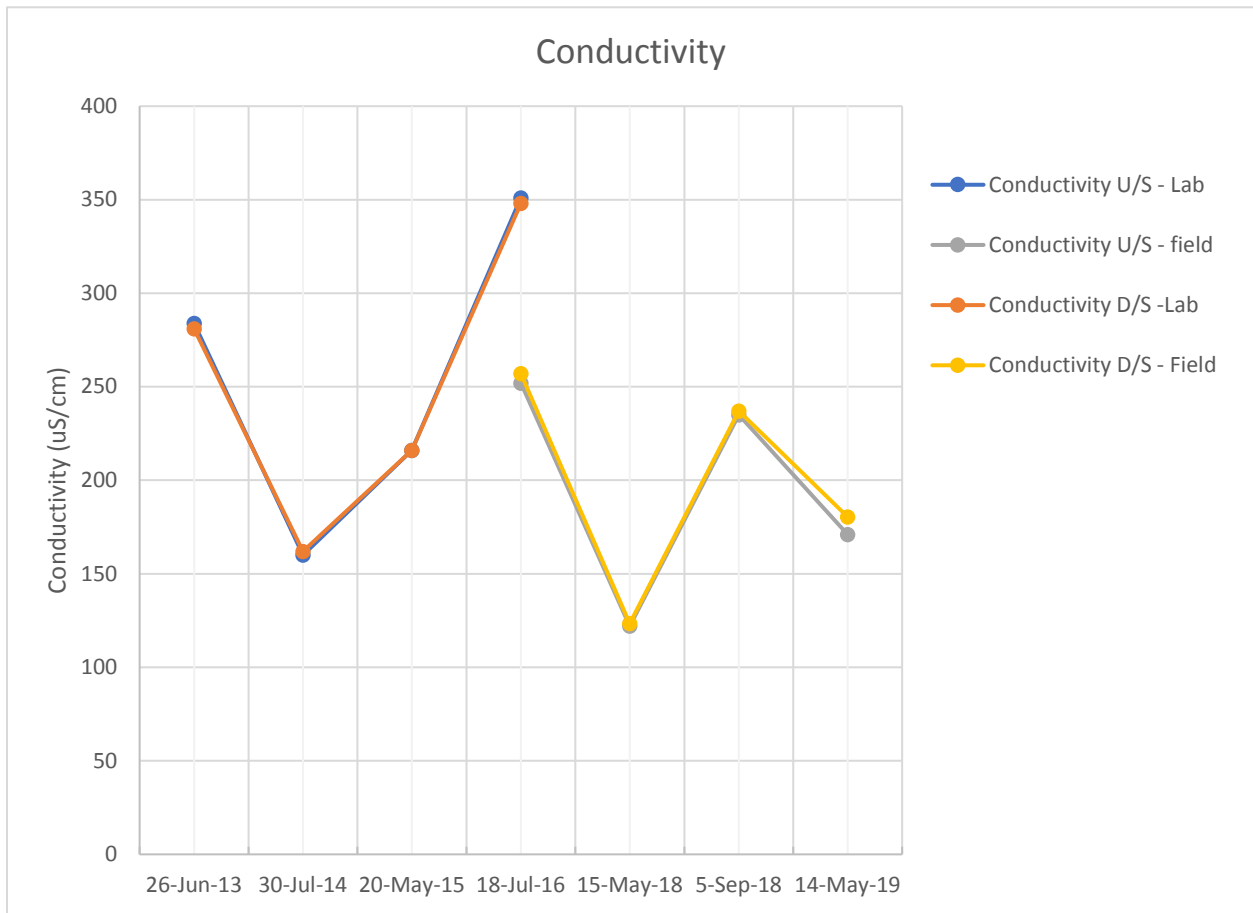


Figure 4. Conductivity over time.

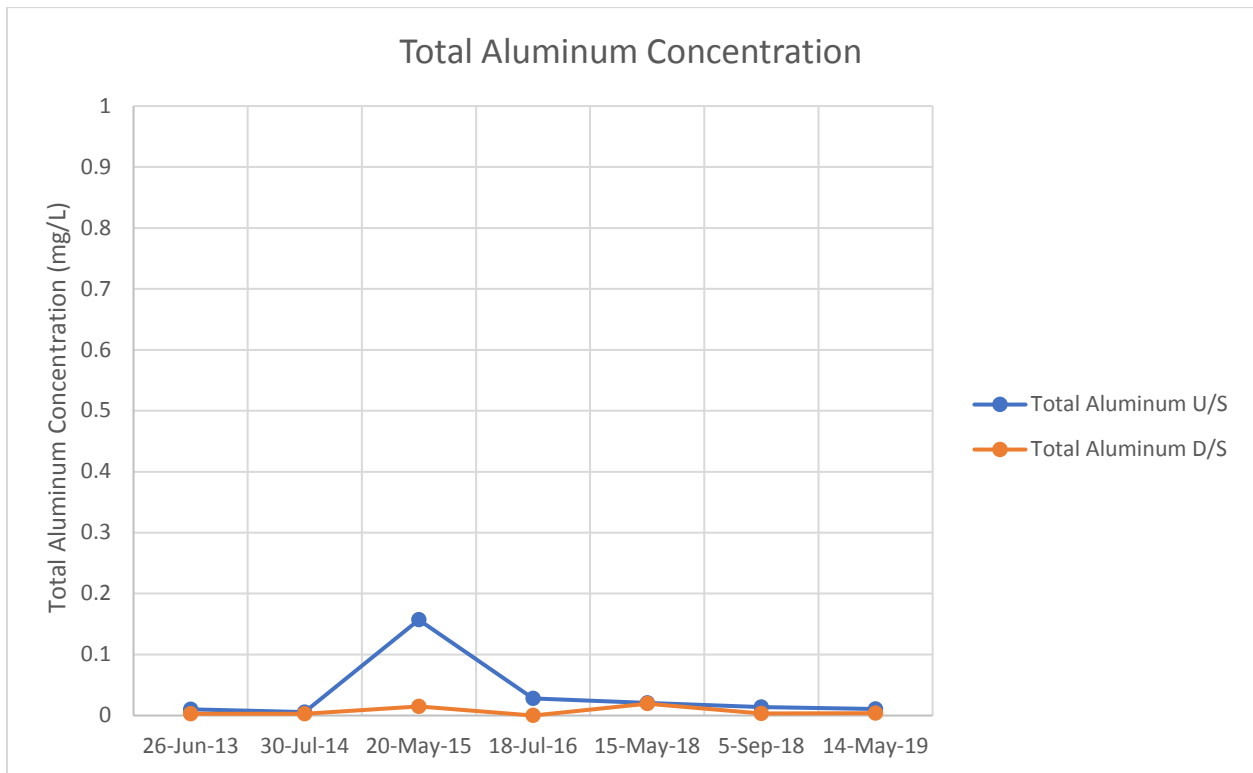


Figure 5. Total aluminum concentration over time.

