

# 2018 CLOSED KITWANGA LANDFILL ANNUAL REPORT

June 2019

**Prepared for:**

British Columbia Ministry of  
Environment & Climate Change  
Strategy  
[EnvAuthorizationsReporting@gov.bc.ca](mailto:EnvAuthorizationsReporting@gov.bc.ca)

**Prepared by:**

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## Kitwanga Landfill Overview

The Kitwanga Landfill (Landfill) is in the process of closure, with one third currently closed with liner and the remainder to be shaped and closed with clays sourced from the Hazelton Waste Management Facility site over the next 10 years. The Kitwanga Landfill is located approximately 5 km north of the community of Kitwanga. Access is via the Stewart-Cassiar Highway.

The Kitwanga Transfer Station (the transfer station) opened in October of 2017 and is owned and operated by the Regional District of Kitimat-Stikine (Regional District or RDKS). The transfer station is on the site of the closed Landfill.

The transfer station accepts and manages municipal solid waste generated from commercial and residential sources in the Kitwanga area, including the communities of Kitwanga, Cedarvale, Gitanyow, Gitwangak, and Gitsegukla in accordance with the Regional District Kitimat-Stikine Solid Waste Management Plan (1995). Material is no longer discharged in the Landfill; waste is consolidated and hauled to the Hazelton Waste Management Facility for landfilling.

Landfill operations are regulated by the Ministry of Environment's Operation Certificate MR-5767, most recently amended in November 2012, and conducted in accordance with the Transfer Station Construction and Landfill Closure Design for The Kitwanga Landfill (Sperling Hansen Associates, 2016).

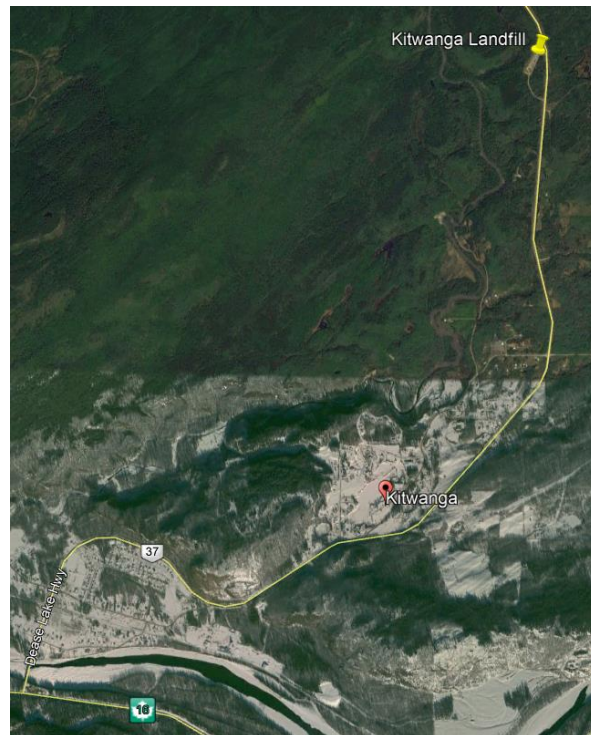


Figure 1 Location of Kitwanga Facility

Environmental monitoring for the Kitwanga 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 surface water monitoring results have been analyzed and reviewed by Tattersfield Consulting. The compiled data, interpretation, and recommendations from Tattersfield Consulting can be found in Appendix A.

It should be noted that the fall environmental monitoring sample was not collected during 2018 as the monitoring locations were dry when the sampling event was attempted on September 5<sup>th</sup>, 2018. It should also be noted that the in-field data for the spring environmental monitoring conducted on April 17<sup>th</sup>, 2018 was lost.

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## 1.0 Introduction

This annual report covers the period of January to December 2018. This report has been prepared to fulfill the requirements of the Landfill's Operational Certificate MR-5767.

Issued by the Ministry of Environment (MOE) in November 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.

As of October 2017, the Kitwanga facility operated as a transfer station to consolidate waste for landfilling at the Hazelton Waste Management Facility, and as a staging location for diverted materials.

This report meets the requirements in Section (10.5) of the Operational Certificate by providing the following information:

- Total volume or tonnage of waste discharged to the landfill during 2018;
- Total volume or tonnage of waste recycled and diverted during 2018;
- Occurrences or observations of wildlife attempting to access the facility; and
- The results and evaluation of all the monitoring programs has been undertaken by Tattersfield Consulting, and is shown in Appendix A.

## 2.0 Waste Disposal

The Kitwanga Transfer Station serves the Kitwanga area including the communities of: Kitwanga, Gitwangak, Gitanyow, Gitsegukla, and Cedarvale. The Landfill is in the process of closure and no waste was discharged at this location in 2018. Waste consolidated at the transfer station is landfilled at the Hazelton Waste Management Facility.

### 2.1 Solid Waste Disposal

The total tonnages of materials collected for consolidation and recycling at the Kitwanga Transfer Station from January through to December 2018 of are shown in Table 1.

Table 1: Waste Qualities for 2018

Material	2018 Quantity (tonnes)	
<b>Refuse to Hazelton Waste Management Facility for Landfilling</b>		
Garbage		927.8*
<b>Diverted Wastes</b>		
Metal	76.6	
Tires	4.5*	
Printed Paper and Packaging	17.9	
Cardboard	13.1	
Household Electronics	4.7	
Small appliances	2.0	
<b>Total Diverted</b>	<b>118.8</b>	
<b>Total to Landfill</b>		<b>927.8</b>

Note: \*This value is based on pre-compaction volume (m<sup>3</sup>) data collected from October to December 2018, inclusive, extrapolated to a 12-month data set. Volume data was converted to tonnage using the U.S. Environmental Protection Agencies *Volume to Weight Conversion Factors* (2016) value of 175kg/m<sup>3</sup> for uncompacted mixed municipal solid waste.

\*This value is an estimate.

### 2.1.1 Garbage

Garbage is defined as discharged materials not including hazardous waste, clean wood, metal, printed paper and packaging, cardboard, and electronics and appliances. Clean wood is segregated and not deposited into the landfill.

In 2018, 927.8 tonnes of garbage was consolidated at the Kitwanga Transfer Station for final disposal at the Hazelton Waste Management Facility.

## 3.0 Diverted Materials

There are designated segregation areas at the Kitwanga facility for: metal materials including large appliances, tires, clean wood, printed paper and packaging, cardboard, household electronics, and small appliances.

### **3.1.1 Metal**

In 2018, a total of 76.6 tonnes of metal, including scrap, propane tanks, and large appliances were collected at the Kitwanga Transfer Station for recycling. All ozone depleting substances were removed from pertinent appliances prior to collection by scrap metal recycler.

### **3.1.2 Tires**

In 2018, a total of 4.5 tonnes of tires were collected at the Kitwanga Transfer Station for recycling through the Tire Stewardship of BC.

### **3.1.3 Printed Paper and Packing Materials (PPP) and Cardboard**

During 2018, 17.9 tonnes of PPP and 13.1 tonnes of corrugated cardboard was collected at the Kitwanga Transfer Station for recycling.

### **3.1.4 Electronics**

During 2018, 4.7 tonnes of household electronics were collected at the Kitwanga Transfer Station for Stewardship recycling through the Encorp Electronics.

### **3.1.5 Small appliances**

During 2018, 2 tonnes of small appliances and power tools were collected at the Kitwanga Transfer Station for Stewardship recycling through Product Care's ElectroRecycle program.

## **4.0 Wildlife Occurrences and Observations**

The closed Kitwanga Landfill/ operating Transfer Station 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 facility, including the entrance gate, to prevent wildlife access and is kept charged from spring until late fall.

Facility operators are required to conduct fence line inspections at a minimum weekly interval, testing for proper voltage, proper tension on fence stands, overall condition of the fence, and signs of wildlife activity. Inspections results are recorded on the Daily Operation Inspection Form.

There were no wildlife incidents or encounters observed during 2018 at the Kitwanga facility.

## **5.0 Environmental Monitoring Report**

Environmental monitoring for the Kitwanga Landfill 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 laboratory data for groundwater, surface water, and leachate monitoring results has been analyzed and reviewed by Tattersfield Consulting. The compiled data, interpretation, and recommendations can be found in Appendix A.



Document prepared by:



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# Appendix A

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# KITWANGA LANDFILL 2018 ENVIRONMENTAL MONITORING REPORT

**Prepared for:**

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**Prepared by:**

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Terrace, BC.

**June 2019**

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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 Kitwanga 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 Kitwanga Operational Certificate (figure 2).

## 1.1. Site Setting

The Kitwanga landfill is located approximately 4.5 km north of Kitwanga to the west of Highway 37 north (Figure 1).

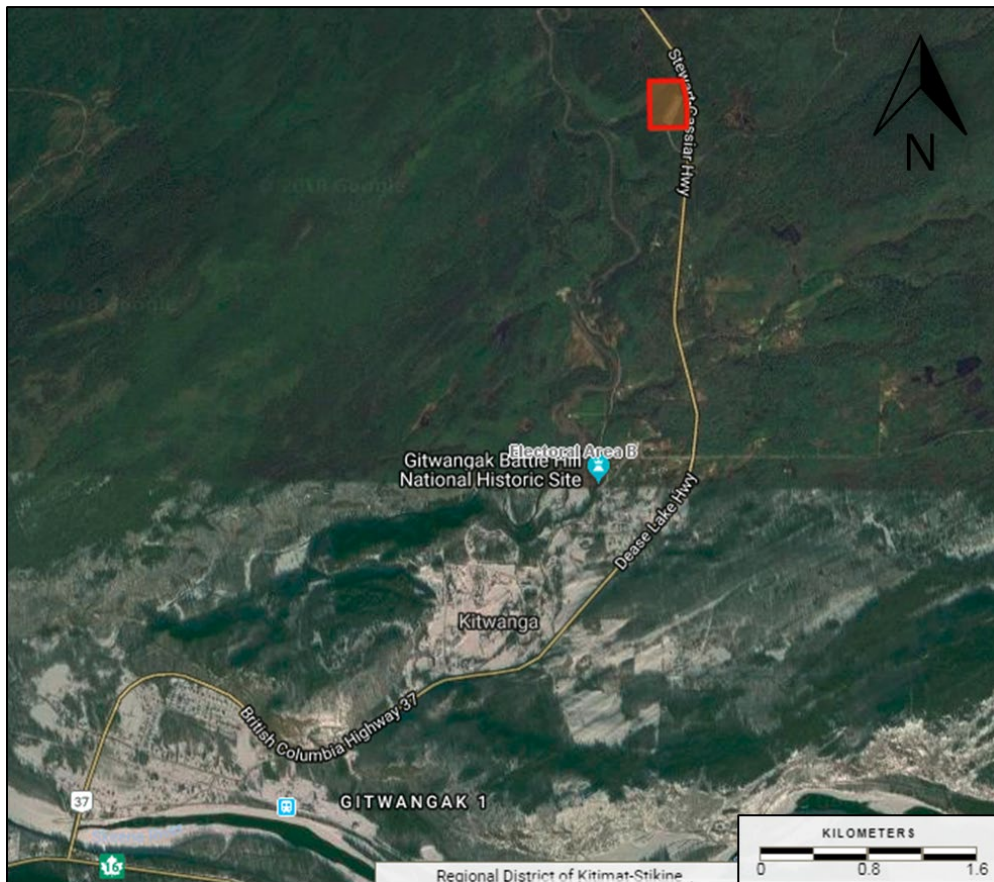


Figure 1. The Kitwanga Landfill is located ~4.5 km north of Kitwanga to the west of Hwy 37 north.

## 2. Surface Water Quality Monitoring

Prior and current surface water sampling has only been completed once annually at two locations. Twice annual sampling (as specified in Figure 2) was not possible in 2018 as the unnamed creek was dry during the fall. The sample creek is located to the north west of the landfill (Figure 3).

Sampling Locations <sup>1</sup> and EMS ID	Frequency <sup>3</sup>	Parameters <sup>3</sup>
Unnamed Creek U/S of Kitwanga Landfill E278450	twice annually, in April and September	<b>Field Measurements:</b> pH, dissolved oxygen, specific conductance, temperature
Unnamed Creek D/S of Kitwanga Landfill E278449		<b>Lab Analysis:</b> BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals <sup>2</sup>
<sup>1</sup> Sampling locations are shown on the site plan <sup>2</sup> Lab analysis for dissolved metals shall use a low level scan <sup>3</sup> May be altered in future, depending on results		

Figure 2. Interim monitoring requirements as shown in the Kitwanga Landfill OC.

Historic sample dates include:

- May 12, 2014
- April 28, 2015
- April 6, 2016
- April 17, 2018

In 2018, surface water sampling was completed April 17, 2018 at the following locations (Figure 3):

- Un-named Creek upstream (U/S) of Kitwanga Landfill (E278450)
- Un-named Creek downstream (D/S) of Kitwanga Landfill (E278449)