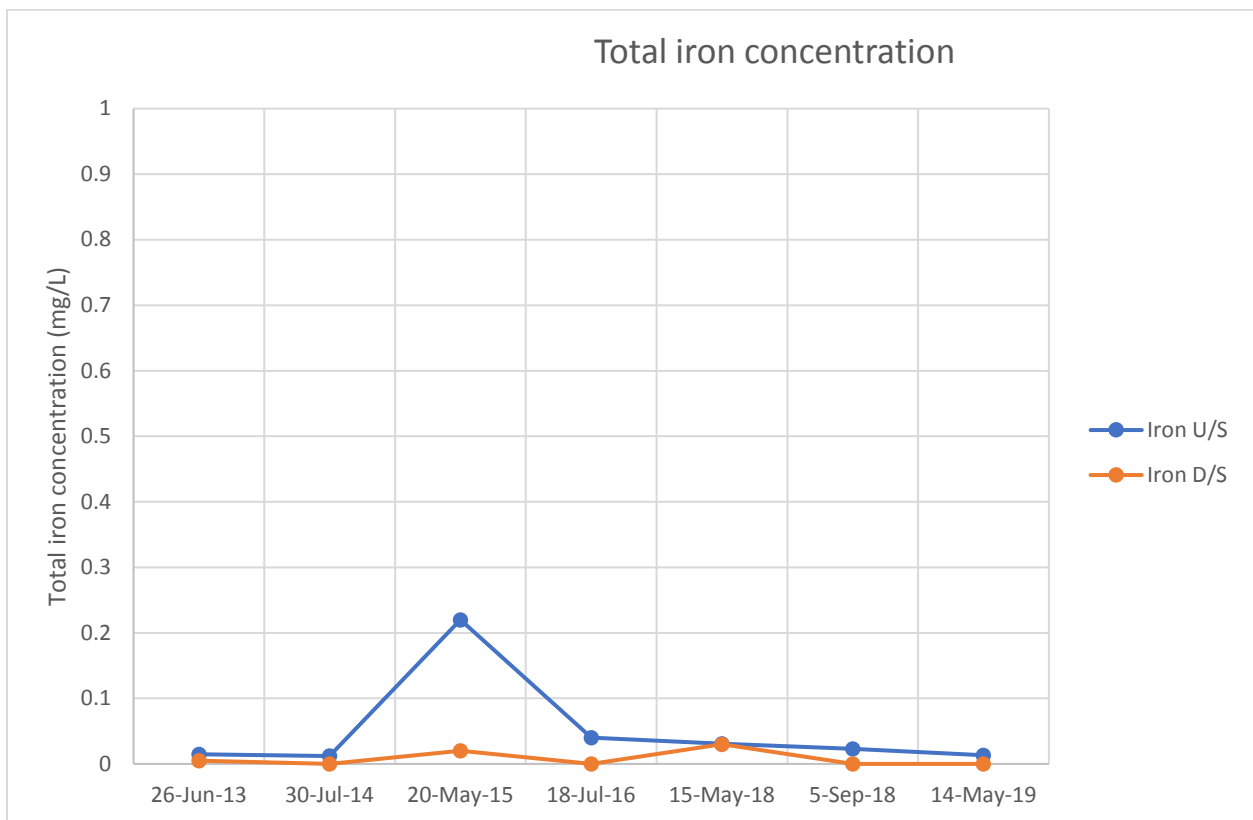


Figure 6. Total iron concentration over time.

4. Conclusion

Based on the data and standards provided by RDKS, and the assumption that they accurately reflect the existing water quality conditions at the Iskut Landfill and BC water quality standards respectively, the landfill operation is not causing water quality concerns in un-named creek.

No exceedances were noted at U/S or D/S sample locations in 2019.

4.1. Recommendations

The following recommendations may be taken into consideration for future monitoring efforts:

- Twice annual surface water sampling at the U/S and D/S locations should be continued, as recommended in the OC.
- Sample timing should be reviewed to allow for more successful sampling (i.e. the stream may contain water earlier in the spring; and less likely to be frozen earlier in the fall and/or time sampling during or after a rain event to capture surface water runoff).
- As per Section 10 in the Iskut OC, an evaluation could be completed by a qualified professional to determine the need for an on-going environmental monitoring program and the necessity of establishing groundwater monitoring sites.

Report prepared by:



Carmen Tattersfield, MSc., RP.Bio.

Tattersfield Consulting

carmen.tattersfield@gmail.com

Appendix A – 2019 Laboratory Data



REGIONAL DISTRICT OF KITIMAT-STIKINE
ATTN: Chris Kerr
300 - 4545 Lazelle Avenue
Terrace BC V8G 4E1

Date Received: 15-MAY-19
Report Date: 23-MAY-19 15:30 (MT)
Version: FINAL

Client Phone: 250-615-6100

Certificate of Analysis

Lab Work Order #: L2274138
Project P.O. #: NOT SUBMITTED
Job Reference: ISKUT LANDFILL
C of C Numbers:
Legal Site Desc:

Amber Springer, B.Sc
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2274138-1	L2274138-2
		Description	Water	Water
		Sampled Date	14-MAY-19	14-MAY-19
		Sampled Time	12:15	12:30
		Client ID	UP STREAM ISKUT	DOWN STREAM ISKUT
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)		165	160
Anions and Nutrients	Ammonia, Total (as N) (mg/L)		<0.0050	0.0059
	Total Nitrogen (mg/L)		0.120	0.126
	Orthophosphate-Dissolved (as P) (mg/L)		<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)		0.0042	0.0058
Total Metals	Aluminum (Al)-Total (mg/L)		0.0105	0.0038
	Antimony (Sb)-Total (mg/L)		0.00013	<0.00010
	Arsenic (As)-Total (mg/L)		0.00030	0.00031
	Barium (Ba)-Total (mg/L)		0.0314	0.0305
	Beryllium (Be)-Total (mg/L)		<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)		<0.000050	<0.000050
	Boron (B)-Total (mg/L)		<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)		<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)		54.3	54.0
	Cesium (Cs)-Total (mg/L)		<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)		<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)		<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)		0.00107	0.00063
	Iron (Fe)-Total (mg/L)		0.013	<0.010
	Lead (Pb)-Total (mg/L)		<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)		<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)		10.3	9.85
	Manganese (Mn)-Total (mg/L)		0.00172	0.00062
	Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		0.00105	0.00103
	Nickel (Ni)-Total (mg/L)		<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050
	Potassium (K)-Total (mg/L)		0.430	0.416
	Rubidium (Rb)-Total (mg/L)		<0.00020	<0.00020
	Selenium (Se)-Total (mg/L)		0.00113	0.00124
	Silicon (Si)-Total (mg/L)		4.16	4.59
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)		2.34	2.26
	Strontium (Sr)-Total (mg/L)		0.149	0.157
	Sulfur (S)-Total (mg/L)		13.1	15.2
	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2274138-1	L2274138-2		
		Description	Water	Water		
		Sampled Date	14-MAY-19	14-MAY-19		
		Sampled Time	12:15	12:30		
		Client ID	UP STREAM ISKUT	DOWN STREAM ISKUT		
Grouping	Analyte					
WATER						
Total Metals	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)		0.00035	<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)		0.000347	0.000310		
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)		0.0075	<0.0030		
	Zirconium (Zr)-Total (mg/L)		<0.000060	<0.000060		
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD		
	Dissolved Metals Filtration Location		FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)		0.0021	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)		0.00012	<0.00010		
	Arsenic (As)-Dissolved (mg/L)		0.00025	0.00028		
	Barium (Ba)-Dissolved (mg/L)		0.0286	0.0291		
	Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)		51.5	49.6		
	Cesium (Cs)-Dissolved (mg/L)		<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)		0.00096	0.00063		
	Iron (Fe)-Dissolved (mg/L)		<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)		<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)		8.96	8.72		
	Manganese (Mn)-Dissolved (mg/L)		0.00040	0.00043		
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)		0.000988	0.000991		
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)		0.354	0.368		
	Rubidium (Rb)-Dissolved (mg/L)		<0.00020	<0.00020		
	Selenium (Se)-Dissolved (mg/L)		0.00116	0.00108		
	Silicon (Si)-Dissolved (mg/L)		3.73	3.82		
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2274138-1	L2274138-2			
		Description	Water	Water			
		Sampled Date	14-MAY-19	14-MAY-19			
		Sampled Time	12:15	12:30			
		Client ID	UP STREAM ISKUT	DOWN STREAM ISKUT			
Grouping	Analyte						
WATER							
Dissolved Metals	Sodium (Na)-Dissolved (mg/L)		1.79	2.01			
	Strontium (Sr)-Dissolved (mg/L)		0.142	0.152			
	Sulfur (S)-Dissolved (mg/L)		12.1	12.3			
	Tellurium (Te)-Dissolved (mg/L)		<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)		<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)		0.000355	0.000292			
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)		0.0071	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)		<0.000060	<0.000060			
Aggregate Organics	BOD (mg/L)		<2.0	<2.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2274138-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2274138-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
<p>This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.</p>			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
<p>Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.</p>			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
<p>Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.</p>			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
<p>Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</p>			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
<p>Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</p>			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p> <p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p> <p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.</p>			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
<p>This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p> <p>Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.</p> <p>Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.</p>			
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Appendix B – Compiled Data