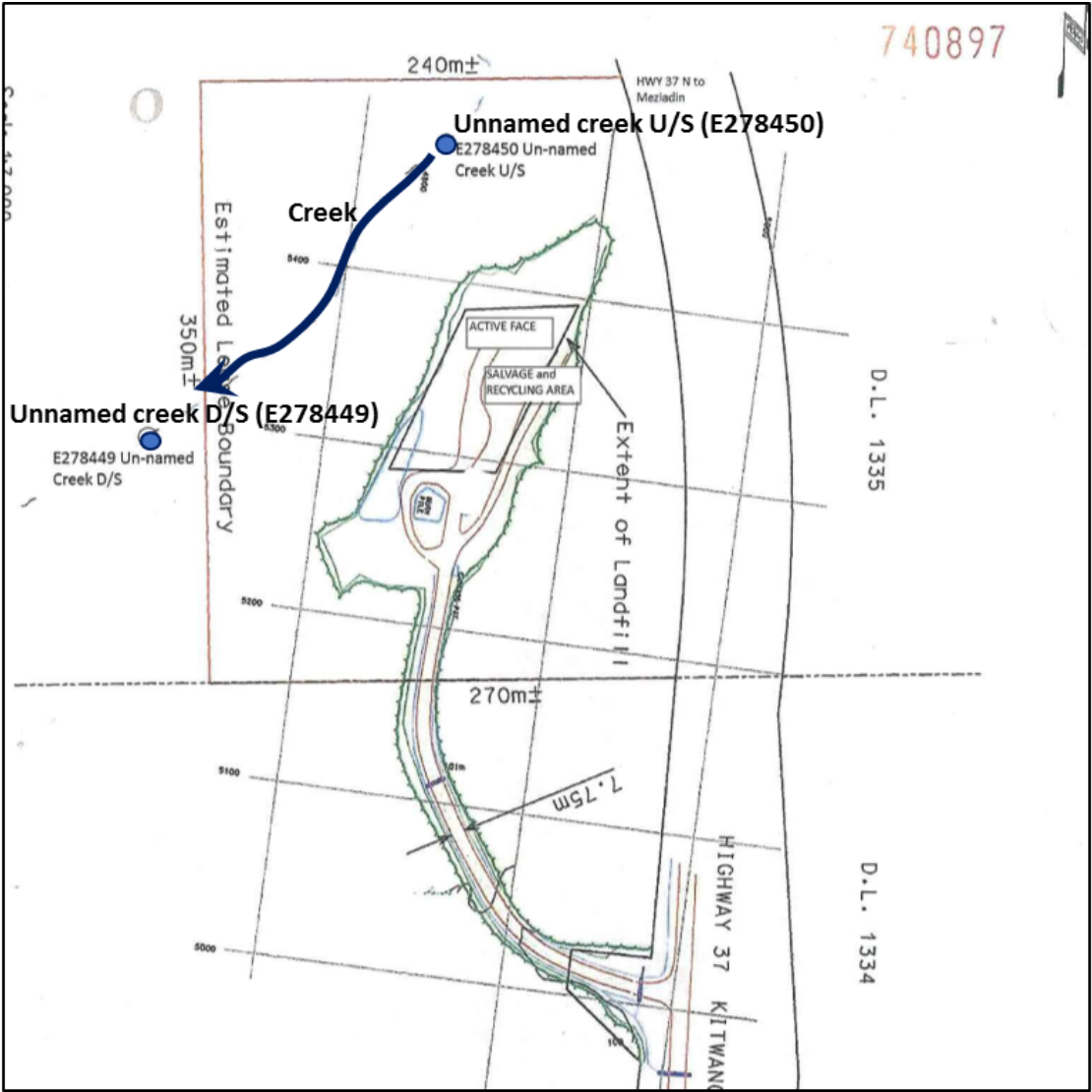


Figure 3. Site plan showing U/S and D/S sampling locations on Unnamed Creek adjacent to the Kitwanga Landfill (adapted from the Kitwanga Landfill OC).

### 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. 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 2018 are attached in Appendix A. Data was compiled for all sample dates (Appendix B) and reviewed against the following guidelines, which were updated and provided by RDKS:

- BC MoE Water Quality Guidelines for aquatic life (BCWQG - AW)
- 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. E278450 Un-named Creek U/S from Kitwanga Landfill

The E278450 sample site is located U/S from potential leachate effects and establishes background surface water quality.

Only one exceedance was noted for total copper: April 2016 at 0.0048 mg/L, which exceeds the lower BCWQG-AW standard of 0.0032mg/L. This exceedance did not occur in the D/S 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: No in-situ field data is available for this site.

Lab:

- BOD: 3.8-<4.0 mg/L
- total nitrogen: 0.325 mg/L (2018 only)
- phosphorus: total <0.02-<0.05 mg/L; dissolved <0.05 mg/L (less than detection limits)
- ammonia: total as N 0.0093-<0.03 mg/L

- pH: 7.1-7.6
- total and dissolved metals:
  - chloride: 1.3-1.7 mg/L
  - sulphate: <0.5-<1.0 mg/L
  - aluminum: total 0.098-0.352 mg/L; dissolved 0.150 mg/L
  - iron: total 0.27-0.503 mg/L; Dissolved 0.201 mg/L
  - manganese: total 0.0364-0.0751 mg/L; dissolved 0.0156 mg/L

### 2.3.2. E278449 Un-named creek D/S from Kitwanga Landfill

The E278449 sample site is located D/S from potential leachate effects. No exceedances were noted in existing 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: No in-situ field data is available for this site.

Lab:

- BOD: <4.0-6.1 mg/L
- total nitrogen: 0.355 mg/L (2018 only)
- phosphorus: total <.02-<.05 mg/L; dissolved <.02-<.05 mg/L (less than detection limits)
- ammonia: total as N 0.0084-0.04 mg/L
- pH: 7.4-7.6
- total and dissolved metals:
  - chloride: 1.7-1.8 mg/L
  - sulphate: <1.0-<0.5 mg/L
  - aluminum: total 0.157-0.406 mg/L; dissolved 0.150 mg/L
  - iron: total 0.368-0.58 mg/L; dissolved 0.201 mg/L
  - manganese: total 0.0437-0.0508 mg/L; dissolved 0.0156 mg/L

## 3. Trends

It is difficult to establish long term trends due to limited historical data. Figures 4-7 illustrate existing data points for E274850 and E278449 for conductivity, total aluminum, total iron and total copper. Trend charts for dissolved metals of interest could be started in following years when more data are available.