Water Quality Results, SW-1 Un-named creek U/S of Iskut Landfill (E282678)											
		BC MoE Guidelines	BC MoE Guidelines	BC MoE Guidelines							
Field	Units	BCWQG-AW (1) □	BCWQG-DW (2)	CSR-DW (2)	26-Jun-13	30-Jul-14	20-May-15	18-Jul-16	15-May-18	5-Sep-18	14-May-19
Conductivity	uS/cm							252	122	235.0	171
pH	pH							8.1	7.37	7.14	7.44
Temperature	°C							8.1	0.7	6.0	0.7
Dissolved Oxygen	mg/L								15	9.0	14
Analyte	Units										
Conductivity	uS/cm	-	700	-	284	160	216	351			
Hardness (as CaCO3)	mg/L	-	-	-	154	169	118	208	115		165
pH	pH	6.5-9.0	6.5-8.5, AC	-	7.9	8	8	8			
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/L) (i) □	-	-							
Total Dissolved Solids	mg/L	-	-	-							
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	125	149	90	150			
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	-	-	0.09	ND	<0.03	0.03	0.0066	<0.0050	<0.0050
Total Nitrogen as N	mg/L	-	-	-					0.158	0.128	0.12
Phosphorus (P)-Total	mg/L	-	-	-					0.0069	0.0088	0.0042
Bromide (Br)	mg/L	-	0.05	-							
Chloride (Cl)	mg/L	600	<250, AO	250	ND	ND	<1.0	<1.0			
Fluoride (F)	mg/L	0.4-1.87 (d)	1.5	1.5							
Nitrate (as N)	mg/L	32.8	10, MAC	10							
Nitrite (as N)	mg/L	0.06-0.6 (h)	1	1							
Sulfate (SO4)	mg/L	128-429 (d)	<500, AO	500	26.3	27.6	32.5	32.5			
Total Organic Carbon	mg/L	+/- 20% of background	4.0 (source water)	-							
BOD	mg/L	-	-	-	ND	ND	<4.0	<4.0	2	<2.0	<2.0
COD	mg/L	-	-	-	ND	ND	<20.0	<20.0			
Total Metals											
Aluminum (Al)-Total	mg/L	-	9.5 MAC	-	0.0104	0.0057	0.157	0.028	0.0206	0.0138	0.0105
Antimony (Sb)-Total	mg/L	0.270	0.006, MAC	-	ND	ND	<0.0001	0.0001	0.0001	<0.00010	0.00013
Arsenic (As)-Total	mg/L	0.005	0.01 MAC	-	0.00026	0.00028	0.0005	<0.0005	0.00029	0.00039	0.0003
Barium (Ba)-Total	mg/L	1	1.0, MAC	-	0.0294	0.0335	0.025	0.036	0.0229	0.0372	0.0314
Beryllium (Be)-Total	mg/L	0.00013	-	-	ND	ND	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Bismuth	mg/L	-	-	-	ND	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	1.2	5.0, MAC	-	ND	ND	0.042	0.006	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.038 - 2.80 (c, d)	0.005 MAC	-	ND	ND	0.00001	0.00003	0.0000073	0.000006	<0.0000050
Calcium (Ca)-Total	mg/L	<4 sensitive to acid input	-	-	48.1	53.0	35.5	65.1	34.6	57.3	54.3
Cesium (Cs) - Total	mg/L	-	-	-					<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L	0.001 e	0.05, MAC (Cr VI)	-	ND	ND	<0.0005	<0.0005	0.00011	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.11 (j)	-	-	ND	ND	0.00013	0.00005	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.0032-0.0396 (d,f)	-	-	0.00075	0.00064	0.0013	0.0017	0.00092	0.00058	0.00107
Iron (Fe)-Total	mg/L	1	<0.3, AO	-	0.0148	0.012	0.22	0.04	0.031	0.023	0.013
Lead (Pb)-Total	mg/L	0.011-0.402 (d,f)	0.01 MAC	-	ND	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	-	ND	ND	0.0004	0.0006	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	-	-	-	8.32	8.97	7.05	10.9	6.41	10.1	10.3
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	<0.05, AO	-	0.0012	0.0015	0.0118	0.0037	0.00215	0.00184	0.00172
Mercury (Hg)-Total	mg/L	0.0001	0.001, MAC	-	ND	ND	<0.00002	<0.00002	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	2	0.25	-	0.0012	0.0011	0.0013	0.0012	0.000938	0.000969	0.00105
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	-	-	ND	ND	0.0012	<0.0002	<0.00050	<0.00050	<0.00050
Phosphorus - Total	mg/L	0.005-0.015 (lakes only)	0.01 AO	-	ND	ND	<0.020	<0.02	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	-	0.282	0.219	0.49	0.28	0.563	0.242	0.43
Rubidium (Rb) - Total	mg/L	-	-	-					<0.00020	<0.00020	<0.00020
Selenium (Se)-Total	mg/L	0.002	0.01, MAC	-	0.00062	0.00033	0.0012	<0.0005	0.000655	0.000385	0.00113
Silicon - Total	mg/L	-	-	-	4.37	4.26	4.4	4.6	3.58	4.54	4.16
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	0.0001 (h)	-	ND	ND	<0.00005	<0.00005	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	<200, AO	-	1.89	2.04	3.14	2.75	1.53	2.28	2.34
Strontium - Total	mg/L	-	-	-	0.128	0.156	0.082	0.155	0.0941	0.166	0.149
Sulfur - Total	mg/L	-	-	-	9.5	9.5	8	12	7.39	11.9	13.1
Tellurium - Total	mg/L	-	-	-			<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0008	-	-	ND	ND	<0.00002	<0.00002	<0.000010	<0.000010	<0.000010
Thorium - Total	mg/L	-	-	-			<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	-	ND	ND	<0.0002	0.0006	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	-	ND	ND	0.01	<0.005	0.00112	0.00069	0.00035
Tungsten (W) - Total	mg/L	-	-	-					<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	0.0085	-	-	0.00022	0.00018	0.00015	0.00023	0.000144	0.000326	0.000347
Vanadium (V)-Total	mg/L	-	-	-	ND	ND	<0.001	<0.001	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	0.033-0.341 (d,f)	<5.0, AO	-	ND	ND	0.006	<0.004	<0.0030	<0.0030	0.0075
Zirconium - Total	mg/L	-	-	-	ND	ND	<0.0001	<0.0001	0.000074	<0.000060	<0.000060

Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L	0.023-0.1 (b,c)	9.5 MAC	9.5				0.0035	0.0021
Antimony (Sb)-Dissolved	mg/L	-	0.006, MAC	0.006				<0.00010	0.00012
Arsenic (As)-Dissolved	mg/L	-	0.01 MAC	0.01				0.00026	0.00025
Barium (Ba)-Dissolved	mg/L	-	1.0, MAC	1				0.0242	0.0286
Beryllium (Be)-Dissolved	mg/L	-	-	0.008				<0.00010	<0.00010
Bismuth	mg/L	-	-	-				<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	-	5.0, MAC	5				<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000027-0.00280 (d,f)	0.005 MAC	0.005				<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L	-	-	-				34.8	51.5
Cesium (Cs)	mg/L	-	-	-				<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	-	0.05, MAC (Cr VI)	0.05-6.0				<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.001				<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	-	-	1.5 AO				0.00081	0.00096
Iron (Fe)-Dissolved	mg/L	0.35	<0.3, AO	6.5				<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	-	0.01 MAC	0.01				<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.008				<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-				6.8	8.96
Manganese (Mn)-Dissolved	mg/L	-	<0.05, AO	1.5				0.00035	0.0004
Mercury (Hg)-Dissolved	mg/L	-	0.001, MAC	0.001				<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	-	0.25	0.25				0.000958	0.000988
Nickel (Ni)-Dissolved	mg/L	-	-	0.08				<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	0.01 AO	-				<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-				0.6	0.354
Rubidium (Rb) - Dissolved	mg/L	-	-	-				<0.00020	<0.00020
Selenium (Se)-Dissolved	mg/L	-	0.01, MAC	0.01				0.000612	0.00116
Silicon (Si) - Dissolved	mg/L	-	-	-				3.36	3.73
Silver (Ag)-Dissolved	mg/L	-	0.0001 (h)	0.02				<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	<200, AO	200				1.6	1.79
Strontium (Sr) - Dissolved	mg/L	-	-	-				0.1	0.142
Sulfur	mg/L	-	-	-				6.3	12.1
Tellurium (Te)-Dissolved	mg/L	-	-	-				<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-				<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	-	-	-				<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	-	2.5				<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-				<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L	-	-	0.003				<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	-	-	0.02				0.000148	0.000355
Vanadium (V)-Dissolved	mg/L	-	-	0.02				<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	-	<5.0, AO	3				<0.0010	0.0071
Zirconium (Zr)-Dissolved	mg/L	-	-	-				<0.000060	<0.000060

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, Updated March 2018
 - (2) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
 - (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
 - (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
 - (c) Limit for dissolved metals, not total metals
 - (d) Limit dependent upon hardness.
 - (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
 - (f) Where hardness data was unavailable, 50 mg/L was assumed
 - (g) Maximum value
 - (h) Limit dependent upon chloride concentration
 - (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows
 - (j) Limit for total metals, not dissolved.
 - * Criteria exceeds detection limit
- MAC = Maximum Acceptable Concentration
AO = Aesthetic Objective