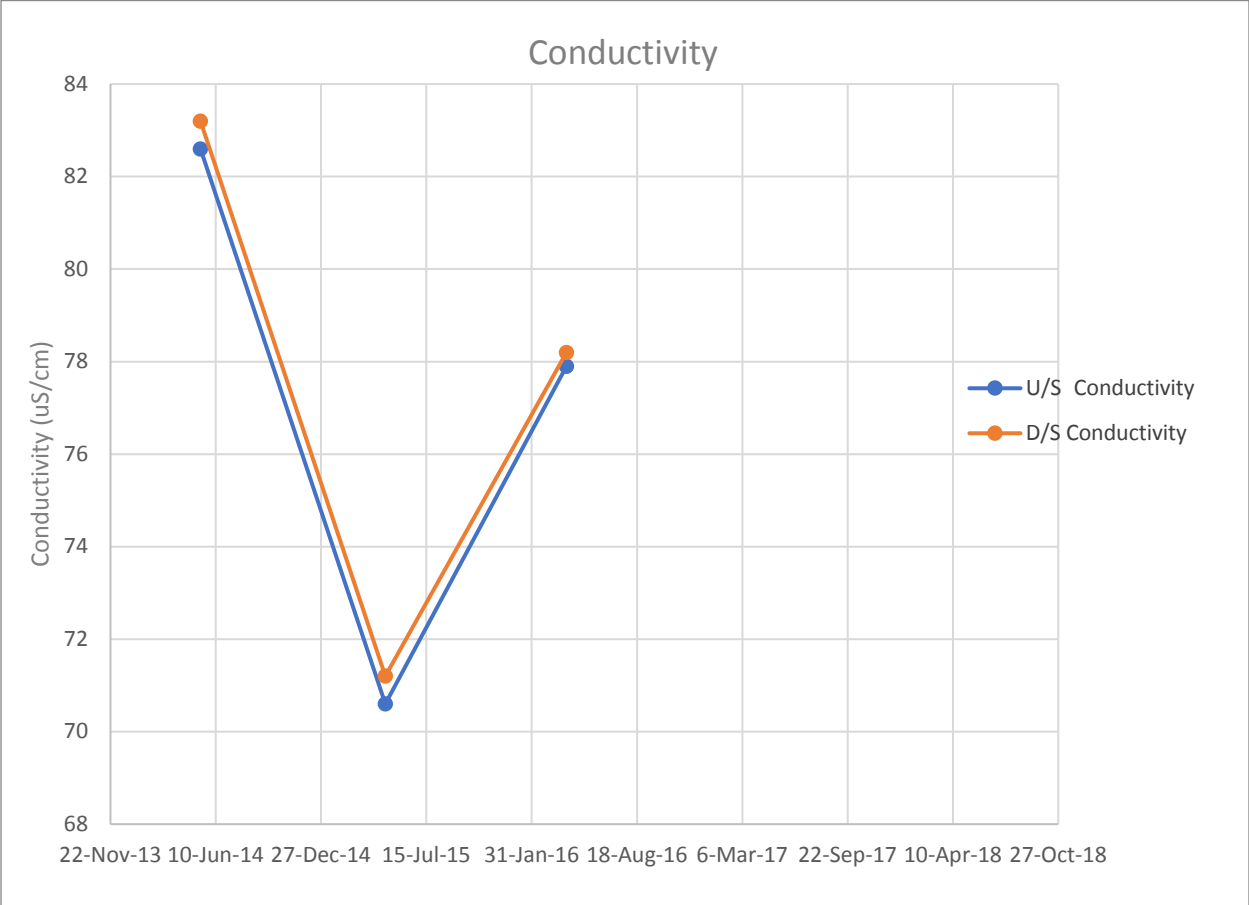


Figure 4. Conductivity over time.

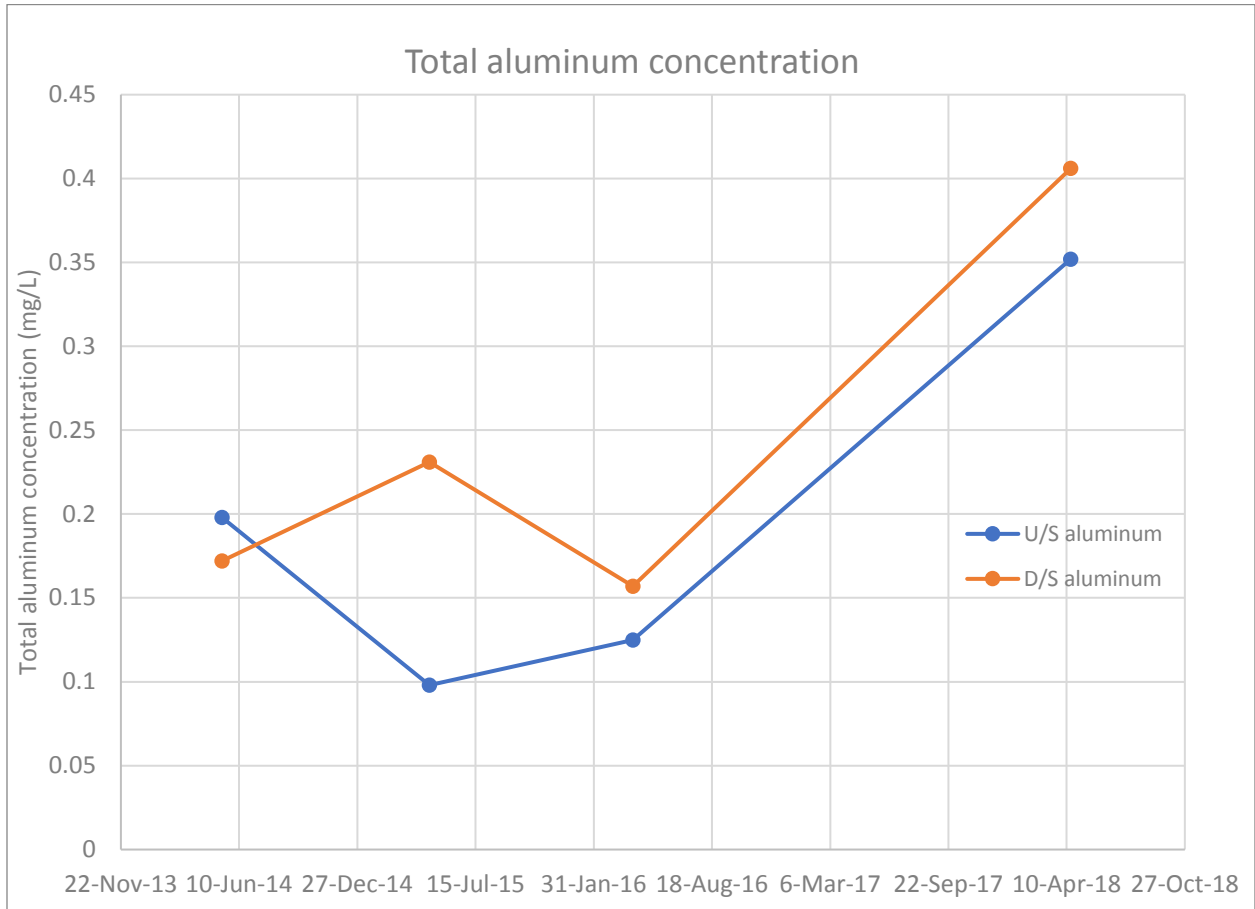


Figure 5. Total aluminum concentration over time.