BCWQG-AW	BC MoE Quality Guidelines for Protection of Aquatic Life
BCWQG-DW	BC MoE Quality Guidelines for Protection of Drinking Water
CSR-AW/DW	BC Contaminated Sites Regulation Water Quality Guidelines for Protection of Aquatic Life

Water Quality Results, SW-2 Un-named Creek D/S of Iskut Landfill (E282679)												
		BC MoE Guidelines	BC MoE Guidelines	BC MoE Guidelines								
		BCWQG-AW (1)	BCWQG-DW (2)	CSR-DW (2)								
Field	Units				26-Jun-2013	30-Jul-2014	20-May-2015	18-Jul-2016	15-May-2018	5-Sep-2018	14-May-2019	
Conductivity	uS/cm	-	700	-	281	162	216	348	257	123.4	237.1	180.4
pH	pH	-	-	-	153	171	116	208	7.8	7.61	7.65	7.38
Temperature	°C	-	-	-	8.1	8.3	8	8.2	9.1	1.00	6.2	1.3
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	14	9.1	14.2
Analyte	Units											
Conductivity	uS/cm	-	700	-	281	162	216	348	257	123.4	237.1	180.4
Hardness (as CaCO3)	mg/L	-	-	-	153	171	116	208	7.8	7.61	7.65	7.38
pH	pH	6.5-9.0	6.5-8.5, AC	-	8.1	8.3	8	8.2	9.1	1.00	6.2	1.3
Total Suspended Solids	mg/L	25 mg/L (backgr 25-250 mg/L) (i)	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	125	150	92	160	-	-	-	-
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	-	-	0.03	ND	<0.03	0.03	0.0050	<0.0050	0.0059	0.0059
Total Nitrogen as N (Nitrate + Nitrite)	mg/L	-	-	-	-	-	-	-	0.158	0.092	0.126	0.126
Phosphorus (P)-Total	mg/L	-	-	-	-	-	-	-	0.0071	0.0027	0.0058	0.0058
Bromide (Br)	mg/L	-	0.05	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	600	<250, AO	250	ND	ND	<1.0	<1.0	-	-	-	-
Fluoride (F)	mg/L	0.4-1.87 (d)	1.5	1.5	-	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	32.8	10, MAC	10	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	0.06-0.6 (h)	1	1	-	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	128-429 (d)	<500, AO	500	26.5	27.7	20.2	32.5	-	-	-	-
Total Organic Carbon	mg/L	+/- 20% of background	4.0 (source water)	-	-	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	ND	ND	<4.0	<4.0	<2.0	-	-	<2.0
COD	mg/L	-	-	-	ND	ND	<20	<20	-	-	-	-
Total Metals												
Aluminum (Al)-Total	mg/L	-	9.5 MAC	-	0.003	0.0031	0.015	<0.005	0.0194	0.0035	0.0038	0.0038
Antimony (Sb)-Total	mg/L	0.270	0.006, MAC	-	0.0005	ND	<0.0001	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.01 MAC	-	0.0001	0.00030	<0.0005	<0.0005	0.00029	0.00039	0.00031	0.00031
Barium (Ba)-Total	mg/L	1	1.0, MAC	-	0.001	0.0334	0.022	0.036	0.0238	0.0363	0.0305	0.0305
Beryllium (Be)-Total	mg/L	0.00013	-	-	0.0001	ND	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	mg/L	-	-	-	0.001	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	1.2	5.0, MAC	-	0.05	ND	0.008	0.006	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.038 - 2.80 (c, d)	0.005 MAC	-	0.00001	ND	<0.00001	0.00002	0.0000122	<0.000050	<0.000050	<0.000050
Calcium (Ca)-Total	mg/L	<4 sensitive to acid input	-	-	0.05	54.4	35.4	65.3	35.3	56.2	54	54
Cesium (Cs) - Total	mg/L	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L	0.001 e	0.05, MAC (Cr VI)	-	0.001	ND	<0.0005	<0.0005	0.00012	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	0.11 (j)	-	-	0.0005	ND	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.0032-0.0396 (d,f)	-	-	0.0002	0.00063	0.0006	0.001	0.00122	0.00055	0.00063	0.00063
Iron (Fe)-Total	mg/L	1	<0.3, AO	-	0.005	ND	0.02	<0.01	0.03	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.011-0.402 (d,f)	0.01 MAC	-	0.0002	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	-	0.005	ND	0.0003	0.0006	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	-	-	-	0.05	8.46	6.76	10.9	6.44	10.1	9.85	9.85
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	<0.05, AO	-	0.001	ND	0.0007	0.0002	0.00226	0.00022	0.00062	0.00062
Mercury (Hg)-Total	mg/L	0.0001	0.001, MAC	-	0.00001	ND	<0.00002	<0.00002	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	2	0.25	-	0.001	0.0011	0.0013	0.0013	0.000896	0.00094	0.00103	0.00103
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	-	-	0.001	ND	0.0002	<0.0002	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus - Total	mg/L	0.005-0.015 (lakes only)	0.01 AO	-	0.01	ND	<0.020	<0.02	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	-	0.05	0.235	0.38	0.23	0.568	0.226	0.416	0.416
Rubidium (Rb) - Total	mg/L	-	-	-	-	-	-	-	0.0002	<0.00020	<0.00020	<0.00020
Selenium (Se)-Total	mg/L	0.002	0.01, MAC	-	0.0001	0.00033	<0.0005	<0.0005	0.000789	0.00039	0.00124	0.00124
Silicon - Total	mg/L	-	-	-	0.1	4.40	4	4.5	3.6	4.54	4.59	4.59
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	0.0001 (h)	-	0.00002	ND	<0.00005	<0.00005	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	<200, AO	-	0.05	2.07	1.55	2.67	1.56	2.21	2.26	2.26
Strontium - Total	mg/L	-	-	-	0.001	0.151	0.084	0.157	0.0957	0.162	0.157	0.157
Sulfur - Total	mg/L	-	-	-	3	9.1	8	9	7.69	12.8	15.2	15.2
Tellurium - Total	mg/L	-	-	-	-	-	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0008	-	-	0.00005	ND	<0.00002	<0.00002	<0.000010	<0.000010	<0.000010	<0.000010
Thorium - Total	mg/L	-	-	-	-	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	-	0.005	ND	<0.0002	0.0003	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	-	0.005	ND	<0.005	<0.005	0.00097	<0.00030	<0.00030	<0.00030
Tungsten (W) - Total	mg/L	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	0.0085	-	-	0.0001	0.00019	0.00013	0.00023	0.000149	0.000324	0.00031	0.00031
Vanadium (V)-Total	mg/L	-	-	-	0.005	ND	<0.001	<0.001	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	0.033-0.341 (d,f)	<5.0, AO	-	0.005	ND	<0.004	<0.004	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium - Total	mg/L	-	-	-	0.0005	ND	<0.0001	<0.0001	0.000066	<0.000060	<0.000060	<0.000060

Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.023-0.1 (b,c)	9.5 MAC	9.5					0.0028	<-0.0010
Antimony (Sb)-Dissolved	mg/L	-	0.006, MAC	0.006					<-0.00010	<-0.00010
Arsenic (As)-Dissolved	mg/L	-	0.01 MAC	0.01					0.00028	0.00028
Barium (Ba)-Dissolved	mg/L	-	1.0, MAC	1					0.0235	0.0291
Beryllium (Be)-Dissolved	mg/L	-	-	0.008					<-0.00010	<-0.00010
Bismuth	mg/L	-	-	-					<-0.000050	<-0.000050
Boron (B)-Dissolved	mg/L	-	5.0, MAC	5					<-0.010	<-0.010
Cadmium (Cd)-Dissolved	mg/L	0.000027-0.00280 (d,f)	0.005 MAC	0.005					<-0.0000050	<-0.0000050
Calcium (Ca)-Dissolved	mg/L	-	-	-					35.8	49.6
Cesium (Cs)	mg/L	-	-	-					<-0.000010	<-0.000010
Chromium (Cr)-Dissolved	mg/L	-	0.05, MAC (Cr VI)	0.05-6.0					<-0.00010	<-0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.001					<-0.00010	<-0.00010
Copper (Cu)-Dissolved	mg/L	-	-	1.5 AO					0.00082	0.00063
Iron (Fe)-Dissolved	mg/L	0.35	<0.3, AO	6.5					<-0.010	<-0.010
Lead (Pb)-Dissolved	mg/L	-	0.01 MAC	0.01					<-0.000050	<-0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.008					<-0.0010	<-0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-					6.7	8.72
Manganese (Mn)-Dissolved	mg/L	-	<0.05, AO	1.5					0.00034	0.00043
Mercury (Hg)-Dissolved	mg/L	-	0.001, MAC	0.001					<-0.0000050	<-0.0000050
Molybdenum (Mo)-Dissolved	mg/L	-	0.25	0.25					0.000941	0.000991
Nickel (Ni)-Dissolved	mg/L	-	-	0.08					<-0.00050	<-0.00050
Phosphorus (P)-Dissolved	mg/L	-	0.01 AO	-					<-0.050	<-0.050
Potassium (K)-Dissolved	mg/L	-	-	-					0.6	0.368
Rubidium (Rb) - Dissolved	mg/L	-	-	-					<-0.00020	<-0.00020
Selenium (Se)-Dissolved	mg/L	-	0.01, MAC	0.01					0.000606	0.00108
Silicon (Si) - Dissolved	mg/L	-	-	-					3.45	3.82
Silver (Ag)-Dissolved	mg/L	-	0.0001 (h)	0.02					<-0.000010	<-0.000010
Sodium (Na)-Dissolved	mg/L	-	<200, AO	200					1.6	2.01
Strontium (Sr) - Dissolved	mg/L	-	-	-					0.1	0.152
Sulfur	mg/L	-	-	-					6.4	12.3
Tellurium (Te)-Dissolved	mg/L	-	-	-					<-0.00020	<-0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-					<-0.000010	<-0.000010
Thorium (Th)-Dissolved	mg/L	-	-	-					<-0.00010	<-0.00010
Tin (Sn)-Dissolved	mg/L	-	-	2.5					<-0.00010	<-0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-					<-0.00030	<-0.00030
Tungsten (W) - Dissolved	mg/L	-	-	0.003					<-0.00010	<-0.00010
Uranium (U)-Dissolved	mg/L	-	-	0.02					0.00015	0.000292
Vanadium (V)-Dissolved	mg/L	-	-	0.02					<-0.00050	<-0.00050
Zinc (Zn)-Dissolved	mg/L	-	<5.0, AO	3					<-0.0010	<-0.0010
Zirconium (Zr)-Dissolved	mg/L	-	-	-					<-0.000060	<-0.000060

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, Updated March 2018
- (2) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows
- (j) Limit for total metals, not dissolved.
- * Criteria exceeds detection limit
- MAC = Maximum Acceptable Concentration
- AO = Aesthetic Objective

BCWQG-AW	BC MoE Quality Guidelines for Protection of Aquatic Life
BCWQG-DW	BC MoE Quality Guidelines for Protection of Drinking Water
CSR-AW/DW	BC Contaminated Sites Regulation Water Quality Guidelines for Protection of Aquatic Life

Appendix C – Iskut Landfill Operational Certificate

ISKEET LANDFILL
5360 03 02

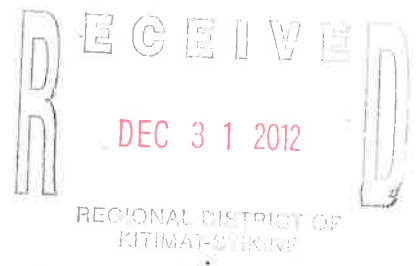


File: MR-4612

Date: December 20, 2012

REGISTERED MAIL

Regional District of Kitimat-Stikine
300-4545 Lazelle Avenue
Terrace, BC
V8G 4E1



Dear Operational Certificate Holder:

Enclosed is Operational Certificate MR-4612 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Skeena Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Director, Environmental Protection, at Ministry of Environment, Regional Operations, Skeena Region, 3726 Alfred Avenue, Box 5000, Smithers, BC, V0J 2N0.

Yours truly,

Mark Love, P. Ag.
for Director, *Environmental Management Act*
Skeena Region

Enclosure



MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE
MR-4612

for the

ISKUT LANDFILL

*Under the Provisions of the Environmental Management Act
and in accordance with the approved
Regional District of Kitimat-Stikine Solid Waste Management Plan, the*

Regional District of Kitimat-Stikine

Suite 300-4545 Lazelle Avenue

Terrace, British Columbia

V8G 4E1

is authorized to store, handle, treat and discharge municipal solid waste from Iskut and surrounding area at the Iskut landfill, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

1. **LOCATION OF LANDFILL PROPERTY**

The location of the property where discharges are authorized to occur is 350 metres north of the Iskut airstrip, at coordinates 57°51'18.70"/129°59'43.56, Cassiar Land District.

2. AUTHORIZED DISCHARGES

2.1 Discharge of Municipal Solid Waste

This section applies to the discharge of municipal solid waste to ground at the landfill located approximately as shown on the attached site plan. The site reference number for this discharge is E208904. Refer to Section 5 for the operational requirements associated with this discharge.

2.1.1 Subject to Sections 4.2, 4.3 and 4.4, the characteristics of the discharge shall be typical of municipal solid waste.

2.1.2 The quantity of solid wastes discharged to ground shall not exceed the design capacity of the landfill facility specified as follows: (1) by an engineered final design footprint (see Section 3.3); and (2) by engineered excavation and final grade contours (see Section 3.4).

2.1.3 The authorized works are a separate municipal solid waste disposal area and related appurtenances located approximately as shown on the attached site plan.

2.2 Storage and Handling of Wastes for Salvage and Recycling

This section applies to the storage and handling of municipal solid wastes for salvage and recycling. Refer to Section 7 for the operational requirements associated with this discharge.

2.2.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of recyclable municipal solid waste.

2.2.2 The quantity of recyclable wastes stored or handled is indeterminate.

2.2.3 The authorized works are a separate recyclable municipal solid waste storage area and related appurtenances located approximately as shown on the attached site plan.

2.3 Discharge of Air Contaminants from Open Burning

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of wood and selected combustibles from a burn pile located approximately as shown on the attached site plan. The site reference number for this discharge is E220154. Refer to Section 8 for the operational requirements associated with this discharge.

- 2.3.1 The characteristics of the discharge shall be typical of those resulting from the regulated open burning of selected combustibles as per Section 8.3.
- 2.3.2 The maximum authorized rate of discharge is indeterminate.
- 2.3.3 The authorized works are a separate burn area associated with a landfill operation and related appurtenances located approximately as shown on the attached site plan.

2.4 Discharge of Liquid Wastes

This section applies to the discharge of septage into a septage lagoon and thence to ground, located approximately as shown on the attached site plan. The site reference number for this discharge is E277450. Refer to Section 9 for the operational requirements associated with this discharge.

- 2.4.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of septic tank pumpage, holding tank and sewage treatment plant sludges.
- 2.4.2 The maximum authorized quantity of discharge is 1000 m³/year.
- 2.4.3 The authorized works are exfiltration lagoons associated with a landfill operation and related appurtenances.


3 LANDFILL DESIGN

3.1 Design by Qualified Professional(s)

The landfill and associated works [including but not limited to the size(s) and location(s) of disposal area(s), maximum allowable slopes of disposal area(s), leachate management system, progressive and final closure details, etc.] shall be designed by qualified professionals [such as engineer(s) and/or geoscientist(s)] registered in the Province of British Columbia who have expertise in the field of landfill design. These details shall be incorporated into a "Design, Operations and Closure Plan" (DOCP) and made available to the Director upon request. Where a design feature prepared by a qualified professional is in conflict with any requirement of this operational certificate, it shall be brought to the attention of the Director who shall determine a resolution to the conflict.

3.2 Construction

The landfill and associated works shall be constructed in accordance with the design prepared by qualified professionals, and as documented in the DOCP.



3.3 Engineered Footprint

The landfill design shall include preparation of an engineered final design footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered final design footprint shall be clearly shown on a scaled plan of the site and the plan made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.4 Engineered Excavation and Final Grade Contours

The landfill design shall include preparation of engineered excavation grade (if below grade landfilling is to occur) and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.5 Legal Survey

The landfill property shall be legally surveyed on or before June 30, 2016, or a minimum of 6 months prior to closure, whichever is sooner.

3.6 Scaled Drawings

A scaled site plan accurately showing the legal survey (when completed), the engineered final design footprint, and final design contours, shall be included in the DOCP and made available in PDF format upon request by the Director. Additional scaled drawings showing excavation contours (if relevant) and typical cross sectional views of the site shall also be included in the DOCP.