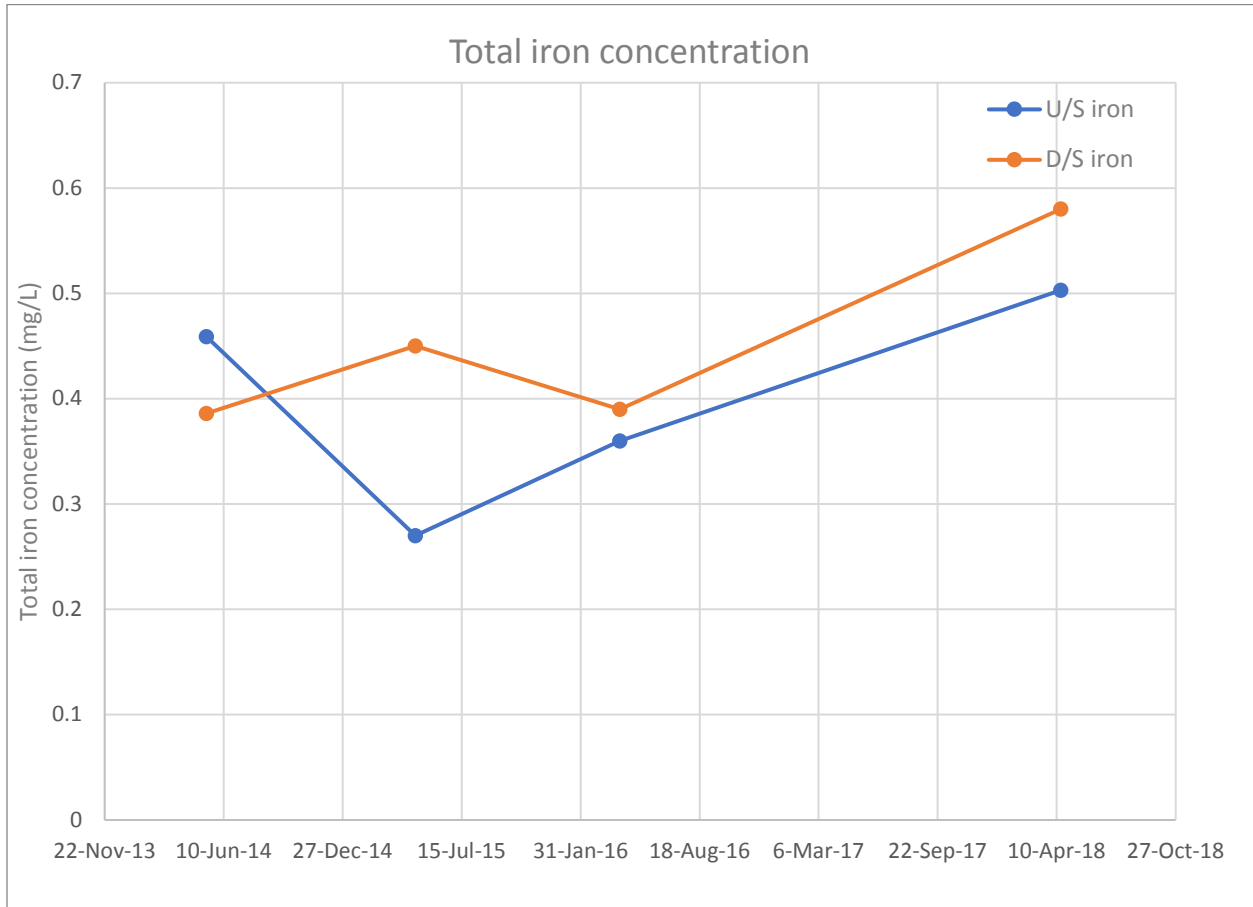


Figure 6. Total iron concentration over time.

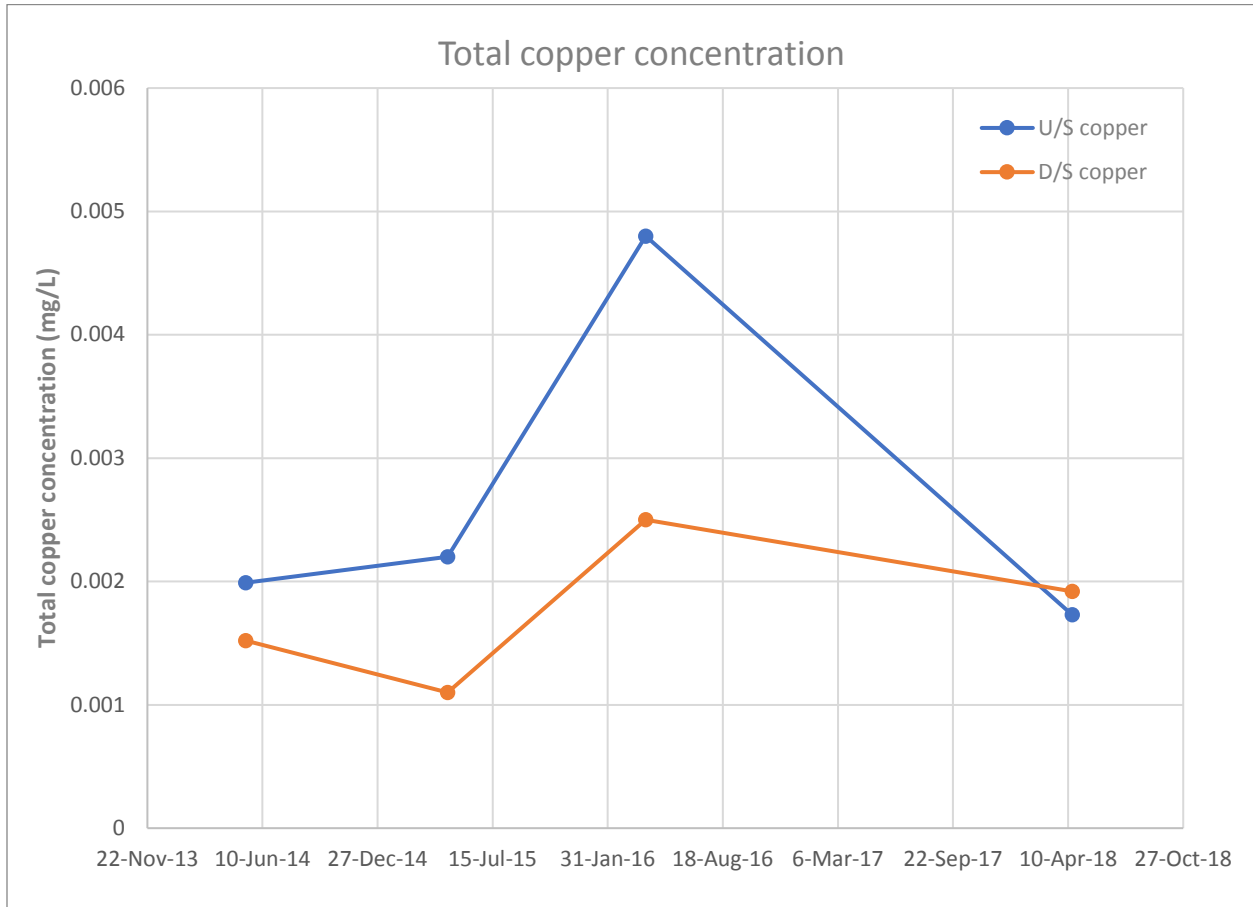


Figure 7. Total copper concentrations over time.

## 4. Conclusion

Based on the data and standards provided by RDKS, and the assumption they accurately reflect the existing water quality conditions at the Kitwanga 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 for all sample dates on record.

### 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.
- A groundwater sampling program could be considered in addition to the on-going surface water monitoring.
- Trend charts could be started for dissolved metals of interest once additional data points are available.

Report prepared by:

A handwritten signature in black ink that reads "C. Tattersfield". The signature is written in a cursive style with a large initial "C".

Carmen Tattersfield, MSc., RP.Bio.

Tattersfield Consulting

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## Appendix A – Laboratory Data





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ATTN: Chris Kerr  
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Date Received: 19-APR-18  
Report Date: 03-MAY-18 11:50 (MT)  
Version: FINAL

Client Phone: 250-615-6100

## Certificate of Analysis

Lab Work Order #: L2082375  
Project P.O. #: NOT SUBMITTED  
Job Reference: KITWANGA TRANSFER STATION  
C of C Numbers: 10-334388  
Legal Site Desc:

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Amber Springer, B.Sc  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2082375-1	L2082375-2		
		Description	Surface	Surface		
		Sampled Date	17-APR-18	17-APR-18		
		Sampled Time	10:32	11:30		
		Client ID	DOWN STREAM OF KITWANGA E278449	UP STREAM OF KITWANGA E278450		
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)		30.9	30.5		
	pH (pH)		7.41	7.59		
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)		0.0084	0.0093		
	Total Nitrogen (mg/L)		0.355	0.325		
	Phosphorus (P)-Total (mg/L)		0.0184	0.0152		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		0.406	0.352		
	Antimony (Sb)-Total (mg/L)		<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)		0.00035	0.00032		
	Barium (Ba)-Total (mg/L)		0.0223	0.0205		
	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)		0.0000053	0.0000059		
	Calcium (Ca)-Total (mg/L)		8.45	8.44		
	Cesium (Cs)-Total (mg/L)		0.000050	0.000042		
	Chromium (Cr)-Total (mg/L)		0.00056	0.00056		
	Cobalt (Co)-Total (mg/L)		0.00019	0.00016		
	Copper (Cu)-Total (mg/L)		0.00192	0.00173		
	Iron (Fe)-Total (mg/L)		0.580	0.503		
	Lead (Pb)-Total (mg/L)		0.000109	0.000088		
	Lithium (Li)-Total (mg/L)		<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)		2.30	2.24		
	Manganese (Mn)-Total (mg/L)		0.0437	0.0364		
	Mercury (Hg)-Total (mg/L)		0.0000118	0.0000097		
	Molybdenum (Mo)-Total (mg/L)		0.000067	0.000065		
	Nickel (Ni)-Total (mg/L)		0.00108	0.00097		
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050		
	Potassium (K)-Total (mg/L)		0.434	0.411		
	Rubidium (Rb)-Total (mg/L)		0.00030	0.00029		
	Selenium (Se)-Total (mg/L)		0.000055	0.000098		
	Silicon (Si)-Total (mg/L)		3.56	3.41		
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)		3.49	3.30		
	Strontium (Sr)-Total (mg/L)		0.0844	0.0848		
	Sulfur (S)-Total (mg/L)		<0.50	<0.50		
	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	L2082375-1	L2082375-2		
		Description	Surface	Surface		
		Sampled Date	17-APR-18	17-APR-18		
		Sampled Time	10:32	11:30		
		Client ID	DOWN STREAM OF KITWANGA E278449	UP STREAM OF KITWANGA E278450		
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	0.00748	0.00623			
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010			
	Vanadium (V)-Total (mg/L)	0.00091	0.00078			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	0.000431	0.000325			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.150	0.150			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00021	0.00019			
	Barium (Ba)-Dissolved (mg/L)	0.0195	0.0203			
	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)	8.39	8.48			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00023			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00151	0.00150			
	Iron (Fe)-Dissolved (mg/L)	0.201	0.201			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	2.41	2.26			
	Manganese (Mn)-Dissolved (mg/L)	0.0137	0.0156			
	Mercury (Hg)-Dissolved (mg/L)	0.0000111	0.0000122			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.410	0.391			
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020	<0.00020			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000053			
	Silicon (Si)-Dissolved (mg/L)	3.03	3.07			
	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	L2082375-1	L2082375-2		
		Description	Surface	Surface		
		Sampled Date	17-APR-18	17-APR-18		
		Sampled Time	10:32	11:30		
		Client ID	DOWN STREAM OF KITWANGA E278449	UP STREAM OF KITWANGA E278450		
Grouping	Analyte					
<b>WATER</b>						
<b>Dissolved Metals</b>	Sodium (Na)-Dissolved (mg/L)		3.57	3.45		
	Strontium (Sr)-Dissolved (mg/L)		0.0825	0.0828		
	Sulfur (S)-Dissolved (mg/L)		<0.50	<0.50		
	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)		0.00296	0.00263		
	Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)		<0.000010	<0.000010		
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)		<0.0010	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)		0.000354	0.000365		
<b>Aggregate Organics</b>	BOD (mg/L)		6.1	3.8		

\* 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)
Method Blank	Nickel (Ni)-Dissolved	B	L2082375-1, -2
Matrix Spike	Aluminum (Al)-Total	MS-B	L2082375-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2082375-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2082375-1, -2
Matrix Spike	Manganese (Mn)-Total	MS-B	L2082375-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2082375-1, -2

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
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**
<b>BOD5-VA</b>	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>			
<b>EC-SCREEN-VA</b>	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>			
<b>HARDNESS-CALC-VA</b>	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>			
<b>HG-D-CVAA-VA</b>	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>			
<b>HG-T-CVAA-VA</b>	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>			
<b>MET-D-CCMS-VA</b>	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>			
<b>MET-T-CCMS-VA</b>	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>			
<b>N-T-COL-VA</b>	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>			
<b>NH3-F-VA</b>	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>			
<b>P-T-PRES-COL-VA</b>	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>			
<b>PH-PCT-VA</b>	Water	pH by Meter (Automated)	APHA 4500-H pH Value
<p>This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH</p>			

## Reference Information

electrode

It is recommended that this analysis be conducted in the field.

\*\* 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:

10-334388

### 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

Kitwanga Water Quality Results											
Analyte	Units	BC MoE Guidelines	BC MoE Guidelines	Upstream Sampling Location				Downstream Sampling Location			
		BCWQG-AW (1) □	CSR-DW (2)	12/05/2014	28/04/2015	06/04/2016	17/04/2018	12/05/2014	28/04/2015	06/04/2016	17/04/2018
Conductivity	uS/cm	-	-	82.6	70.6	77.9		83.2	71.2	78.2	
Hardness (as CaCO3)	mg/L	-	-	35.4	29.4	35.3	30.5	27.0	31.8	35.3	30.9
pH	pH	6.5-9.0	-	7.4	7.1	7.6	7.59	7.4	7.5	7.6	7.41
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l) (i)	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Acidity	mg/L	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	-	<0.03	<0.03	<0.03	0.0093	<0.03	<0.03	0.04	0.0084
Total Nitrogen	mg/L	-	-	-	-	-	0.325	-	-	-	0.355
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	600	250 (z)	1.7	1.3	1.6		1.8	1.7	1.8	
Fluoride (F)	mg/L	0.4-1.87 (d)	1.5 (z)	<0.1	<0.10	<0.10		<0.1	<0.10	<0.10	
Nitrate (as N)	mg/L	32.8	10 (z)	<0.02	<0.01	<0.01		<0.02	<0.01	0.01	
Nitrite (as N)	mg/L	0.06-0.6 (h)	1 (z)	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	
Sulfate (SO4)	mg/L	128-429 (d)	500 (z)	<0.5	<1.0	<1.0		<0.5	<1.0	<1.0	
Total Organic Carbon	mg/L	+/- 20% of background	-	-	-	-		-	-	-	
BOD	mg/L	-	-	<4.0	<4.0	<4.0	3.8	<4.0	<4.0	<4.0	6.1
COD	mg/L	-	-	30	34	35		25	<20	36	
<b>Total Metals</b>											
Aluminum (Al)-Total	mg/L	-	-	0.198	0.098	0.125	0.352	0.172	0.231	0.157	0.406
Antimony (Sb)-Total	mg/L	0.270	-	0.00007	<0.0001	0.0001	<0.00010	0.000065	<0.0001	0.0003	<0.00010
Arsenic (As)-Total	mg/L	0.005 (j)	-	0.000513	<0.0005	<0.0005	0.00032	0.000401	<0.0005	<0.0005	0.00035
Barium (Ba)-Total	mg/L	1	-	0.0208	0.024	0.019	0.0205	0.0165	0.023	0.019	0.0223
Beryllium (Be)-Total	mg/L	0.00013	-	<0.00001	<0.0001	<0.0001	<0.00010	<0.00001	<0.0001	<0.0001	<0.00010
Bismuth		-	-	-	-	<0.0001	<0.000050	-	-	<0.0001	<0.000050
Boron (B)-Total	mg/L	1.2 (j)	-	<0.05	0.014	0.007	<0.010	<0.05	0.012	0.007	<0.010
Cadmium (Cd)-Total	mg/L	-	-	0.000008	0.00036	<0.00001	0.0000059	0.000009	<0.00001	0.00002	0.0000053
Calcium (Ca)-Total	mg/L	<4 sensitive to acid input	-	10.0	8.2	9.8	8.44	7.57	8.9	9.9	8.45
Cesium (Cs)		-	-	-	-	-	0.000042	-	-	-	0.00005
Chromium (Cr)-Total	mg/L	0.001e	-	0.00064	<0.0005	<0.0005	0.00056	0.00058	<0.0005	<0.0005	0.00056
Cobalt (Co)-Total	mg/L	0.11 (j)	-	0.000167	0.00013	0.00011	0.00016	0.000142	0.00015	0.00014	0.00019
Copper (Cu)-Total	mg/L	0.0032-0.0396 (d,f)	-	0.00199	0.0022	0.0048	0.00173	0.00152	0.0011	0.0025	0.00192
Iron (Fe)-Total	mg/L	1	-	0.459	0.27	0.36	0.503	0.386	0.45	0.39	0.58
Lead (Pb)-Total	mg/L	0.011-0.402 (d,f)	-	0.000093	<0.0001	0.0003	0.000088	0.000072	0.0001	0.0001	0.000109
Lithium (Li)-Total	mg/L	-	-	<0.0005	0.0002	0.0001	<0.0010	<0.0005	0.0003	0.0001	<0.0010
Magnesium (Mg)-Total	mg/L	-	-	2.50	2.17	2.63	2.24	1.97	2.31	2.57	2.3
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	-	0.0582	0.0751	0.0538	0.0364	0.0466	0.0508	0.0449	0.0437
Mercury (Hg)-Total	mg/L	0.0001 (j)	-	<0.00001	<0.00002	<0.00002	0.0000097	<0.00001	<0.00002	<0.00002	0.0000118
Molybdenum (Mo)-Total	mg/L	2 (j)	-	0.00012	0.0001	0.0001	0.000065	0.000091	<0.0001	0.0002	0.000067
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	-	0.00096	0.0008	0.0006	0.00097	0.00086	0.0008	0.0007	0.00108
Phosphorus - Total	mg/L	0.005-0.015 (lakes only)	-	-	-	<0.02	<0.050	-	-	<0.02	<0.050
Potassium (K)-Total	mg/L	-	-	0.50	0.46	0.43	0.411	0.39	0.42	0.43	0.43
Rubidium (Rd) - Total	mg/L	-	-	-	-	-	0.00029	-	-	-	0.0003
Selenium (Se)-Total		0.002	-	-	-	-	0.000098	-	-	-	0.000055
Silicon - Total	mg/L	-	-	-	-	3.40	3.41	-	-	3.300	3.560
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	-	<0.000005	<0.00005	<0.00005	<0.000010	0.000008	<0.00005	<0.00005	<0.000010
Sodium (Na)-Total	mg/L	-	-	3.96	4.05	4.32	3.3	3.03	3.59	4.25	3.49
Strontium - Total	mg/L	-	-	-	-	0.095	0.0848	-	-	0.093	0.0844
Sulfur - Total	mg/L	-	-	-	-	<1	<0.50	-	-	<1	<0.50
Tellurium - Total	mg/L	-	-	-	-	<0.0002	<0.00020	-	-	<0.0002	<0.00020
Thallium (Tl)-Total	mg/L	0.0008	-	<0.000002	<0.00002	<0.00002	<0.000010	0.000002	<0.00002	<0.00002	<0.000010
Thorium - Total	mg/L	-	-	-	-	<0.0001	<0.00010	-	-	<0.0001	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.0002	<0.0002	<0.0002	<0.00010	<0.0002	<0.0002	<0.0002	<0.00010
Titanium (Ti)-Total	mg/L	-	-	<0.005	<0.005	<0.005	0.00623	<0.005	<0.005	<0.005	0.00748
Tungsten (W) - Total	mg/L	-	-	-	-	-	<0.00010	-	-	-	<0.00010
Uranium (U)-Total	mg/L	0.0085	-	0.000006	<0.00002	<0.00002	<0.000010	0.000006	<0.00002	<0.00002	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.00058	<0.001	<0.001	0.00078	0.00057	0.001	<0.001	0.00091
Zinc (Zn)-Total	mg/L	0.033-0.341 (d, f)	-	0.0049	0.006	<0.004	<0.0030	0.0037	<0.004	<0.004	<0.0030



Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.023-0.1 (b,c)	9.5			0.15				0.15
Antimony (Sb)-Dissolved	mg/L	-	0.006			<0.00010				<0.00010
Arsenic (As)-Dissolved	mg/L	-	0.01			0.00019				0.00021
Barium (Ba)-Dissolved	mg/L	-	1			0.0203				0.0195
Beryllium (Be)-Dissolved	mg/L	-	0.008			<0.00010				<0.00010
Bismuth - Dissolved	mg/L	-	-			<0.000050				<0.000050
Boron (B)-Dissolved	mg/L	-	5			<0.010				<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000027-0.00280 (d,f)	0.005			<0.0000050				<0.0000050
Calcium (Ca)-Dissolved	mg/L	-	-			8.48				8.39
Cesium (Cs) - Dissolved	mg/L	-	-			<0.000010				<0.000010
Chromium (Cr)-Dissolved	mg/L	-	0.05-6.0			0.00023				0.00014
Cobalt (Co)-Dissolved	mg/L	-	0.001			<0.00010				<0.00010
Copper (Cu)-Dissolved	mg/L	-	1.5 (AO)			0.0015				0.00151
Iron (Fe)-Dissolved	mg/L	0.35	6.5			0.201				0.201
Lead (Pb)-Dissolved	mg/L	-	0.01			<0.000050				<0.000050
Lithium (Li)-Dissolved	mg/L	-	0.008			<0.0010				<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-			2.26				2.41
Manganese (Mn)-Dissolved	mg/L	-	1.5			0.0156				0.0137
Mercury (Hg)-Dissolved	mg/L	-	0.001			0.0000122				0.0000111
Molybdenum (Mo)-Dissolved	mg/L	-	0.25			<0.000050				<0.000050
Nickel (Ni)-Dissolved	mg/L	-	0.08			<0.00050				<0.00050
Phosphorus - Dissolved	mg/L	-	-			<0.050				<0.050
Potassium (K)-Dissolved	mg/L	-	-			0.391				0.41
Rubidium (Rb) -Dissolved	mg/L	-	-			<0.00020				<0.00020
Selenium (Se)-Dissolved	mg/L	-	0.01			0.000053				<0.000050
Silicon - Dissolved	mg/L	-	-			3.07				3.03
Silver (Ag)-Dissolved	mg/L	-	0.02			<0.000010				<0.000010
Sodium (Na)-Dissolved	mg/L	-	200			3.45				3.57
Strontium - Dissolved	mg/L	-	-			0.0828				0.0825
Sulfur- Dissolved	mg/L	-	-			<0.50				<0.50
Tellurium - Dissolved	mg/L	-	-			<0.00020				<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-			<0.000010				<0.000010
Thorium - Dissolved	mg/L	-	-			<0.00010				<0.00010
Tin (Sn)-Dissolved	mg/L	-	2.5			<0.00010				<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-			0.00263				0.00296
Tungsten (W) - Dissolved	mg/L	-	0.003			<0.00010				<0.00010
Uranium (U)-Dissolved	mg/L	-	0.02			<0.000010				<0.000010
Vanadium (V)-Dissolved	mg/L	-	0.02			<0.00050				<0.00050
Zinc (Zn)-Dissolved	mg/L	-	3			<0.0010				<0.0010
Zirconium - Dissolved	mg/L	-	-			0.000365				0.000354
<b>NOTES</b>										
(1) BC MoE Approved and Working Water Quality Guidelines, Updated March 2018										
(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life or drinking water, Schedule 6										
(3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)										
(4) BC MoE Water Quality Guidelines for Protection of Wildlife										
(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										
* Criteria exceeds detection limit										
BCWQG-AW	BC MoE Quality Guidelines for Protection of Aquatic Life									
CSR-AW/DW	BC Contaminated Sites Regulation Water Quality Guidelines for Protection of Aquatic Life									