4. GENERAL REQUIREMENTS

4.1 Site Identification

A sign shall be erected at the main entrance to the landfill which identifies the following: site name, owner, operator, contact phone number and address, hours of operation, tipping fees (if applicable) and prohibition of hazardous wastes. The lettering on the sign shall be such that it is clearly readable by the public upon approach.

4.2 Prohibited Wastes

No wastes as defined by the *Hazardous Waste Regulation* shall be received, stored, treated or disposed of at this site except as authorized by the Director.



Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Hazardous Waste Regulation* and with Section 8 of this operational certificate. Tires equal to or less than 22" in rim size and auto hulks shall not be landfilled.

4.3 Waste Asbestos

Notwithstanding Section 4.2 of this operational certificate, the disposal of waste asbestos under Section 2.1 of this operational certificate and in compliance with the requirements of Section 40 of the *Hazardous Waste Regulation* is hereby authorized.

4.4 Contaminated Soil

Soil that contains contaminants in concentrations less than "Hazardous Waste" as defined by the *Hazardous Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by Section 5 of this operational certificate. Disposal does not include use as final cover material.

4.5 Waste Measurement

The quantity of waste material landfilled at the site shall be measured or estimated by means suitable to the Director. The results shall be submitted in accordance with Section 11.5, once per year on or before June 30 for the previous year, expressed in tonnes/yr and/or m³/yr.

4.6 Ozone Depleting Substances

Release of ozone depleting substances from the storage, handling and transport of used refrigerator equipment, freezers, motor vehicle air conditioners and other air conditioning equipment, fire extinguishers and the like is strictly forbidden as per the requirements of the *Ozone Depleting Substances and Other Halocarbons Regulation*.

4.7 Fire Prevention

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be



maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a Fire Prevention and Response Plan.

4.8 Extinguishment of Fires

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. The operational certificate holder shall also immediately notify the Provincial Emergency Program (phone: 1-800-663-3456) and any local fire authority of an unauthorized fire.

4.9 Buffer Zone

No material shall be landfilled within 50 metres of the property boundary.

4.10 Litter Control

The operational certificate holder shall make all reasonable efforts to prevent litter from scattering. Any litter scattered on neighbouring property shall be cleaned up as soon as practicable.

4.11 Water Table Restriction

Wastes shall not be deposited or stored less than 1.2 metres above the highest groundwater level.

4.12 Surface Water Management

The distance between a natural body of surface water and any stored or buried materials shall be a minimum of 25 metres.

4.13 Inert Materials

Specific inert materials may be exempted from the requirements of Section 4.11 by the Director. The permission of the Director must be obtained in writing prior to any disposal or handling of inert materials on an exemption basis.

4.14 Landfill Gas Lower Explosive Limit

The landfill shall be operated such that combustible gas concentrations do not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit in any on-site or off-site structure or facility, including any services (water, sewer, electrical, etc.).



Mark Love, P.Ag.

For Director, Environmental Management Act

4.15 Water Quality and Protection

The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the Director, at the landfill property boundary or other specified location.

If exceedences of the specified criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for approval prior to conducting the work.

In addition to requirements specified by the director, groundwater must be managed in accordance with the Contaminated Sites Regulation.

4.16 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the operation regularly and maintain it in good working order. The operational certificate holder shall immediately notify the Director of any circumstance which prevents continuing operation in the approved manner or results in non-compliance with the requirements of this operational certificate.

4.17 Electric Fencing

4.17.1 Design, Construction and Maintenance

Wherever required, electric fencing and gate systems at the landfill shall be designed, constructed, and maintained such that bears are prevented from entering into the landfill through any portion of the fence or gates at any time of the day.

4.17.2 Fence Type

Fencing may be either high tensile smooth wire or fence fabric (e.g., mesh-wire, page-wire, chainlink or the like). The configuration of a high tensile smooth wire fence shall consist of a minimum of eight strands, with four energized strands alternating with four grounded strands as follows: the bottom strand shall be a grounded or (-) strand and shall not be more than 10 cm from the ground (soil) at any location; and thence starting from the bottom strand, the other seven strands shall be spaced 15 ± 2 cm, 15 ± 2 cm, 15 ± 2 cm, 20 ± 2 cm, 20 ± 2 cm, 20 ± 2 cm, and 25 ± 2 cm. Additional strands to this minimum configuration may be used.

A fence fabric may be used instead of high tensile smooth wire. The fence fabric shall: be a minimum of 1.22 metre high; be constructed of a minimum



wire thickness of 11 gauge, and have a maximum mesh size of 15 cm. The bottom of the fabric shall not be more than 10 cm from the ground (soil) at any location. Any uncharged fence fabric must have a minimum of four strands of charged wires on an outrigger system, spaced as follows: the first strand shall not be higher than 25 cm from the ground; and each of the remaining three strands shall be spaced approximately 25 cm apart from adjacent charged strands.

4.17.3 Wire Tension

For a high tensile smooth wire fence construction, all strands shall be tightened to a minimum of 125 lbs tension at 20°C. The required tension is to be corrected for temperature by use of the following formula for 12-½ gauge high tensile steel wire:

$$Tension = 125 - 2.5(Temperature - 20)$$

where: *Tension* is in lbs force

Temperature is in °C

4.17.4 Post Spacing

Fence posts shall be spaced a maximum of 7.5 metres apart.

4.17.5 Grounding System

A grounding system shall be installed consisting of solid grounding rods (i.e., not pipe) with a minimum diameter of 16 mm (5/8 inch) that have a buried length of at least 2 metres. A minimum of three grounding rods (spaced at least 3 metres apart) shall be installed and connected to the energizer.

Alternative energizer grounding systems (e.g., grounding plates, or a deep-driven grounding system) may be used provided the grounding is equivalent to or better than three grounding rods. A grounding rod (or equivalent) shall be installed at least once every 450 metres along the fence and connected to the grounded wire strands or uncharged fence fabric. Additional grounding may be required for dry sites or if other conditions affect proper grounding.

4.17.6 Period of Operation

Electric fencing shall be fully operational during the period of April 1 to October 31 inclusive each year and at any other time of year when there is bear activity in the immediate surrounding area. If snow is present during this period, any electrified strands above snow line shall be isolated from the remainder of the system and energized.



Mark Love, P.Ag.

For Director, Environmental Management Act

4.17.7 Minimum Voltage

Electric fencing shall be operated with a minimum voltage of 6,000 volts.

4.17.8 Gate(s)

Any access through electric fencing for vehicles, equipment and personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000 volts at all times except when being opened or closed. Any gate that is open during operating hours shall be periodically checked by the attendant for bear activity during hours of operation. Gaps between the gate and the fence and ground, and between gate panels (for a double-hung gate), shall not exceed 10 cm.

4.17.9 Fence Inspections

The entire perimeter of the electric fencing shall be inspected at least once every seven days and the voltage of the fencing measured at several points along the fencing and at each gate using a proper electric fence voltmeter matched to the brand of the fence charging unit. The results of voltage testing shall be recorded in a log book. Any results less than the minimum 6,000 volts shall be immediately investigated for the cause of the low voltage (e.g., low battery, litter, vegetation, loose or crossed wires, broken insulators, breaks in the grounding system, etc.). Corrective actions to restore proper voltage shall be immediately undertaken.

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service at 1-877-952-7277 and to the Director at 250-847-7260.

In cases of low voltage or signs of penetration attempts, inspections shall be increased from once per week to once per day until proper voltage is fully restored and until there are no new signs of penetration attempts, respectively.

4.18 Other Agency Requirements

This operational certificate does not relieve the operational certificate holder from complying with requirements of federal, provincial, regional district or municipal authorities.



5. OPERATIONAL REQUIREMENTS FOR THE DISPOSAL OF SOLID WASTE

5.1 Location

The operational certificate holder shall identify an area for disposal of solid waste (herein referred to as the solid waste disposal area) that is within the authorized municipal solid waste disposal footprint (see Section 2.1.3). Signs which identify the nature of the waste acceptable at the designated solid waste disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public upon approach.

5.2 Nature of Wastes

Wastes disposed at the active face of the solid waste disposal area may include any municipal solid waste except liquid wastes and hot ashes or as otherwise restricted by Section 4.2.

5.3 Bear-Proofing

The solid waste disposal area shall be maintained inside an electric fence. The electric fence shall comply with all requirements of Section 4.17.

5.4 Waste Compaction

Wastes at the active face of the solid waste disposal area shall be spread in layers of 60 centimetres or less on the active face and then compacted with a minimum of three (3) passes with heavy equipment.

5.5 Maximum Lift Height

The maximum height of any lift of compacted waste in the solid waste disposal area shall be 5 metres.

5.6 Waste Cover

Cover shall be applied to waste in the solid waste disposal area as specified below. The operational certificate holder shall maintain a log book to record all dates of cover application.

5.6.1 Active Face Cover

Except as otherwise stated in Sub-section 5.6.2, the active face of the solid waste disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed waste at the active face, however, the Director may require that



the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

5.6.2 Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active waste cell in the solid waste disposal area such that no more than 200 m² of waste are exposed at the active face at any time and such that the volume of waste in the cell does not exceed 2000 m³. Once the maximum volume of waste has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new waste cell begun.

5.6.3 Final Cover

Completed portions of the solid waste disposal area shall progressively receive final cover during the active life of the landfill (see Section 12.5).

5.7 Dead Animal Disposal

Dead animals and animal parts shall be disposed of in the solid waste disposal area and covered as soon as practicable with a minimum of 60 centimetres of soil and/or waste material such that flies and scavenging animals are prevented from accessing the carrion. Disposal of Specified Risk Material from cattle shall only be done in accordance with Canadian Food Inspection Agency requirements and procedures.

6. OPERATIONAL REQUIREMENTS FOR COMPOSTING

6.1 Composting

Composting operations shall comply with the requirements of the *Organic Matter Recycling Regulation* and any other relevant legislation.

6.2 Bear-Proofing

If the composting operation is to receive any organic wastes that are potential attractants to bears, then composting shall be completely enclosed by an electric fence or contained in a bear-proof structure (building or composting vessel). The electric fence shall comply with all requirements of Section 4.17.



7. OPERATIONAL REQUIREMENTS FOR STORAGE OF SELECTED WASTES FOR SALVAGE AND RECYCLING

7.1 Location

The operational certificate holder may identify an area for the storage of selected wastes for salvage and recycling (herein referred to as the salvage/recycling area). Any salvage/recycling shall be restricted to the designated salvage/recycling area. This area shall be clearly identified at the landfill site. Signs which identify the nature of the materials acceptable at the designated salvage/recycling area shall be erected and maintained. The lettering on the signs shall be such that it is clearly readable by the public upon approach.

7.2 Nature of Wastes

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value such as tires, lead-acid batteries, auto hulks, white goods, furniture, used lumber, used goods and the like, but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by Section 4.2.

7.3 Compliance

Salvage/recycling shall comply with the requirements of the *Storage of Recyclable Material Regulation* and any other relevant legislation and any additional requirements contained in this operational certificate.

7.4 Contamination

Contamination of any of the designated salvage/recycling storage piles with putrescible wastes shall be cleaned up immediately.

8. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

8.1 Location

The operational certificate holder may identify an area for the use of open burning to dispose of selected combustibles (herein referred to as the open burning area). Any open burning of selected wastes shall be restricted to the designated open burning area. This area shall be clearly identified at the landfill site. Signs which identify the nature of the waste acceptable at the designated open burning area shall be erected and maintained. The lettering on the sign(s) shall be such that it is clearly readable by the public upon approach.



8.2 Quantity, Timing, and Duration of Discharge

The maximum authorized quantity of wood residue to be open burned during each event is that which has accumulated at the time of burn initiation. The pile(s) shall be constructed so as to ensure a rapid and complete burn. The quantity of air contaminants is indeterminate.

The maximum authorized duration of each burn shall be limited to the period between two hours after sunrise on the day of ignition, and sunset on the following day. Each open burn must be completely extinguished at the end of the authorized burn duration.

Should a condition arise which prevents the burn pile(s) from being burned within this period, the Director must be notified in accordance with Section 8.10 of this authorization.

8.3 Nature of Wastes

No wastes shall be burned which are unacceptable to the Director. Acceptable materials for burning may only include dry, unpainted, untreated demolition, construction and packing-related wood residue, clean stumps and brush, but must exclude nuisance-causing combustibles such as glue-containing wood, painted and treated wood, sawdust, yard wastes, mulch, wood chips, rubber, plastics, tars, insulation, roofing material, asphalt shingles, etc.

8.4 Favourable Weather for Smoke Dispersion

Open burning shall not proceed unless weather conditions are such that emissions are dispersed away from populated areas.

The operational certificate holder must also obtain a burn registration number from the Ministry of Forests (1-888-797-1717) prior to ignition.

Open burning of wood residue must not be initiated or continued if the local air flow will cause the smoke to negatively impact a nearby population or cause pollution.

No burning shall occur during periods of fire hazard or when burning is prohibited by other agencies.

8.5 Fire Accelerant

A suitable amount of approved fire accelerant such as diesel fuel or commercial fire starter gel or a flame-thrower shall be used to ensure efficient and rapid ignition of the waste material.

8.6 Minimization of Smoke

The burn shall be tended and fed in a manner that ensures minimization of smoke emissions. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates dirt; waiting to burn until wastes are reasonably dry after any significant precipitation event; and using adequate equipment and staff.

8.7 Contingency Plan

Prior to burning, a contingency plan must be in place detailing how the open burn will be extinguished in the event of any of the following occurring:

- i) Inadequate smoke dispersion in the surrounding environment;
- ii) wood residue continues to smoulder after the authorized burn period; and,
- iii) the Director requires that the open burn be extinguished for environmental protection reasons.

At a minimum, the plan must detail the actions to be taken to extinguish the open burn should any of the above conditions occur. The plan shall be made available to the Director upon request.

8.8 Extinguishment

All combustion shall be completely extinguished at the end of the authorized period as set out in Section 8.2 "Quantity, Timing and Duration of Discharge."

8.9 Fire Supervision and Suppression

An attendant shall be on-site to supervise the burn. Adequate fire suppression equipment shall be available for the entire duration of the event, and must be capable of extinguishing the fire if necessary. Local fire departments must be notified of the operational certificate holder's intent to burn, prior to ignition.

8.10 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the burn piles regularly and ensure that they are burning well. In the event of an emergency, or condition beyond the control of the operational certificate holder which prevents continuing operation of the approved method of open burning, the operational certificate holder shall notify the Director within two hours. If notification is necessary, it shall be accomplished by contacting the Environmental Protection program at (250) 847 - 7260.

The Director may require additional controls on the burning process and may require that the burn be extinguished at any time based on its impacts on the receiving environment.

8.11 Documentation

Following completion of each burn, notice shall be sent to the Director by fax (250-847-7591) or by e-mail to a Skeena Environmental Protection staff member advising of the following details: time of burn initiation, time of burn cessation, volume of wood residue burned, venting index values obtained for burning, and any extraordinary conditions encountered during the burn.

9. OPERATIONAL REQUIREMENTS FOR LIQUID WASTE DISPOSAL

9.1 Location

The designated septage waste disposal area shall be clearly identified at the landfill site. Septage waste disposal shall be restricted to this area. The location and design of the designated septage waste disposal area shall be to the satisfaction of the Director. This area shall be fenced to restrict access to the sewage lagoons. Signs worded 'Septage Waste Disposal' shall be erected and maintained such that the lagoons are identifiable from any approach.

9.2 Freeboard and Berms

A minimum freeboard of 50 centimetres shall be maintained at all times. The lagoon berms shall be maintained in good working order and the Director shall be notified immediately of any failure or overflow.

9.3 Nature of Wastes

The nature of wastes which may be discharged to the designated lagoons is that of typical septic tank pumpage, holding tank waste and sewage treatment plant sludge. Industrial sludges (including, but not limited to, oil separation sludges and the like) shall not be discharged to the designated lagoons.

9.4 Sludge Removal

Sludge from the septage lagoons shall be disposed in a manner and at a location approved by the Director. If the sludge is to be removed from the lagoon for final disposal on the adjacent landfill, the lagoon must be rested for a sufficient amount of time to allow the wastes to dewater. Once the solidified sludge is deposited on the



landfill, it must be covered immediately with a minimum of 30 centimetres of compacted cover material.

9.5 **Lagoon Closure**

If the lagoons are to be closed, the sludge must be allowed to dewater to a moisture content that will support final cover. The lagoons must then be covered with a minimum of 1 metre of compacted soil and sloped to promote runoff.

10. **MONITORING REQUIREMENTS**

The operational certificate holder shall have a qualified professional evaluate whether an environmental effects monitoring program is needed. The assessment and recommended monitoring program, should one be required, shall be submitted for Director's approval on or before June 30, 2013. In addition to surface water sites, the qualified professional should consider the necessity of establishing ground water monitoring locations.