# Appendix C – Kitwanga Landfill Operational Certificate



File: MR-5767

Date: November 8, 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-5767 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-5767

for the

KITWANGA 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 Kitwanga and surrounding area at the Kitwanga 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 District Lot 1335 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 E209210. 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 E219223. Refer to Section 8 for the operational requirements associated with this discharge.



Mark Love, P.Ag.

For Director, Environmental Management Act

- 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.

### **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 autohulks 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 10.5, once per year on or before June 30 for the previous year, expressed in tonnes/yr and/or m<sup>3</sup>/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 Regulation 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.).

**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  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm, and  $25 \pm 2$  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



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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.

#### 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.



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**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 m<sup>2</sup> 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 m<sup>3</sup>. 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 11.5).

**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 sign 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.



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**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. 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



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monitoring locations.

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

Sampling Locations <sup>1</sup> and EMS ID	Frequency <sup>3</sup>	Parameters <sup>3</sup>
Unnamed Creek U/S of Kitwanga Landfill E278450	twice annually, in April and September	<b>Field Measurements:</b> pH, dissolved oxygen, specific conductance, temperature
Unnamed Creek D/S of Kitwanga Landfill E278449		<b>Lab Analysis:</b> BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals <sup>2</sup>
<sup>1</sup> Sampling locations are shown on the site plan <sup>2</sup> Lab analysis for dissolved metals shall use a low level scan <sup>3</sup> May be altered in future, depending on results		

## 10. REPORTING REQUIREMENTS

### 10.1 Reporting

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

### 10.2 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.

### 10.3 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.

### 10.4 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 probably cause(s) of the non-compliance; and,
- iii) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

### 10.5 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.

## 11. CLOSURE REQUIREMENTS

### 11.1 Notification of Closure

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

### 11.2 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.

### **11.3 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 11.2, plus a reasonable contingency for any remediation which may be required.

### **11.4 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.

### **11.5 Progressive Application of Final Cover**

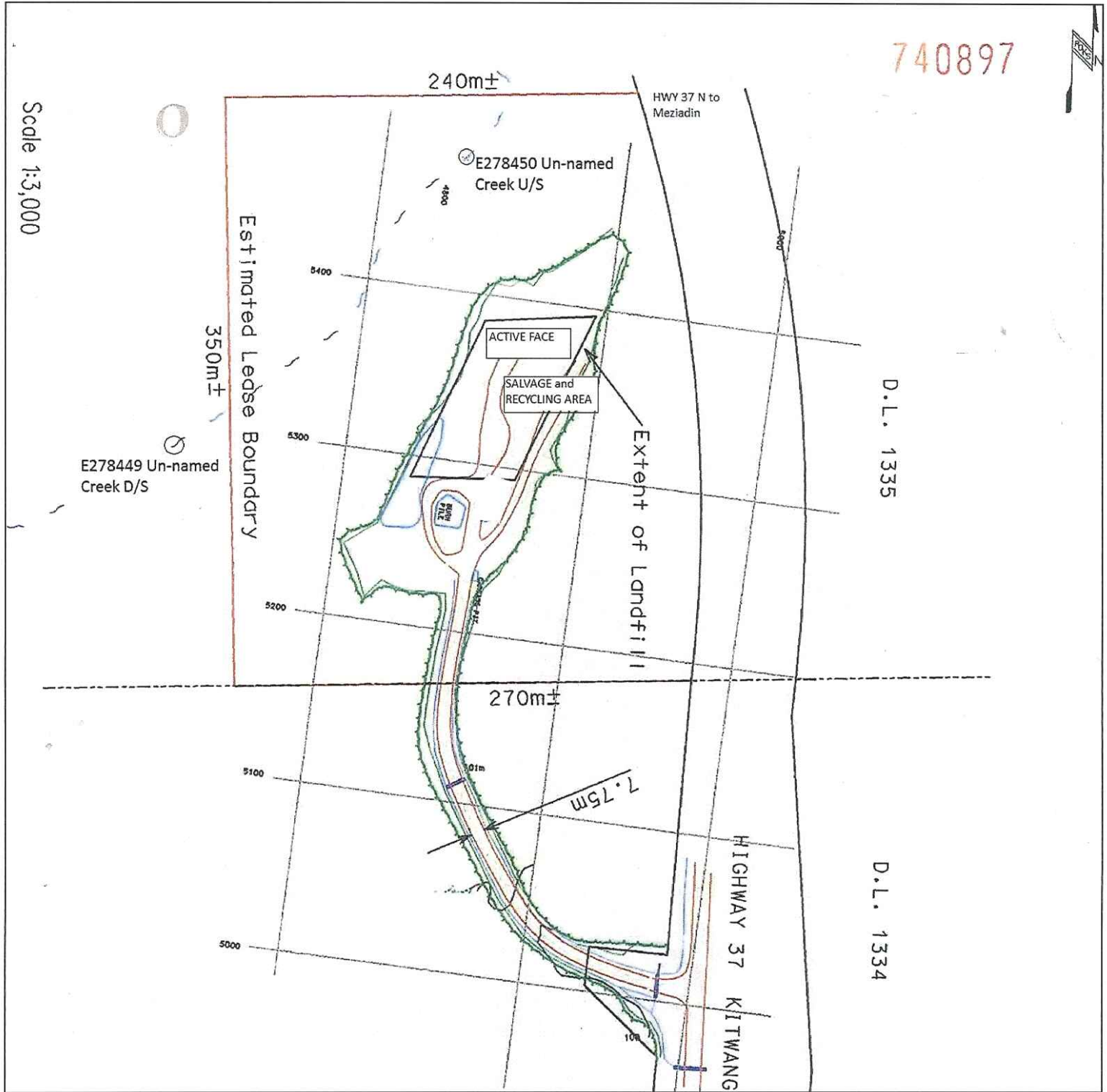
Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in Section 11.4.

## **12. 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: November 8, 2012  
Date Amended:  
(most recent)

*M. Love*  
Mark Love, P.Ag  
for Director, *Environmental Management Act*  
Skeena Region  
Permit Number: MR-5767