Until June 30, 2013, an interim monitoring program shall be implemented as follows:

Sampling Locations ¹ and EMS ID	Frequency ³	Parameters ³
Un-named Creek U/S of Iskut Landfill E282678	twice annually, in April and September	<u>Field Measurements:</u> pH, dissolved oxygen, specific conductance, temperature
Un-named Creek D/S of Iskut Landfill E282679		<u>Lab Analysis:</u> BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals ²
¹ Sampling locations are shown on the site plan ² Lab analysis for dissolved metals shall use a low level scan ³ May be altered in future, depending on results		

11. **REPORTING REQUIREMENTS**

11.1 **Reporting**

All reports, drawings, data, studies and the like shall be submitted in hardcopy and electronic formats unless otherwise specified by the Director.

11.2 **Log Book**

As required by Sections 4.17.9 and 5.6 the operational certificate holder

shall maintain a log book. The log book shall be made available for inspection by Ministry staff upon request.

11.3 Non-compliance Reporting

The operational certificate holder shall immediately notify the Director of any non-compliance with the requirements of this operational certificate and take appropriate remedial action. Written confirmation of all non-compliance events, including available test results, is required by facsimile or email to Environmental Protection staff within 24 hours of the original notification unless otherwise directed by the Director.

11.4 Non-compliance Follow-up

Upon request, the operational certificate holder shall submit to the Director a written report within 30 days of the non-compliance occurrence. The report shall include, but not necessarily be limited to, the following:

- i) All relevant information and test results related to the non-compliance;
- ii) an explanation of the most probable cause(s) of the non-compliance; and,
- iii) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

11.5 Annual Report

The operational certificate holder shall submit a basic annual report to the Director on or before June 30 each year for the previous calendar year.

The report shall contain, at a minimum:

- i) The type and tonnage or volume of waste received, recycled, and landfilled for the year;
- ii) occurrences or observations of wildlife attempting to access the facility;
- iii) the results of any monitoring programs undertaken by the operational certificate holder for this site. Trend analysis, as well as an evaluation of any identified impacts of the discharges on the



receiving environment in the previous year shall be carried out by a qualified professional, if determined to be necessary by the Director.

12. CLOSURE REQUIREMENTS

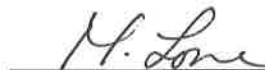
12.1 Notification of Closure

The operational certificate holder shall notify the Director in writing of intentions to close the landfill site.

12.2 Closure Plan

A closure plan shall be submitted to the Director no later than 6 months in advance of scheduled closure. The closure plan shall, at a minimum, include the following:

- i) Proposed end-use of the landfill property after closure;
- ii) anticipated total waste volume, tonnage, and life remaining of the landfill;
- iii) a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- iv) design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;
- v) procedures for notifying the public about the closure and about alternative waste disposal facilities;
- vi) rodent and nuisance wildlife control procedures;
- vii) a comprehensive monitoring plan, if determined to be necessary by a qualified professional, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;
- viii) a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required);
- ix) a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and,



- x) an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

12.3 Closure Funding

The operational certificate holder shall ensure that sufficient funds will be available to provide for all closure and post-closure requirements as outlined in the closure plan required by Section 12.2, plus a reasonable contingency for any remediation which may be required.

12.4 Final Cover

The final cover system shall be designed by a qualified professional to match the intended end-use of the landfill site and to match the needs of any required environmental management systems (leachate minimization or recirculation, as the case may be, landfill gas collection and treatment, etc.). Generally, the final cover shall consist of a layer of 1 metre of low permeability ($<1 \times 10^{-5}$ cm/s) compacted soil followed by a layer of topsoil suitable for establishment of vegetation. Higher permeability soil may be used if determined to be acceptable by a qualified professional and specified in the DOCP. The final cover shall be constructed with minimum and maximum slopes as specified by a qualified professional (see Section 3.4) to promote runoff and minimize erosion, with appropriate runoff drainage controls, erosion controls, and gas venting controls. The site shall be seeded with a grass/legume mixture suited to the local climate.

12.5 Progressive Application of Final Cover

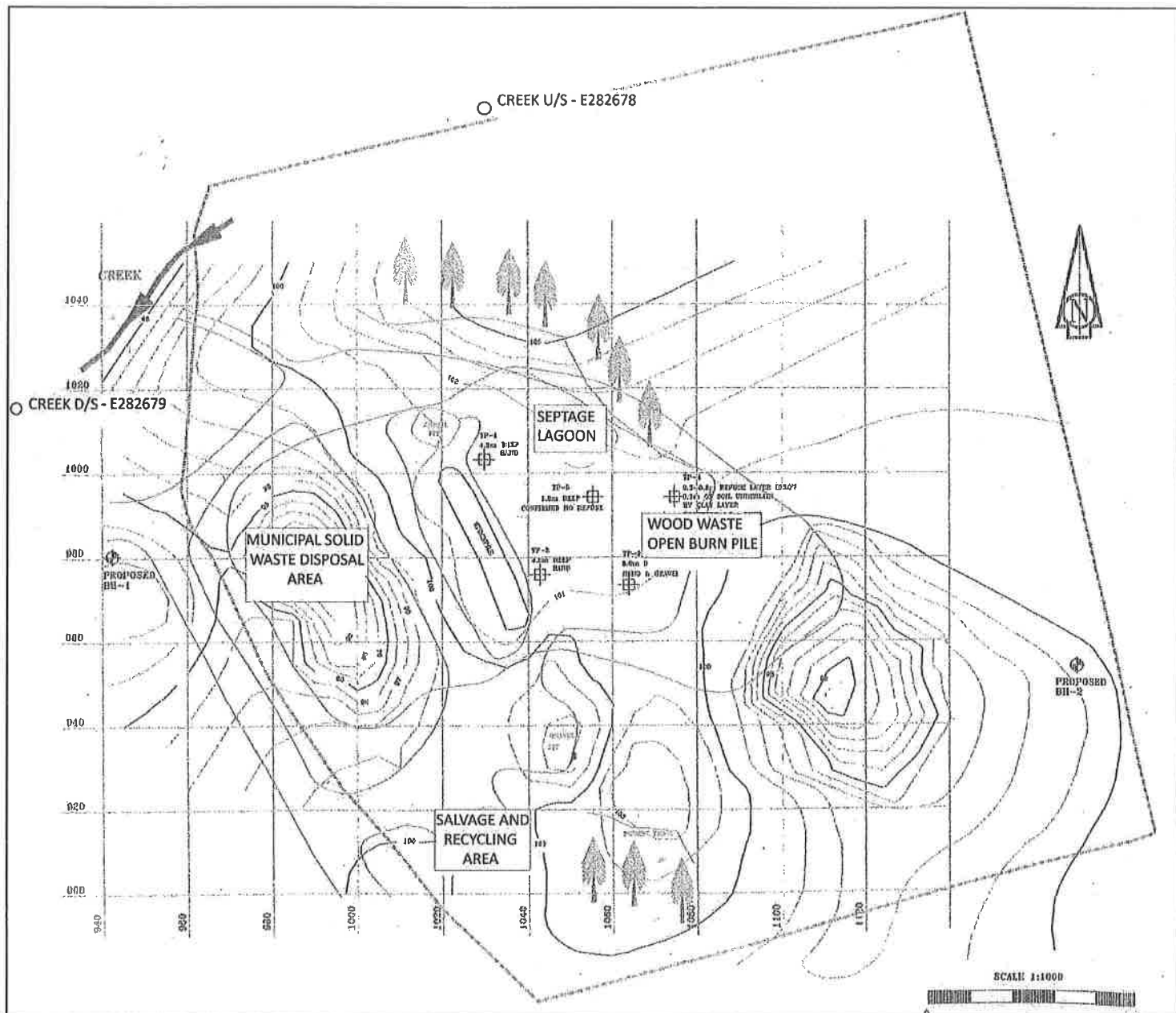
Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in Section 12.4.

13. ENVIRONMENTAL IMPACT

Inspections of the discharge will be carried out by Environmental Protection personnel as a part of the routine operational certificate inspection procedure. Based on these inspections and any other information available to the Director on the effect of the discharge on the receiving environment, the operational certificate holder may be required to undertake additional monitoring, undertake additional studies, install additional pollution control works, or change the method of operation.

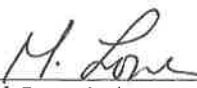


SITE PLAN



Date Issued: December 20, 2012
Date Amended:
(most recent)

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Mark Love, P.Ag
for Director, *Environmental Management Act*
Skeena Region
Permit Number: MR-4612

